

Bowling League Tuneup



**The Art and Science of Creating
Successful Bowling Leagues™**



Bowling League Tuneup
Version 3.1
January 2021

User Manual
1st Edition

© 2021 Priceless Analytical Software

www.bl tuneup.com

Table of Contents

<u>Introduction</u>	I-1
<u>Documentation</u>	D-1
<u>Overview</u>	D-1
<u>What does Bowling League Tuneup do?</u>	D-1
<u>What doesn't Bowling League Tuneup do?</u>	D-1
<u>Is Bowling League Tuneup really needed?</u>	D-2
<u>How would a league use Bowling League Tuneup?</u>	D-2
<u>Who is Bowling League Tuneup's target audience?</u>	D-4
<u>Who created Bowling League Tuneup?</u>	D-4
<u>Handicapping leagues</u>	D-5
<u>Handicapping fundamentals</u>	D-5
<u>The handicap percentage</u>	D-6
<u>The handicap base</u>	D-6
<u>Beating the handicap system</u>	D-7
<u>Beating handicap cheaters</u>	D-8
<u>Setting an appropriate handicap formula</u>	D-9
<u>Handicapping issues</u>	D-10
<u>Website and blog (mis)information</u>	D-10
<u>Sandbagging</u>	D-12
<u>The sweepers problem</u>	D-12
<u>The USBC study</u>	D-13
<u>The good-bowler problem</u>	D-14
<u>The alleged bad-bowler advantage</u>	D-15
<u>Scratch-league mentality</u>	D-16
<u>How to proceed</u>	D-17
<u>Preparing for a new season</u>	D-17
<u>Determining league attributes</u>	D-18
<u>Creating a new league</u>	D-18
<u>Saving a league definition</u>	D-24
<u>Performing a league analysis</u>	D-24
<u>Saving a league analysis</u>	D-26
<u>Preseason tuneup: adjusting league attributes</u>	D-28
<u>Adjusting the handicap formula</u>	D-29
<u>Capping the handicap</u>	D-33
<u>Adjusting season length</u>	D-35
<u>Splitting the season</u>	D-37
<u>Splitting the season with dual handicaps</u>	D-38
<u>Using dual handicaps in a non-split season</u>	D-39
<u>Adjusting other league variables</u>	D-40

Bowler performance measures	D-41
Average: the measure of ability	D-41
Trend: the measure of improvement	D-42
Volatility: the measure of consistency	D-45
Putting it all together	D-45
Using Bowling League Tuneup during the season	D-47
Bowler information revisited	D-47
Using computed bowler data	D-48
Dealing with bowler absences	D-50
Editing the bowler grid	D-52
Entering weekly bowler scores	D-53
Importing weekly bowler scores	D-55
Changing a league's roster of teams	D-64
Changing team lineups	D-68
Producing bowler performance sheets	D-72
Postseason diagnostics	D-79
Comparing league analyses with actual results	D-79
What-if analyses and mass changes	D-85
Postseason inquiries	D-92
Identifying potential cheating	D-96
Using Bowling League Tuneup as a research tool	D-101
Creating league libraries	D-105
Congregating the data	D-105
Searching the data	D-107
Mining the data	D-108
Sharing the data	D-109
Application information	D-109
Monte Carlo simulations	D-109
Application architecture	D-110
Mathematical challenges	D-111
Mathematical skepticism	D-112
Official research	D-115
Reference Guide	R-1
Keyboard use	R-1
Main screen	R-2
Edit bowler window	R-9
Define league window	R-13
Save league window	R-16
Bowler score extraction window	R-18
Bowler score entry/import windows	R-22
Excel workbooks	R-24

<u>Appendices</u>	A-1
<u>A. System requirements</u>	A-1
<u>B. Installation instructions</u>	A-1
<u>C. Application startup</u>	A-2
<u>D. Excel configuration</u>	A-2
<u>E. Trend probability tables</u>	A-3
<u>F. Glossary</u>	A-8
<u>G. FAQs</u>	A-12
<u>H. Support</u>	A-16

Introduction

Is your bowling league fair? How do you know?

These are simple questions that have never had simple answers. The problem is that bowling centers have never had any tools to help them assure their handicap leagues are fair. So even though the handicap formula has a profound influence on league results and league fairness, there has never been a way to determine the optimal formula to use given the specific attributes of a league and its bowlers.

As a result, it is likely your handicap league is not fair. Either the better teams are not rewarded adequately – or at all – for their bowling abilities or the poorer teams have such low chances of success that they're essentially out of the running for first place before the league even starts.

Handicap bowling leagues were invented with the goal of rewarding good bowling while assuring that the highest-average teams don't routinely dominate and the lowest-average teams aren't routinely trounced. A properly configured handicap league will do exactly that, maximizing the fun for all bowlers during the season and keeping them coming back season after season.

Bowling League Tuneup is breakthrough software that takes the guesswork out of setting up handicap bowling leagues. By combining a powerful analytical tool with a simple, intuitive user interface, BLT makes it easy to test proposed league settings before committing to them.

Before the season starts, Bowling League Tuneup can accurately assess teams' chances of success in both handicap and scratch bowling leagues. During the season, BLT can be used to record bowler scores in order to monitor league competitiveness and to create bowler performance sheets which may be distributed to the bowlers. After the season, BLT can use the data gathered during the season to help make sense of league outcomes and to test the effects of possible changes to league settings in subsequent seasons.

Bowling League Tuneup doesn't favor any subjective theories about the best way to configure a league. It is totally driven by mathematics. Results are expressed in terms of simple, easily understood probabilities. No other application can answer questions like these:

- What is a team's actual probability of success at the start of a season?
- What type of performances would be required to bring a poor team into contention in a handicap league?
- How much did an excessive number of absences hurt a team's chances in a league?
- How much did a team's poor performance at the start of a handicap league improve the team's chances for success in the league?
- How effective would it be to use book averages at the start of the season in a handicap league as an antidote to suspected sandbaggers?
- If a bowler establishes an average over the handicap base, how much does that affect his or her team's chances of success?
- How effective would it be to split the season as a way of leveling the playing field?
- If the season length or league size changes from previous seasons, how should the handicap percentage be altered to preserve the league's competitive balance?

Perhaps the most important question Bowling League Tuneup can answer is this one: At the start of the season, can league bowlers be shown that their handicap league has been set up fairly, giving a deserved advantage to the better teams while assuring that all teams have a realistic chance of success? Now, for the first time ever, the answer is yes.

This user manual contains all the information you need to master the use of this one-of-a-kind application.

Documentation

The goal of this user manual is to make you an expert on the principles of setting up successful bowling leagues and on the use of Bowling League Tuneup to achieve that end. Let's get started.

OVERVIEW

Here we'll present some background into what Bowling League Tuneup is and how it came to be.

What does Bowling League Tuneup do?

Bowling League Tuneup answers the question that no other bowling software can: What are a team's actual chances of success in a bowling league?

When gamblers sit down at a blackjack table, they know exactly what their chances of success are. The odds of the game are well documented. Few people would want to risk their money playing a game with no knowledge about their chances of losing their money.

But for decades bowlers have joined bowling leagues with no real idea about their chances of winning. Oh sure, some bowlers would say their real goal in a league is just to have fun and that doing well in the league really isn't that important to them. But people pay real money to bowl in a league, and some of that money goes to a prize fund that's distributed to the league's top finishers. In a handicap league there is an implicit assumption that everyone who joins has a realistic chance to rise to the top of the standings and reap those rewards. All a team has to do is bowl well relative to its own abilities to give itself a good shot at success.

Sadly, this is often not the case. Leagues are often set up in a way that makes failure a virtual mathematical certainty for many teams. But before Bowling League Tuneup, there was no way to know whether this was the case in a particular league. Bowling League Tuneup was created to, finally, determine a team's actual chances of success in a bowling league.

What doesn't Bowling League Tuneup do?

Bowling League Tuneup analyzes bowling leagues and creates reports with statistics and charts for league bowlers. But it is not a league management system.

There are many league management systems on the market that provide all the tools necessary to run a bowling league. Among other things, these systems create league schedules, make weekly team lane assignments, produce weekly recap sheets of results and standings, track bowler payment records, compute season bests for both team and individual achievements, and determine trophy distribution and monetary winnings for the season and for sweepers. Bowling League Tuneup does none of these things.

But Bowling League Tuneup does something no league management system (or any other system) does: it provides the information needed to assure bowling leagues are set up to be fair and competitive. That is a vitally important function. After all, what good is it to use a league

management system to create a beautifully run league that is totally unfair? League management software and Bowling League Tuneup are both indispensable components of successful bowling leagues.

Is Bowling League Tuneup really needed?

Bowling leagues have been around forever and have never used league analysis software. So why is league analysis software suddenly essential?

The popularity of league bowling has been diminishing for decades. There is surely a complex array of societal changes that accounts for this, but the lack of fairness of many handicap leagues certainly has not helped the matter. When league bowlers come to perceive a lack of fairness in their leagues, it is inevitable they will eventually lose interest in participating.

Even the United States Bowling Congress, which sanctions leagues throughout the country, acknowledged to the creator of Bowling League Tuneup that this lack of fairness surely exists. Their solution is to recommend that all handicap leagues be set up to give all teams, regardless of skill level, an equal chance to win. But for all but the very least-competitive bowlers, this is not a popular configuration, as it gives bowlers and teams absolutely no reward for becoming better bowlers.

The USBC admitted that this is the reason most leagues ignore their published recommendation and instead use a handicap formula that gives an advantage to better bowlers. The USBC's stance is that if a league wants to do this, as the vast majority of handicap leagues do, any unfairness that results from an inappropriately selected handicap formula is the league's problem, not the USBC's.

The result is that the USBC is sanctioning – giving its seal of approval – to leagues which are set up in a way that is demonstrably unfair to large numbers of league bowlers. The USBC acknowledges this sad fact and says there's nothing they can do about it – not even recommending the use of Bowling League Tuneup. That's because, they said, they don't endorse products – although they did agree to refer bowlers and leagues to our website when issues involving league fairness arise.

We're on a mission to help save the pastime of league bowling from a continuing loss of popularity that we believe is at least partially caused by the prevalence of improperly configured leagues – a problem that even the preeminent organization responsible for nurturing that pastime recognizes but chooses to ignore.

How would a league use Bowling League Tuneup?

Because Bowling League Tuneup can compute teams' chances of success in a league, it can also be used to assure a league is set up to be fair.

When a new league is created, the person who creates the league (we'll call this person the league manager) can use Bowling League Tuneup to compute the chances of success for each of the league's teams, given the new league's proposed attributes (handicap formula, season length, etc.) and the bowlers' established or estimated averages. If the results of this analysis show too heavy a bias for or against any teams, the league manager can use BLT to see how potential changes to the league's attributes would affect its fairness. We call this process of adjusting a league's attributes to find its ideal settings "tuning up" the league.

In scratch leagues, where the highest team total wins a game, the odds of success are directly correlated with each team's average score. The higher a team's average, the better its chances of success. The results of a preseason BLT analysis will show teams' projected chances of success, giving bowlers a clear understanding of the league's competitiveness and knowledge about what kinds of performances might be needed from their teams to have a shot at success in the league.

The real power of Bowling League Tuneup lies in its ability to allow a league manager to configure handicap leagues so that teams of potentially greatly different abilities can nevertheless be competitive against one another.

The league manager's goal in every handicap league is – or should be – to set up the league in a way that assures success is feasible for all participants, regardless of their skill levels. That's the *purpose* of having handicap leagues. Creating a handicap league in which some teams have no realistic chance of success is contrary to the very idea of having a handicap league. Recruiting teams into such a league would at best represent a case of false advertising and would at worst border on downright dishonesty. But without a way to measure a league's fairness, avoiding such a pitfall presented a daunting task for a league manager!

One way to assure every team has a reasonable chance of success is to follow the USBC's recommendation to give all teams an equal chance of success. While that is actually easy to do, we've already pointed out that most leagues choose not to go this route. In such a league, better bowlers have no advantage whatsoever over poorer bowlers. Teams are rewarded solely for bowling well compared to their own previous efforts. While this setup may work well for a non-competitive "fun" league, people with any interest in becoming better bowlers will generally try to avoid joining such leagues. People like to be rewarded for getting better at things, and bowling is no exception.

So, handicap leagues are usually set up to give some advantage to better teams, while still trying to assure that poorer teams have a realistic hope for success if they do very well compared to their typical performances. To accomplish this goal, the league manager has to perform a delicate balancing act. But there have never been any tools to help him or her succeed at this goal.

Maybe it would be more accurate to say that league managers have had only two not-so-good tools at their disposal: tradition and guesswork. Tradition might dictate setting up a league as, say, a "90%" league. (Details on this later.) But it can be shown that this handicap setting may not always be appropriate. Any modifications a league manager may make to try to assure that all teams have a reasonable chance of success – altering the handicap formula, changing the season length, splitting the season, using book averages, and so on – have really amounted to nothing more than guesswork – a *hope* that the modification will alter the competitive balance of the league meaningfully and in the desired manner. But there has never been any way to determine the effect of a modification mathematically and no way to test the modification to see if it does what it's supposed to without actually implementing it. And even then, one season's worth of results does not provide nearly enough data to draw any general conclusions about the success of the change. Even veteran league managers cannot hope to get experience with enough leagues to derive mathematically reliable conclusions from their experiences.

League managers now have a new tool at their disposal. A tool that gives answers based on mathematics, not on guesswork. Bowling League Tuneup is that tool.

Who is Bowling League Tuneup's target audience?

Bowling League Tuneup was originally designed for use by bowling centers and league managers as a way for them to create fair, competitive leagues. Other benefits from a bowling center's use of BLT include the production and distribution of weekly bowler performance sheets and the easy storage of and access to many seasons of this collected information. Examination of bowler and league analyses from past seasons can, for instance, reveal patterns of cheating that could not be detected from examining a single season's worth of data.

If you are a bowler in a league that does not use Bowling League Tuneup, you are also part of the target audience. It is a great tool for tracking personal performances – for you as well as for teammates and any other league bowlers you care to track. And, of course, a league bowler may also use BLT to evaluate his or her own league's fairness when the bowling center does not do so. In fact, that is precisely how the author of BLT used it after he wrote it! (After convincing league bowlers that the league was not fair, the recommended changes were voted in – and had immensely positive results – in the following season.)

Who created Bowling League Tuneup?

Bowling League Tuneup was created by Richard Price, a software engineer for a major defense company in the Los Angeles area. Richard has been a league bowler for more years than he wants to admit. While not blessed with great bowling ability, he's boosted his average into the 180s, and occasionally into the 190s, an accomplishment he's proud of given that he's never had the time to devote to lots of practice.

In recent years, Richard bowled in his company's bowling league. He was recruited into the league the way so many others were: he was told it didn't matter how good a bowler he was or how good his teammates were because this was a *handicap* league. The sales pitch was along these lines: "Handicapping levels the playing field, so *everyone* has a shot at first place. So don't worry about your bowling ability. Just come join the fun!"

Well, over 10 seasons in this league, with mostly the same group of bowlers competing each season, Richard watched helplessly as the same teams almost always competed for the top places of finish (and, not incidentally, the big bucks that went to the top finishers), while his team, with bowlers having averages nowhere near as high as those on the successful teams, always languished near the bottom of the standings – even in seasons where his team did quite well relative to their established averages. He began to suspect the league had not been tuned up properly, and that, mathematically, his team had very little actual chance of success. But there was no way to know for sure. Perhaps his team had just been chronically unlucky. Maybe next season their fortunes might change.

Richard was determined to solve this puzzle. That's when he realized that he was much more skilled as a mathematician and a computer programmer than as a bowler. So he devoted himself to coming up with some answers. Bowling League Tuneup is the result of several years of effort to finally bring some science to the art of setting up a bowling league.

HANDICAPPING LEAGUES

Understanding the use of Bowling League Tuneup requires an understanding of bowling handicaps. Even if you already understand how handicaps work, you should make sure this whole section makes sense to you. Successful use of BLT requires this.

Handicapping fundamentals

In a handicap league, each bowler is assigned a handicap, which is the number of pins that are added to his or her score each game before results are tallied to determine the winner. Better bowlers have lower handicaps and poorer bowlers have higher handicaps. This allows poorer bowlers to be competitive against better bowlers. Handicaps are usually recomputed after each week of the season, so they are continually changing to accurately reflect each bowler's skill level.

Each league has a handicap formula, specified at the time the league is created, which is used to compute bowler handicaps. A formula such as "95% of 220" means that each bowler's *scratch* average (the bowler's actual, non-handicap average score) is subtracted from 220, then 95% of that number becomes the bowler's handicap.

Using this formula, a bowler averaging 200 would have a handicap of $0.95 \times (220 - 200)$, which equals 19. A bowler averaging 150 would have a handicap of $0.95 \times (220 - 150)$, or 66.5. Leagues ignore the decimal part, so this bowler's handicap would be 66.

Notice that if these two bowlers bowled against each other and each bowled exactly his or her average, the handicap results would be 219 to 216. The 200-average bowler would win by three pins. The reason for this is the 95% part of the handicap formula, which gives a slight advantage to the better bowler. This is by design, to reward bowlers for getting better.

If the handicap percentage were changed to 100, there would be no advantage to having a higher average, and the bowlers would tie. This is the situation described previously, where all teams start with an equal chance of success. In this type of league, the winner of each game would be the team that bowls higher relative to its established average than the other team.

If instead the handicap percentage were reduced to 90, that would increase the advantage of the better bowler, who would then win by five pins. Part of the art of setting up a league is to *tune* the handicap formula of the league in a way that rewards good bowlers while still giving poorer bowlers a reasonable chance of success if they are able to bowl well relative to their past performances, as defined by their bowling averages.

Note that a scratch league, i.e., a league which does not use handicaps, can be thought of as a league in which the handicap percentage is zero. That makes everyone's handicap zero, so nothing is being added to bowlers' scratch scores. In the given example, the bowler averaging 200 who bowls his/her average would beat the 150-average bowler who bowls his/her average by 50 pins. While the 150-average bowler would be likely to beat the 200-average bowler every now and then in a scratch league, the 150-average bowler would have virtually no chance to win more games than the 200-average bowler over a full season.

The handicap percentage

Setting an appropriate handicap formula is a key factor in tuning a league to achieve the desired level of competitiveness. There are two parts to the handicap formula; an improper setting in either part can cause the same lack of competitive balance that handicapping is there to prevent.

We've already discussed the first part of the handicap formula, the handicap percentage. A percentage of 100 completely levels the playing field. No one has an advantage from being a better bowler. Games will be won by the team which bowls better in relation to its established average than the other team, regardless of the skill level of the team.

As the percentage decreases below 100, greater weight is given to bowler skill levels. As we just stated, when the percentage is reduced all the way to zero, you have the other extreme, namely a scratch league.

A percentage of 90 is commonly used by handicap leagues. This is surely appropriate for some leagues, but there is no one-size-fits-all solution to setting handicap percentages. Some factors to consider are:

- The disparity in skill levels between the best and the worst teams: The greater the disparity, the higher the percent should probably be in order to give the poorer teams a reasonable chance of success.
- The length of the season: The longer the season, the greater the percentage should probably be, since longer seasons will be more likely to allow the law of averages to work to the benefit of the better teams.
- The size of the league: The more teams, the greater the percentage should probably be to allow poorer teams to overcome the greater number of better teams they must outperform to be successful in the league.

So, what's the optimal percentage for a particular league? For years, that answer has just been a guess. But Bowling League Tuneup can now be used to get an answer to that question for any bowling league.

The handicap base

The second number in the handicap formula is the number the bowler's average is subtracted from. It is called the *base* number. This number is not in the formula to affect league competitiveness. It is there for the sole purpose of giving higher averages lower handicaps and lower averages higher handicaps via subtraction.

In the example of the 150-average bowler bowling against the 200-average bowler, we subtracted the averages from the base number of 220. If we had instead subtracted from a base number of 250, the handicap score difference between the two bowlers would have been identical (excepting potential round-off issues), regardless of the handicap percentage used. Increasing the base number by 30 pins would simply add the same number of pins (30 times the handicap percentage) to each of the bowlers' handicap scores, which will obviously have no effect on wins and losses.

But just because the base number doesn't affect competitiveness, that doesn't mean its value isn't important. Specifically, that value must be at least as high as the highest average attained by any bowler during the league.

To see why this is the case, consider our two sample bowlers again. If the base number were set to 180 and the handicap percentage were 90, the 150-average bowler would have a handicap of $0.90 \times (180-150)$, which equals 27, while the 200-average bowler would have a handicap of $0.90 \times (180-200)$, which equals -18. Most leagues, however, do not allow negative handicaps, which would *subtract* pins from a bowler's scratch score each game. So the 200-average bowler would carry a handicap of zero.

The problem here is significant. In a 90-percent league, the two bowlers in question, whose averages differ by 50 pins, should have handicaps that differ by 45 pins. But because the handicap base was set too low, the difference is only 27 pins. That represents a huge, essentially insurmountable advantage for the 200-average bowler, whose handicap is 18 pins higher than the formula would otherwise dictate since negative handicaps are not allowed.

Let's pause here to comment that a distressingly large percentage of bowlers do not recognize the significant and unfair advantage gained by a bowler who can achieve an average higher than the handicap base. In fact, many believe a bowler who accomplishes this feat and gets a handicap of zero is actually at a great *disadvantage* against bowlers with non-zero handicaps – and that giving such a good bowler a positive handicap by increasing the handicap base gives that bowler an unfair advantage over other bowlers. The fact that the truth is the exact opposite of this is one of many obstacles that must be overcome in convincing a league to alter its handicap formula.

There are two easy remedies to this handicap base problem. If negative handicaps are allowed, that solves the problem. But bowlers tend not to like it when the handicap *reduces* their game scores. Of course mathematically, this is just as valid as adding higher numbers to everyone's scores, but when the psychological effect of subtracting from scores is considered, negative handicaps are usually rejected by leagues.

The other remedy is to simply always make the handicap base be 300. Clearly, no one will ever exceed an average of 300, so the problem of a too-small base is eliminated. Again, mathematically, this is a perfectly valid solution. The problem here is that handicap scores (scratch score plus handicap) tend not to look like bowling scores when the base is set so high. If our 150-average and 200-average bowlers bowl games of, say, 190 and 230, respectively, in a league whose handicap formula is 90% of 300, the handicap scores have the 150-average bowler winning 325 to 320. Although the actual sum of the scratch score and the handicap is not a number that means anything in absolute terms (only in comparison with the numbers of other bowlers in that same league), that nonetheless looks a little funny and therefore bothers some people.

So leagues go on setting base numbers that are too low, giving humongous advantages to anyone who can get his or her average above that number. Bowling League Tuneup can quantify exactly how much of an advantage the improperly set base is giving, which should provide ample evidence of the need to make sure that number is big enough – or to use negative handicaps.

Beating the handicap system

Leagues can be unfair, and not just as a result of poorly set handicap formulas. They can be unfair as a result of unethical behavior by the bowlers themselves.

Handicaps are based on bowler averages. Usually, a bowler's average is recomputed after each week of bowling and that average is used to set the bowler's handicap for the following week. On

the first week of bowling, averages and handicaps are computed *after* the games are bowled, then the computed handicap is retroactively applied to those games after they are bowled.

So, what if a bowler bowled badly on the first week of the season? It wouldn't hurt the bowler too much that first week, since he or she would establish a high handicap that would greatly reduce the disadvantage of the low scores. On subsequent weeks, that high handicap would be a big advantage, since handicap leagues reward bowling well in relation to your established average. The good effects of that initial high handicap could last for many weeks, until the bowler's normal performance gradually brings the handicap in line with the bowler's actual ability.

It is, of course, entirely possible to have a bad week on the first week of the season while trying to bowl well. It is also possible to bowl poorly on purpose, in order to reap the benefits of having a high handicap. When a bowler bowls badly on purpose early in the season, that is called *sandbagging*. Even though league bowlers are always supposed to bowl their best at all times, it is virtually impossible to prove that someone is not doing that. If a bowler is sufficiently motivated to do well in a league, sometimes the temptation to sandbag is too inviting to resist. Because the sad truth is that sandbagging improves a team's chances of success significantly.

There is one other form of unethical behavior which can be just as effective a way of cheating. Rather than only bowling poorly early in the season, a good bowler could also purposely bowl badly anytime in the season when victory – or even defeat – in a game or series is pretty much assured, i.e., on those occasions when the bowler's or team's final score is rendered meaningless. This practice, often called *dumping*, is done with the intention of keeping the bowler's average artificially low and handicap artificially high in preparation for occasions when the high handicap can be used as a weapon in particularly tough games or series. Dumping is much more difficult to detect than sandbagging, and it is also more difficult to thwart.

Beating handicap cheaters

Sandbagging works best when bowlers establish a brand-new average on the first week of a new league, independent of any of the bowlers' previously established league averages. For whatever reason, this is usually what is done in bowling leagues – unlike golf, for instance, where a golfer carries his or her established handicap to a golf round or tournament.

But sanctioned leagues *do* create officially recognized averages for league bowlers, and those averages can be used as a basis for bowler handicaps at the start of a new league, diminishing a bowler's ability to gain an advantage by bowling badly to start the league. Use of previously established averages (known as *book averages*) can be a league's most effective weapon against sandbagging.

Leagues usually choose to base bowler handicaps on bowlers' book averages for some number of weeks to start the season rather than for the full season. This prevents a bowler who has improved his or her average from previous seasons from getting too big of an advantage in the league – and, conversely, from hurting a bowler who may be recovering from an injury, trying to adjust to new equipment, or has a lower average for some other reason. After the prescribed number of weeks has been bowled, handicaps revert to being based on the current season's scores. Any bowlers without an established book average will have their handicaps each week retroactively based on their current season average, including the current week's games, for as many weeks as a book average would be used.

While this method effectively reduces the effects of bowling badly (on purpose or otherwise) to start a season, it does increase the workload for the league manager, who must determine bowler book averages (including selecting the appropriate one to use when a bowler has multiple established averages from different leagues and/or bowling centers), use them properly in determining handicaps, and deal with the inevitable situations where bowlers will feel it's unfair for their performances in other seasons, leagues, or bowling centers to adversely affect their handicap scores in this league. A manager has to weigh these pros and cons in making a decision to use book averages in a league.

Setting an appropriate handicap formula

The most important part of creating a fair bowling league is setting an appropriate handicap formula. As discussed, this is difficult to do, and it's even more difficult to prove you've succeeded. There are so many factors that affect league competitiveness, mathematically computing the odds of each team's success is an almost impossible task. So league setup has always been just a matter of guesswork. Bowling League Tuneup can, at long last, solve that problem.

During the research phase of the development of Bowling League Tuneup, one league manager said the bowling center was finding it increasingly difficult to fill its leagues. She said that bowlers were sick of watching the same teams win season after season, so they lost interest in joining the leagues there. In analyses of data from some of the leagues there, BLT showed that, indeed, the league manager was setting up her leagues in a way that gave little chance for poorer teams to succeed. But without BLT, the poor league manager could only keep flailing away in her attempts to achieve a good competitive balance. And she kept failing.

To understand the difficulty in analyzing the fairness of a league, consider some of the factors that affect teams' probability of success:

- Number of bowlers and teams
- Team averages
- Length of season
- Handicap formula
- Use of book averages to set handicaps
- Use of split seasons (turning one season into two, with a playoff to determine the winner)

A change in any single one of these factors, e.g., adjusting one team's average up or down, and changes to several lesser factors as well, will affect probabilities of success throughout the entire league. Measuring the effects of these changes presents a daunting mathematical challenge – far more complex than determining your odds at a blackjack table!

Without Bowling League Tuneup, the only advice a league manager could get was to start with a "standard" handicap formula, like 90% of 220, then tweak it in subsequent seasons if it appeared not to be fair. But with a sample size of only a small number of seasons, no mathematically reliable results could be derived this way.

That's where Bowling League Tuneup comes in. Using BLT, a league manager can fully define a league: all its attributes and all its bowlers. BLT can then compute highly accurate probabilities showing each team's chances of success in the league. It can also show how any potential league or bowler changes will affect those probabilities, allowing a league manager to tune up a league to produce exactly the desired probability-of-success distribution among all the league's teams.

HANDICAPPING ISSUES

Before creating Bowling League Tuneup, the author did a lot of Internet searches in a futile attempt to find software tools that could analyze and optimize bowling leagues. What he found instead was a seemingly endless number of websites and blogs where authors expounded at length on their theories for setting up a bowling league. Everyone, it seemed, had an opinion on the subject. Unfortunately, many of those theories contradicted each other and many of the opinions expressed were not mathematically defensible. This, apparently, is what happens in the absence of a tool that can objectively settle debates.

Presented in this section is a summary of some of the issues to consider and problems that can arise when setting up a handicap bowling league.

Website and blog (mis)information

Bowling websites and blogs abound on the Internet. How to set up a bowling league fairly is a popular subject. Unfortunately, while there's a lot of good information available in cyberspace, there's also a whole lot of bad information out there.

As a case in point, here's a randomly selected entry from a bowling blog: "If you average over 200 then you should get a zero-pin handicap. I don't believe in negative handicaps, which penalize the scratch bowler for doing so well. Handicap should be 90% of 200."

This blogger is expressing the common perception that you should never add handicap pins to a good bowler's score because that represents an increased advantage for the good bowler, nor should you ever subtract handicap pins from a good bowler's score because that penalizes the good bowler. The last sentence suggests that setting handicap at 90% of 200 will be the appropriate handicap for all leagues. All three of the sentences in this blogger's post are provable nonsense, and following this advice can end up exacerbating a league's problems rather than solving them.

To see this, let's use a common handicap formula like 90% of 220. With this formula, a 120-average bowler will get 90 pins added to each game, while a 220-average bowler will get 0 pins added to each game. This 90-pin difference means that the 120-average bowler, whose average is 100 pins less than the 220-average bowler, must bowl 10 pins better relative to his or her average than the 220-average bowler must bowl just to get a tie.

But if the formula were 90% of 250, the 120-average bowler would get 117 pins added to each game, while the 220-average bowler would get 27 pins added to each game. The difference between these two bowlers' handicaps is still 90. Adding 27 pins of handicap to the good bowler did not provide that bowler with an increased advantage.

Likewise, if the handicap formula were 90% of 200, but with negative handicaps allowed, the 120-average bowler would get 72 pins of handicap added to each game, while the 220-average bowler would get 18 pins of handicap *subtracted* from each game. The difference between these two bowlers' handicaps remains 90. In other words, subtracting 18 pins of handicap from the good bowler again made no difference at all and in no way penalizes him or her.

The point about handicaps is that *everything is relative!* The mistake people make in looking at handicaps is to look at them in isolation from other bowlers' handicaps. You should never do this. You must always look at the *differences* in handicaps between different bowlers in a league.

This implies that a handicap score (i.e., a scratch score plus the bowler's handicap), in and of itself, is also a pretty meaningless number. It's certainly not a number that can or should be interpreted as an actual bowling score. If a 180-average bowler in a 90% of 240 league bowls a 260 game, that bowler's handicap score would be 314. No, that is not a valid scratch score – but who cares? On one website, someone wrote: "Ever seen a 316 or higher handicap game score? That drives me nuts." Well, it shouldn't. Once a league is established as a handicap league, scores over 300 will always be possible. So what? The handicap base will inflate all bowlers' scores equally, so competitiveness is not affected. All that matters is bowlers' handicap scores in relation to other bowlers' handicap scores – not in relation to scratch scores.

If a league really hates having huge handicap scores, it can simply use a smaller handicap base. But if there's any chance for a bowler to exceed that base at any point during the season, negative handicaps must be allowed. Unfortunately, the same people complaining that handicap scores are too high would likely complain when good bowlers get pins *subtracted* from their scratch scores due to having a negative handicap. *That* problem is caused by people who trust their guts over arithmetic.

To see the need to allow negative handicaps, let's go back to the blogger's suggestion that all leagues should use a handicap formula of 90% of 200. But this time, per the blogger's insistence, we won't allow negative handicaps. Here, the 120-average bowler would get 72 pins of handicap added to each game, while the 220-average bowler would get no pins of handicap added to each game. The difference between these two bowlers' handicaps is now just 72, not 90. That extra 18 pins represents a tremendous and unintended advantage for the 220-average bowler that will be virtually impossible for the 120-average bowler to overcome over the course of a season.

There is absolutely no justification for setting the handicap base lower than any bowler's average while also prohibiting negative handicaps. Remember, the handicap base is just a meaningless number that's there to turn small numbers into large ones and large numbers into small ones. Making that number too small turns it into a bonus number that will give any bowler good enough to exceed it and achieve a zero handicap (a "scratch bowler" in the terminology of the first blogger) a disproportionate advantage over poorer bowlers – thus almost completely undoing the playing-field-leveling that is the very purpose of creating a handicap league.

It should be noted that leagues have been known to set limits on the highest handicap a bowler or team can have. Once that magic number is reached, handicap isn't allowed to get any higher. Leagues do this to dispel the fear better bowlers may have that poorer bowlers are getting too big of an advantage from the handicap. Once again, this is mathematical nonsense. This practice has the exact same effect as setting an artificial lower limit of zero on bowler handicaps, namely decreasing the handicap difference between good and bad bowlers without a logical or mathematical (only a psychological) reason for the decrease. Both of these practices create an artificial advantage for the better bowlers that can make them unbeatable over the course of a season. Bowling League Tuneup can quantify the amount of that advantage and show the adverse effect it can have on a league.

If a league manager wants to give better bowlers a larger advantage in a handicap league, the way to do that is to reduce the handicap percentage – *not* reduce the handicap base or put upper limits on handicaps!

Plenty of well-meaning people have some very bad theories about league setup. Bowling League Tuneup is designed to let you put those theories to the test – *before* the integrity of the league is destroyed by implementing mathematically invalid theories.

Sandbagging

Sandbagging is recognized to be the scourge of handicap bowling leagues. The problem is a real one, and there is no shortage of proposed solutions on websites and blogs.

Here's a quote from someone on a bowling blog: "100% handicap encourages sandbagging and discourages improvement." Let's examine this claim.

Since a 100% handicap gives no advantage to bowlers with higher averages, it is true that a bowler who joins only 100% leagues would have no incentive to improve from season to season. But all handicap leagues reward bowling better than your current league average each week, so there is a strong incentive to improve as the season progresses. Of course, the easiest way to improve from week to week is to start out poorly. The conditions are ripe for sandbagging, which is the eternal problem of handicap leagues.

To illustrate this, if a career 180-average bowler in a 100% of 220 handicap league bowls a 130 average the first week (raising suspicions that he or she is sandbagging), his/her handicap to start the league will be 90 – which is 50 pins higher than it would have been had the bowler averaged 180 the first week. That's a nice reward for having a bad week, and it will surely pay dividends in future weeks of the season.

Now let's see how this would change if this were only a 90% handicap league. In a league with a 90% of 220 handicap formula, the same bowler's handicap would be 81 – which is 45 pins higher than it would have been had the bowler averaged 180 the first week. This is five pins fewer than the bowler's handicap would be in a 100% league. The question is, do those five extra pins of handicap in the 100% league represent a huge increase in the incentive for the bowler to sandbag on the first week of the league?

The truth is, both numbers represent a huge incentive to sandbag. It is true that in the 100% league, since being a better bowler provides no advantage whatsoever, an unscrupulous bowler might be more likely to consider sandbagging as the only way to gain an edge in the league. In this respect, we'd have to say the blogger's claim has a lot of merit. But it could also be argued that a bowler who would be willing to sandbag in a 100% league would be unlikely to reject this course of action in a 90% league, where the rewards for this unethical behavior would be just about as great.

Sandbagging is legitimately a huge concern for handicap leagues, but adjusting the handicap formula is probably not a very effective way to combat this practice. Using BLT, you can run analyses using a variety of different proposed handicap schemes, and this will clearly show that tweaking the handicap percentage is largely ineffective in thwarting the evils of sandbagging.

The sweepers problem

For good or for bad, bowlers can often reap the biggest monetary rewards in a league not from finishing the season high in the standings or from achieving great individual performances, but from having great performances during sweepers.

Sweepers is the common name for an additional week of bowling held after the season is over. This postseason week provides an opportunity for the bowlers to get together for distribution of cash prizes and/or trophies for team and individual accomplishments from the just-completed season. It

also gives bowlers one final week of bowling in which they can put money into pots to try to win cash for bowling well, either individually, paired with other league bowlers, or as teams.

In handicap leagues, sweepers bowlers are assigned the handicaps they established during the season. Since the cash rewards bowlers may receive for good sweepers performances may greatly exceed the rewards they can receive for the entire season of bowling they just finished, bowlers have been known to purposely bowl below their capabilities all season long to establish an artificially high season-ending handicap. Whether they are dumping, i.e., bowling poorly only when a good performance won't affect outcomes, or just cruising through the whole season without ever taking their bowling scores or game outcomes very seriously, these bowlers do not bowl to the best of their abilities until sweepers, when they hope their inflated handicaps will allow them to make a killing.

If a league suspects this is happening (if, for instance, inconsistent, mediocre league bowlers predictably become reliable models of consistency during sweepers), the best remedy would be to set up the league's monetary rewards in a way that assures that good individual and team performances during the season will be more lucrative to the bowlers than good sweepers performances will be. A few games of postseason bowling should not mean more to the bowlers than an entire season of league bowling, nor should league bowlers ever be incentivized to bowl poorly, in violation of handicap league rules.

The USBC study

A number of years ago, the U.S. Bowling Congress conducted a four-year study which ultimately showed that a 100% handicap formula did not equalize all teams' chances in a handicap league. The USBC claimed that even at 100%, teams above the median average for the league still took first place 70% of the time. The study showed that not until the handicap percentage went all the way up to 116% did the teams under the league's median average have an equal shot of success as the teams above the median average.

This 116% figure is now cited – and argued about – on websites and blogs far and wide. It's unclear whether any leagues actually followed through on the USBC's findings and set up their leagues with this bizarre handicap formula – and, if so, what kinds of results those leagues experienced. After all, any handicap over 100% should give an advantage to teams with *lower* averages. And by the time the handicap goes all the way up to 116%, the poorer teams should have an overwhelming advantage in the league.

Mathematics says that a league should be totally balanced, with no advantage given to either good teams or bad teams, when the handicap percentage is 100%. So why did the USBC come up with such dramatically different results?

There are at least two possible explanations for the USBC's findings. One, it's possible that the USBC included leagues in their study which did not have a high enough handicap base set. As we've discussed, if the base is set too low, a potentially significant advantage is given to bowlers who can get their averages above that base. In these cases, offsetting this advantage would require setting a handicap percentage that gives the advantage back to the poorer bowlers – which 116% would surely do. This would, however, be a case of fixing one wrong (a too-low handicap base) by creating another wrong (a too-high handicap percentage). This would result in a league in which the teams with the highest scratch averages but without superstar bowlers who average above the handicap base would have the smallest chances of success in the league. It's hard to

imagine why anyone would want to create a league like this. If the USBC did not exclude leagues with a too-small handicap base from their study, the study's findings are mathematically meaningless and, worse, could cause anyone heeding the study's findings to set up their leagues in a terribly unfair way.

The other possible explanation is cheating. It is unknown how pervasive the practices of sandbagging and dumping are in bowling leagues, but the results of the USBC study indicate they may be very pervasive indeed. This theory requires the assumption that sandbagging and dumping are practiced significantly more (or at least more successfully) by better bowlers than by poorer bowlers. This is not a hard theory to accept, given that (a) these practices work best when a bowler has a reasonably high average to reduce, (b) it requires some degree of bowling skill to pull these practices off successfully (you need to be able to reliably convert certain spares, for instance, before missing such spares on purpose would produce significantly lower scores than normal), and (c) good bowlers are likely to have a higher level of competitiveness than casual bowlers have.

Regardless of the flavor of cheating that's employed (at the start the season or throughout the season), if enough bowlers engage in these practices, it would force leagues to restore competitiveness by giving a significant advantage to the poorer teams in the form of a greater-than-100% handicap percentage – another case of fixing one wrong by creating another wrong. In such a league, the good teams whose bowlers do not cheat would be the teams with the smallest chances of success.

Without further information about the USBC study, any attempts to draw conclusions about the reason they found that a 100% handicap percentage did not fully level the playing field would be purely speculative. All we can say is that if handicap bases are set properly and if bowlers always bowl to the best of their abilities, the USBC study's results make no mathematical sense. The fact that there has been no noticeable adoption of a greater-than-100% league handicap formula is a reflection of bowling leagues' skepticism about the validity of this finding.

Bowling League Tuneup provides mathematically valid evaluations of league competitiveness which can be used to create genuinely fair and competitive handicap leagues. It can measure the effects of an improperly set handicap base and it can help identify bowlers who are sandbagging and dumping. In short, BLT can be used to combat the league issues which likely produced the troubling conclusions of the USBC study.

The good-bowler problem

Handicap leagues can have problems keeping all bowlers happy when there are particularly good bowlers in the league. That's because at the end of the season, leagues usually reward not just the teams which finish at the top of the standings, but also individual bowlers for accomplishments such as league high handicap game and league high handicap series.

The problem is that it may be almost impossible for high-average bowlers to win such prizes. For example, if a 90% of 240 league has a bowler who averages 230 scratch, that bowler will have a handicap of 9. That means the highest handicap score that bowler can achieve (by bowling a perfect 300 scratch game) is 309. Meanwhile, a 160-average bowler in the same league will have a handicap of 72, so if that bowler bowls a mere 238 game at any time during the season, he or she will have surpassed the maximum handicap score the 230-average bowler can possibly get. With the 230-average bowler competing against dozens of these lower-average bowlers, he or she has very little chance of ever winning handicap game and series prizes.

What can a league do to fix this problem? The truth is, if a league has bowlers with very high scratch averages, there is very little it can do. The only real solution would be to prevent bowlers with book averages above a defined limit from even joining the league. This would be a perfectly valid restriction for a league to impose. But if a league does not want to impose this restriction, the best it can do is to remind the high-average bowlers that (a) unless it's a 100% league, their decreased chances of personal recognition are offset by the fact they are increasing their teams' chances of success in the league, and (b) with their averages in the stratosphere, they really should be bowling in scratch leagues, not handicap leagues, and that being in a handicap league will require them to make some sacrifices – one of which will be their likely inability to get a prize for bowling a great handicap game or series.

Leagues have been known to modify their handicap formulas as a way of solving the good-bowler problem. The problem is, this doesn't work. Lowering the handicap percentage will give the best bowlers even more of an advantage in the league, and it will not significantly affect the good-bowler problem until the percentage gets so low that the league would effectively be a scratch league. Raising the percentage would just exacerbate the problem. Modifying the handicap base has no effect on competitiveness, and therefore no effect on the good-bowler problem, since any changes to the base will affect all bowlers equally – unless it's set below the best bowlers' averages, which, as discussed previously, will give an unfair advantage to the better bowlers.

A league can mollify its high-average bowlers by offering scratch prizes in addition to handicap prizes. Scratch prizes are more likely to be won by the better scratch bowlers, while handicap prizes are more likely to be won by the non-elite bowlers, giving all bowlers a reasonable chance to win *something*.

The alleged bad-bowler advantage

It has been argued that bowlers with low scratch averages have a built-in advantage in handicap leagues. That's because handicap leagues reward bowling above your established average. And clearly, a bowler with a lower average, say 100, has more room to bowl above his or her average than does, say, a 200-average bowler. Advocates of the bad-bowler-advantage theory use this incontrovertible bit of arithmetic as justification for their contention that poorer bowlers actually have an advantage in handicap leagues, even if the handicap formula gives an advantage to better bowlers.

There are several ways to refute the bad-bowler-advantage claim. First, if a bowler has a low average, there is a reason for that. The reason is that the bowler bowls a lot of low-score games. The fact that a bowler with a 100 average could theoretically bowl a game 120 pins over his or her average, while a 200-average bowler could not, does not make it likely such a thing would happen. It could be argued just as reasonably that it is at least as likely for a 200-average bowler to bowl a 250 game (25% over his or her established average) than for a 100-average bowler to bowl a 150 game (50% over his or her established average). Regardless, citing unlikely scenarios does not constitute a reasonable mathematical argument.

An argument can be made that it's easier for poorer bowlers to significantly raise their averages over the course of a season than it is for better bowlers. While poorer bowlers certainly have more room for improvement, it could be argued that better bowlers have shown a stronger desire and ability to improve than poorer bowlers have, and that the odds of a 200-average bowler improving his or her average by 10 pins are therefore at least as great as the odds of a 100-average bowler improving by 10 pins. If any studies have been done to correlate bowlers' averages with the

probabilities they will make marked improvements in their averages during the course of a season, we are unaware of them.

Furthermore, the argument that lower-average bowlers have more room for improvement seems to imply that poorer bowlers deserve to have little success in handicap leagues unless they raise their averages. Handicap leagues would have a hard time recruiting bowlers if poorer teams almost always fail unless they improve as bowlers. That philosophy is contrary to the notion of using handicapping to level the playing field. Handicapping is supposed to give all teams, good and bad, a reasonable chance of success if they do reasonably well compared to their normal performances. Handicap leagues should never require poorer teams to raise their averages to the approximate level of the better teams before they can achieve success. That is scratch-league philosophy!

In any case, these types of arguments about bowlers' potential for improvement seem to ignore the reality that the vast majority of bowlers bowl within a relatively narrow range of averages from league to league and season to season. That is why established book averages are widely accepted as a good gauge of bowlers' abilities. In those cases where a bowler works hard to boost his or her average from one season to the next, the bowler's higher average will make further improvement more difficult, and the bowler's lower handicap will reduce the advantage gained by the improvement. That's the reality of handicap league bowling.

The bottom line is that it is nonsense to say that poorer bowlers have a built-in advantage in handicap leagues. If the handicap percentage is under 100, better bowlers have the mathematical advantage.

Scratch-league mentality

Scratch-league mentality, as just described, is a common affliction in handicap leagues. It is characterized by a mindset, usually among the league's best bowlers and perhaps even among the league officers, that the highest-average teams should always do well, regardless of the fact it's a handicap league.

In the league that served as the incentive for the creation of Bowling League Tuneup, its creator confronted the league secretary about the bias that was apparent in the league. After 10 seasons of bowling together as a league, the secretary's team, which usually had the league's highest team scratch average, had finished in the top half of the standings all 10 seasons. Almost every season, her team was either firmly in possession of first place or was at least in the battle for first place at the end of the season. And that battle was always with another one of the league's elite teams. Season after season, the leagues' lowest-average teams dwelled in the bottom half of the standings.

When asked whether this wasn't strong evidence that the league had not been set up fairly and that her team really did indeed have a huge advantage over most teams, the league secretary responded that all those successful seasons were because "I work really hard [at my bowling]."

This exchange demonstrates the challenges that await anyone trying to retune a handicap league. Even with 10 seasons of results as evidence of a league's overwhelming bias toward high-average teams, the beneficiaries of that bias will often be convinced not of the league's unfairness due to a poorly chosen handicap formula, but only of their own worthiness over their competitors.

This is the epitome of scratch-league mentality. A handicap league may have been set up with the goal of allowing all skill levels to compete for first place, and bowlers may have been recruited with the promise that, because it's a handicap league, being a good bowler is not a requirement for success, but once competition begins, all that can easily be forgotten.

A lot of these attitudes can surely be explained only by psychologists, who may understand how a desire to win can create a sense of entitlement and obscure a sense of fairness in a league which is designed to eliminate entitlement and create fairness. What we can say is that when scratch-league mentality permeates a handicap league, the result is detrimental and often fatal to the league's health. The best cure we know for this syndrome is to have afflicted individuals read this user manual to make sure they understand how handicap leagues are supposed to work.

How to proceed

If all the information and misinformation presented in this section tells us nothing else, it's that a bowling league manager has to sift through a lot of theories, opinions, and hunches in deciding how to set up a league. The easiest thing for a manager to do has always been to ignore all that noise, use an accepted standard handicap that is unlikely to be questioned by anyone, e.g., 90% of 200, and then allow league signups to proceed. Whether the league was actually set up fairly for the particular mix of bowlers that signed up and for the particular attributes of the league (size, length, etc.) would never be known since a single season's results aren't sufficient to expose flaws in the setup. This lamentable state of affairs has continued for season after season, decade after decade, in bowling leagues everywhere.

Bowling League Tuneup aims to change this pattern for good. The new normal will be to do league signups *before* committing to the use of a specific handicap formula. Once the size of the league, length of the league, and relative abilities of the bowlers and teams are known, BLT can be used to perform a tuneup of the league before it starts, assuring the creation of a fair and competitive league. League bowlers can be assured that the tuneup process has left no team behind, i.e., that every team has been given a mathematically realistic chance of success. When bowlers can be assured that such a tuneup has been done, it can be a boon to the health of a bowling league. After all, when bowlers see that the same high-average teams are winning season after season, or when they perceive that significantly above-average performances by some of the league's poorer teams are rarely getting rewarded with high places of finish – neither of which should happen in handicap leagues – they are unlikely to stick around as league bowlers.

The rest of the documentation will take you through the process of using Bowling League Tuneup to confidently create fair, fun, and successful bowling leagues.

PREPARING FOR A NEW SEASON

In this section we'll explore how to use Bowling League Tuneup to tune up a league before the league has started but after the league's bowlers and teams have been set. If Bowling League Tuneup has not yet been installed on your computer, please refer to Appendices B and C for information on installing and starting Bowling League Tuneup.

Determining league attributes

The league manager must make several decisions when creating a new league. For example:

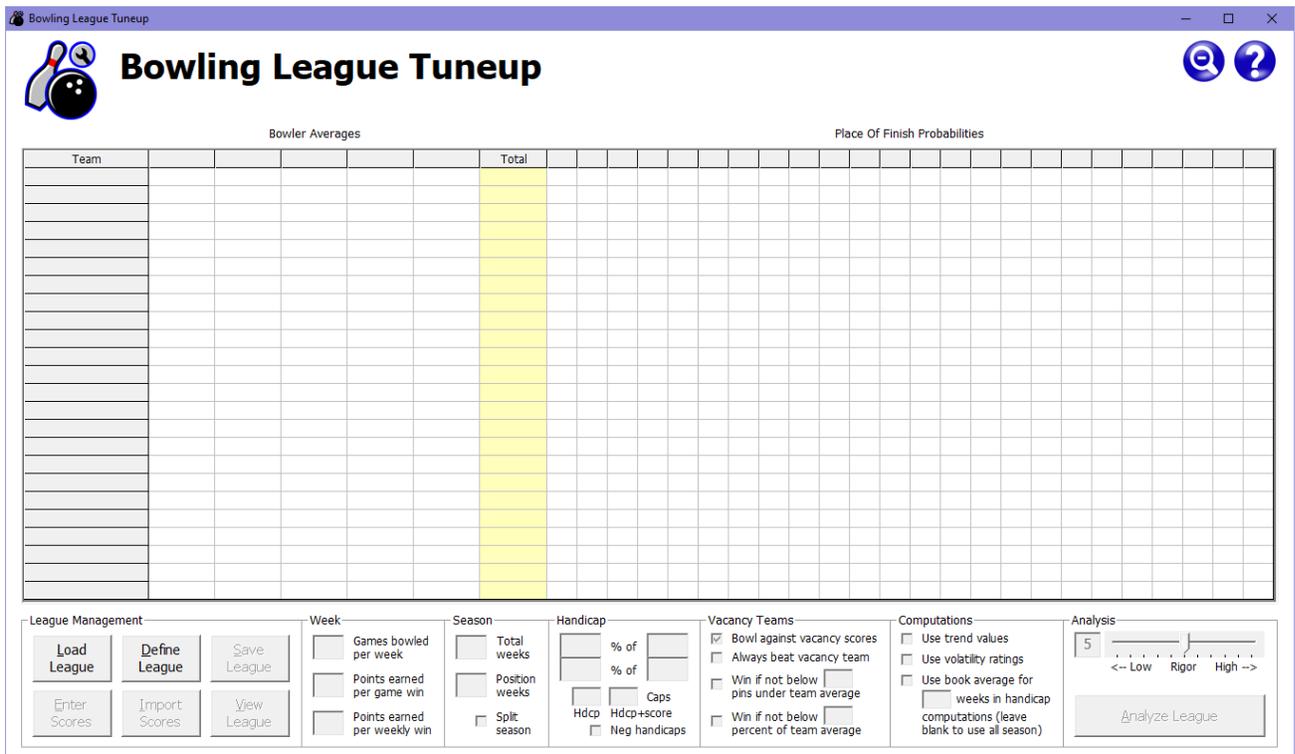
- How many games will be bowled each week?
- How will team wins and total pin counts be counted in the standings?
- How many weeks will the league last?
- How many position weeks will there be?
- Will book averages be used to determine handicaps at the start of the season, and for how many weeks will they be used?
- Will the season be split, with standings reset at the halfway point?
- How are wins determined when bowling against vacancy teams?

While some league attributes will be known early on (e.g., games bowled per week or total weeks), others may not yet be decided at the time the league is created in Bowling League Tuneup (e.g., the handicap formula or whether to split the season). As a starting point, choose reasonable values for any undecided entries.

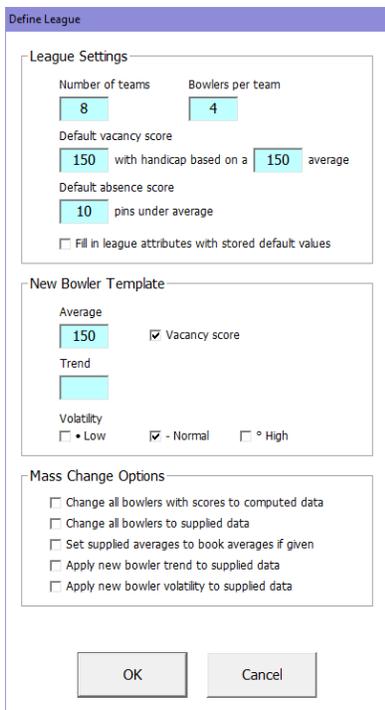
There are a few decisions to be made that aren't explicitly entered into Bowling League Tuneup. For instance, a manager might choose to set an upper limit on individual bowler scratch averages or on team scratch averages. This kind of thing is done as another way of leveling the playing field, preventing a super bowler or super team from unfairly dominating the league. When such limits are set, they may be based on bowlers' historical book averages or on their first-week results. In the latter case, changes to team lineups may have to be made after the first week of bowling. Bowling League Tuneup does not need to know about these types of decisions, as they will be reflected in the team lineups that are entered into BLT.

Creating a new league

Before any league attributes can be entered into Bowling League Tuneup, a league must first be created. That's done by clicking the Define League button, one of only two actions (the other being to load a previously saved league) we can perform immediately after Bowling League Tuneup is started.



When Define League is clicked, the Define League window comes up to allow us to create a new league by setting the number of teams that will be in the league and the number of bowlers that will be on each team.



Here, we're creating a league with eight teams and four bowlers per team. All other fields have been left at their default values. We can see that missing bowlers in this league (also known as "vacancy" bowlers) will be assigned a vacancy score of 150 and a handicap that will be based on

Here, we're renaming the first team to In The Gutter (ignoring the other parts of the Team Entry Mode window). We've preceded the name with the team number, which is a common practice to allow team names to be listed in team number order. When OK is clicked (or Enter is pressed), the new team name will be displayed in the grid and the next team in order will come up in the Team Entry Mode window. This sequence will repeat until Cancel is clicked (or Escape is pressed) to terminate the editing of teams.

If you only want to edit a single team and avoid this repetitive process, you can press the Shift key while clicking on the grid cell you want to work with. When you do this, clicking OK (or pressing Enter) in the editing window records the requested changes and terminates the editing process. This shift-click technique works when editing grid contents anywhere in Bowling League Tuneup.

At this point, we might want to enter the names of the league bowlers and their averages. To do this, we can click on a bowler's grid cell or just press F3 to edit the first bowler on the first listed team. This brings up the Edit Bowler window.

Edit Bowler

Team 1 Bowler 1

Use Supplied Bowler Data

Average
 Vacancy score

Trend

Volatility
 Low Normal High

Use Computed Bowler Data

Book average
(not currently used)

Week	1	2	3	4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

The default bowler name of team number and bowler number can be typed over with the actual bowler name if desired. If names are to be alphabetized on the league summary sheet, they should be entered as Lastname, Firstname. (They will always display as Firstname Lastname.)

Below the name are two frames. In the top frame (Use Supplied Bowler Data), we can supply Bowling League Tuneup with the average, and possibly other attributes (to be discussed later), for this bowler. The bottom frame (Use Computed Bowler Data) is used when we want to enter actual bowler scores and let BLT compute average and other attributes from those scores.

Since we have no scores to enter at the start of the season, we will just type in each bowler's book or estimated average into the top frame. When a bowler average is typed into the Average field, the Vacancy Score checkbox unchecks and the Volatility field ungrays. For now, we'll ignore the trend and volatility fields. After we click OK (or press Enter) to enter a bowler's information, the Edit Bowler window will be brought up for next bowler in sequence.

We'll continue this process for each bowler in the league. There is no team 8, so we'll leave the Edit Bowler window alone for those bowlers, leaving them with vacancy scores. Clicking Cancel (or pressing Escape) in the Edit Bowler window terminates the editing session.

Finally, we must describe the league itself on the main screen by entering below the grid the league attributes we've tentatively decided upon for this league. Let's say this league will bowl a 12-week season. Teams will be paired up each week (using a standard league schedule) to bowl three games against each other, with one point given to the winning team in each game (i.e., the team with the highest handicap total) and one additional point awarded to the team with the highest handicap pin total over all three games, for a total of four points to be distributed between the two teams. The season will have two position weeks (spaced equally in the season, with the last one in the season's final week), when teams are paired not by the standard schedule but

instead based on their positions in the standings (first-place versus second-place, third-place versus fourth-place, etc.). We'll propose an initial handicap formula of 90% of 220.

After entering all bowler definitions and league attributes, the main screen looks like this.

Bowling League Tuneup
Pin Pals

Team	Bowler Averages					Total	Place Of Finish Probabilities													
	1	2	3	4			1	2	3	4	5	6	7							
1-In The Gutter	230	158	152	137		677														
2-Heatwave	131	165	113	170		579														
3-The Four Shots	181	224	229	237		871														
4-Aches & Pains	163	132	163	137		595														
5-El Capitan	131	164	162	227		684														
6-Pinheads	218	164	155	191		728														
7-Alley Oops	128	180	190	130		628														
8-VACANCY																				

League Management
 Load League | Define League | Save League
 Enter Scores | Import Scores | View League

Week
 Games bowled per week: 3
 Points earned per game win: 1
 Points earned per weekly win: 1

Season
 Total weeks: 12
 Position weeks: 2
 Split season

Handicap
 90 % of 220
 Hdcp
 Hdcp+score
 Neg handicaps

Vacancy Teams
 Bowl against vacancy scores
 Always beat vacancy team
 Win if not below 50 pins under team average
 Win if not below percent of team average

Computations
 Use trend values
 Use volatility ratings
 Use book average for weeks in handicap computations (leave blank to use all season)

Analysis
 5
 <-- Low Rigor High -->
 Analyze League

Even after typing in all the bowlers' names, you can see that those names do not display here, only their averages. You could click in a bowler's cell to bring up the Edit Bowler window in order to see the bowler's name. A speedier alternative to left-clicking in the cell is to right-click, which will briefly display the name of the bowler in the empty area above the Team column header.

A couple of things should be noted about this league. First, notice that only seven teams joined the league. Since leagues must have an even number of teams, the eighth team has been left as a vacancy team. Each week, one team will bowl against the mythical vacancy team (i.e., they bowl by themselves), their wins and losses for the week being determined by the setting in the Vacancy Teams frame. In this league, a team gets a win in a game if they bowl no lower than 50 pins below their team average.

Also note that team 3, The Four Shots, far exceeds the skill levels of the other teams in the league, as their combined team average is 143 pins higher than the next-best team's. This kind of disparity can cause fits for a league manager trying to create a fair league. It can be prevented by establishing a maximum allowable team average for the league, thus preventing a super team from being created that will dominate the league. But no maximum average was defined for this league, so the league manager must find a league setup that prevents team 3 from being a runaway favorite to take first place in this league.

Saving a league definition

Now that we've created a league definition, and before we begin the process of tuning the league, it's a good idea to save the league definition so it can be loaded back into Bowling League Tuneup at any time without having to reenter any values. Bowling League Tuneup uses Microsoft Excel to save league definitions as Excel files – and also to create league analysis graphs and bowler performance sheets, which are also stored in these files.

When you click the Save League button, Bowling League Tuneup will check to make sure all required league information has been supplied and all fields contain valid values. If any problem is found, the save request will be terminated with a description of the error. If no problems are found, the Save League window will be displayed.

The screenshot shows the 'Save League' dialog box. It is titled 'Save League' and contains three main sections. The first section, 'Save Options', has two checkboxes: 'Save open workbook' (unchecked) and 'Save league as a new workbook' (checked). The second section, 'Save League & Bowler Data', has a checked checkbox, two date pickers for 'Updated date' and 'Season week (optional)', and two unchecked checkboxes: 'Exclude trend and volatility data from bowler sheets' and 'Store league attributes as retrievable default values'. The third section, 'Analysis Options', has a list box for 'Existing analysis sheets (check to delete from workbook)', two buttons 'Check All' and 'Uncheck All', and two unchecked checkboxes: 'Save current analysis as workbook sheet' and 'View current analysis after save is completed'. At the bottom are 'OK' and 'Cancel' buttons.

Because this is a new league and no analyses have been performed yet, almost all save options are grayed out. We just need to click OK (or press Enter) to save the league as a new Excel workbook. That will bring up the Windows Save As dialog box, where we'll name the league file to create and specify the folder to store it in. When a league is saved, the name of the league file is shown in the main screen's Windows title bar. Here, we're saving the league in an Excel file named Pin Pals.xlsx.

This league definition can be reloaded into Bowling League Tuneup at any time via the Load League button. This button brings up the Windows Open dialog box to let you navigate to the proper folder and specify the league file you want to open. Opening a league file brings all of the league's attributes and bowler data right back into BLT to let you continue where you left off.

Performing a league analysis

Once all required information has been entered on the main screen, a league analysis can be performed by simply clicking the Analyze League button. Again, if any required information is missing or if any supplied values are invalid, an error message will be displayed. If all inputs are good, the analysis begins. Analysis progress is shown on the progress bar, which displays above

the Analyze League button. Analyses can take from a few seconds to several minutes or even hours, depending on the size of the league, the length of the season, and the rigor of the analysis (discussed below). To terminate an analysis before it finishes, click on the progress bar (or just press the Escape key) during the analysis.

During a league analysis, Bowling League Tuneup simulates thousands, tens of thousands, or hundreds of thousands of bowling seasons in order to determine each team’s probability of finishing in each place. The more seasons that are simulated, the more consistent and accurate the results are – and, of course, the longer the analysis will take. The number of seasons to simulate is referred to as the *rigor* of the analysis. Prior to performing an analysis, the rigor can be set from 0 (lowest rigor, about a thousand seasons simulated) to 10 (highest rigor, about a million seasons simulated). Rigor can be set either by typing it directly into the light-blue box (using “H” for 10) or by using the adjacent slider to set the value.

When an analysis is complete, the Place Of Finish Probabilities section of the grid gets filled in, as shown below.

Bowling League Tuneup
Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7						
1-In The Gutter	230	158	152	137	677	2.7	33.9	24.0	17.1	11.1	6.9	4.2						
2-Heatwave	131	165	113	170	579	0.1	5.5	8.0	13.8	18.5	26.5	27.5						
3-The Four Shots	181	224	229	237	871	94.7	4.1	0.9	0.2									
4-Aches & Pains	163	132	163	137	595	0.2	6.3	9.5	15.6	19.5	25.0	23.9						
5-El Captain	131	164	162	227	684	2.0	28.0	24.1	19.2	13.2	8.4	5.1						
6-Pinheads	218	164	155	191	728	1.7	25.5	21.6	20.3	14.8	9.8	6.4						
7-Alley Oops	128	180	190	130	628	0.4	9.7	12.3	18.0	20.0	21.6	18.1						
8-VACANCY																		

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season

Handicap: 90 % of 220, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 5, Analyze League

Let’s discuss how to interpret these results.

There are seven teams in the league, so the columns numbered 1 through 7 show the probability of each team finishing in that place in any given season. Here, team 3 has a 94.7% chance of finishing in first place. That means that if this league were to bowl 100 seasons together, team 3 could be expected to finish first in close to 95 of those seasons. Its chances of finishing in fifth, sixth, or seventh place are so low, they’re not statistically significant – hence, no results are shown in those places.

Notice that percentages do not add up to 100 in each column. That is because of the possibility of ties. If two teams tie for first, both teams get credit for a first-place finish. That is why column 1 will almost always total over 100%. For the same reason, the last-place column will almost always

total under 100%, since two teams tying for last will both get credit for a next-to-last place finish, with no team finishing in last. (Note that split seasons can also cause columns totals to differ significantly from 100%. That will be addressed when we discuss split seasons later on.)

Percentages across each row, on the other hand, will always add up to 100% – although round-off issues may mean the total will be slightly off from exactly 100%. Row percentages are additive. For instance, by adding together the values in columns 1, 2, and 3 for team 1, we see this team has approximately a 60% chance of finishing in the top three places in the standings. In other words, a top-three finish can be expected to happen about six seasons out of every 10 if this group of bowlers bowled in this same league season after season.

The team with the lowest team average, team 2, has a ridiculously low chance of finishing in first place – about once in a thousand seasons. A top-three finish would only be expected to happen less than 14% of the time – about once in every seven seasons. Prospects for team 2 are not good.

Saving a league analysis

After an analysis is performed, displayed analysis results are wiped clean when any information on the screen is changed. This behavior assures that displayed results are for the league and bowler information currently being displayed.

When information in the grid is edited while analysis results are displayed, the edit window will show a warning that making a change will discard displayed analysis results. Canceling out of the edit window leaves results intact. When the league information below the grid is changed, the analysis results will be immediately wiped off the screen, but a message will appear in red above the grid on the right side of the screen which says "(Escape to restore analysis)." If you press Escape (or click on the message), the change which cleared the analysis results will be undone and the analysis results will be restored. If you change a second field before pressing Escape, the message goes away and analysis results cannot be restored.

Bowling League Tuneup allows you to save analysis results, letting you refer back to any past analyses you've performed. Saved analyses have the added bonus of containing graphical depictions of the results that may be easier to read than the grid of numbers presented on the main screen.

Analysis results are stored in the same Excel workbook as the league definition and therefore are also saved using the Save League button. Here, since analysis results are now being displayed from the analysis we just performed, the Analysis Options section of the Save League window may now be used. This is the first analysis of this new league, so there are no analysis sheets in the league's workbook yet. We'll just check the box to save the current analysis as a workbook sheet, we'll name the sheet Initial Analysis, and we'll check the box to view the analysis after the save is completed.

Save League

Save Options

Save open workbook

Save league as a new workbook

Save League & Bowler Data

Updated date Season week (optional)

Exclude trend and volatility data from bowler sheets

Store league attributes as retrievable default values

Analysis Options

Existing analysis sheets (check to delete from workbook)

Check All Uncheck All

Save current analysis as workbook sheet

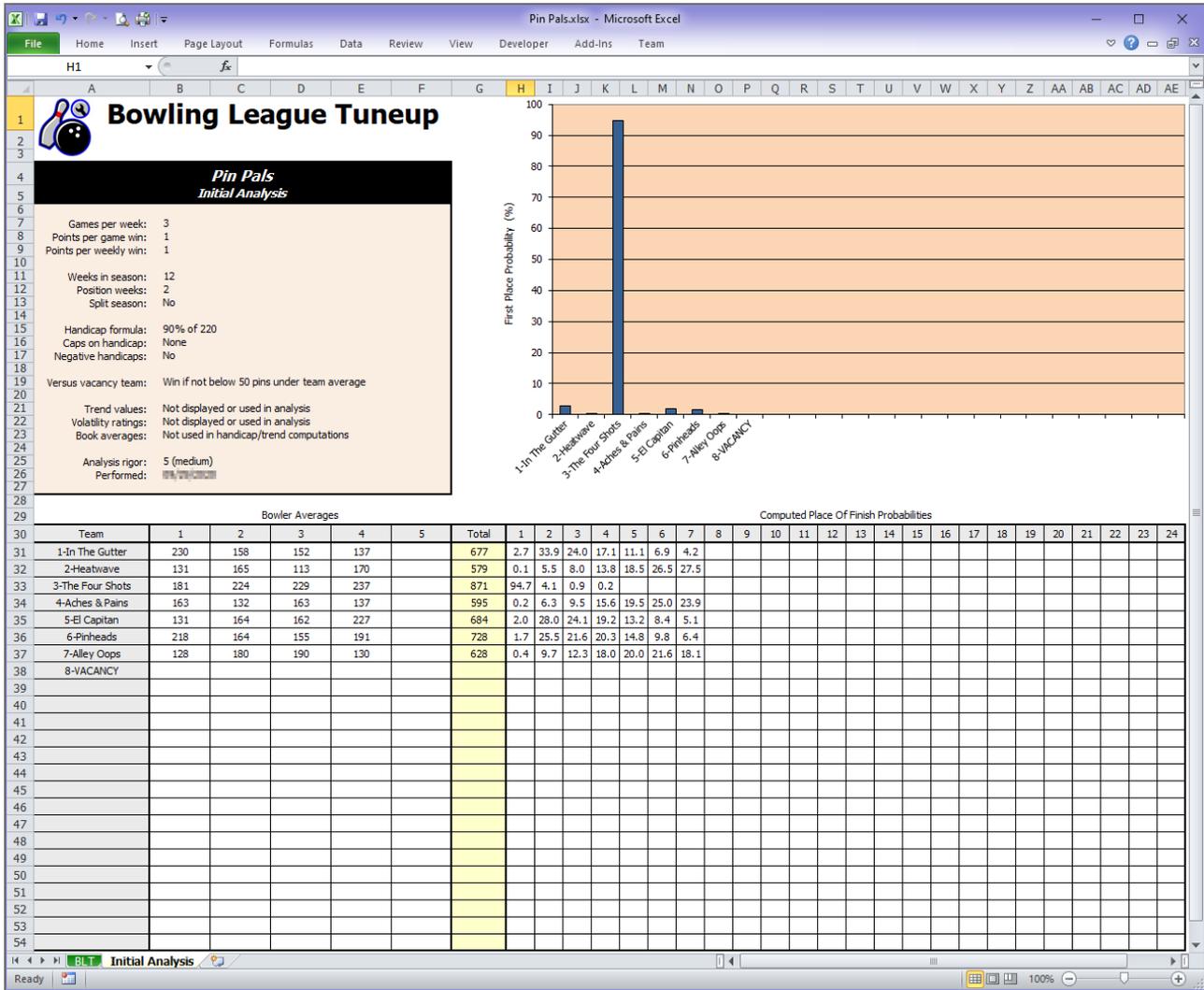
Initial Analysis

View current analysis after save is completed

OK Cancel

Even if we don't check the box to view the analysis immediately, we can view the saved analysis later by clicking the View League button on the main screen to open the league workbook. The workbook's contents can also be viewed at any time without using Bowling League Tuneup by simply opening the workbook file in Microsoft Excel.

When we click OK, the analysis will get saved, Excel will open, and the analysis sheet will display.



The analysis sheet shows us all the information pertinent to this analysis, plus it contains a graph of the analysis results. The graph shows column 1 of the computed place of finish probabilities, i.e., the computed chances for each team to finish in first place. If it wasn't obvious from looking at the raw numbers, the graph makes it clear this league needs tuning!

PRESEASON TUNEUP: ADJUSTING LEAGUE ATTRIBUTES

Our initial analysis showed that our new league is far from fair. Now that we know how to interpret analysis results, let's examine the ways we can use Bowling League Tuneup to adjust league attributes to try to achieve the desired competitive balance.

Adjusting the handicap formula

The league handicap formula is the most obvious place to begin trying to tune up a league. The league manager must try to find the optimal formula to use for a league with a specific set of attributes and bowlers. If the league's handicap formula must be set prior to league sign-ups, the league manager will have to make assumptions about the bowlers who will be in the league. In this example, the handicap formula will not be announced until bowler sign-ups have concluded, which allows the manager to set a formula most appropriate for the specific mix of bowlers in the league.

Our initial analysis of the proposed league exposed two different problems. As already noted, team 3 can be expected to win almost every season. Also, teams 2 and 4 each have over a 50% chance to finish last or next-to-last, with negligible chances to finish first. This league is anything but competitive.

But there's yet another problem. Notice that the second-best team, team 6, is not expected to do as well as teams 1 and 5, although they have lower averages than team 6. Looking to explain this anomaly, we see that teams 1, 3, and 5 all have bowlers who average above the handicap base of 220. As previously discussed, this gives those bowlers, and hence their teams, an unfair advantage.

This last problem is easy to solve. If we let the league use negative handicaps, that's all we need to do. Otherwise, we'll have to raise the handicap base to a higher average than any bowler is likely to achieve during the season. Note that setting the base to 240 is probably not high enough. Even if no bowler ends the season with an average higher than 240, it is quite conceivable that a bowler who ends the season with a 237 average (the average that bowler 4 on team 3 carries) will exceed an average of 240 at some point during the season, giving team 3 an unfair advantage for as many weeks as that is the case. So we'll set the base at 250, producing the new analysis shown below.

Bowling League Tuneup
Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	61.1	19.8	9.9	5.0	2.4	1.2	0.6
6-Pinheads	218	164	155	191	728	16.3	25.3	19.0	15.5	11.1	7.9	5.0
5-El Capitan	131	164	162	227	684	9.8	18.7	17.9	18.1	14.9	12.2	8.4
1-In The Gutter	230	158	152	137	677	9.5	18.2	17.3	18.0	14.9	12.7	9.5
7-Alley Oops	128	180	190	130	628	4.9	11.8	13.7	18.1	18.0	17.9	15.6
4-Aches & Pains	163	132	163	137	595	3.3	8.4	11.1	15.9	18.1	22.0	21.2
2-Heatwave	131	165	113	170	579	2.3	7.3	10.1	15.0	17.4	23.4	24.6
8-VACANCY												

Place Of Finish Probabilities

League Management: Load, Define, Save, Enter, Import, View

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season (unchecked)

Handicap: 90% of 250, Hdcp, Hdcp+score, Neg handicaps (unchecked)

Vacancy Teams: Bowl against vacancy scores (unchecked), Always best vacancy team (unchecked), Win if not below 50 pins under team average (checked), Win if not below percent of team average (unchecked)

Computations: Use trend values (unchecked), Use volatility ratings (unchecked), Use book average for weeks in handicap computations (leave blank to use all season) (unchecked)

Analysis: 5, Analyze League

For readability, from this point forward we've changed the display by clicking on the Total column header so results are sorted on team averages. Examining the results, we can see we've removed

the effects of a too-low base number, since teams' chances are now directly related to their averages. But it appears that 90% may be too low a handicap percentage for this league. The best team is still a huge favorite to finish in first place and can expect to do so about six seasons out of every 10. By adding their chances, you can also see that a first-place finish by one of the three poorest teams can be expected only about one season in 10. It appears this still would not be a very competitive league.

Let's look at these numbers another way. Suppose this league gives trophies to the members of the teams that finish in the top two places in the standings. Adding the probabilities of finishing in first or second place, we see that team 3 can expect to finish in the top two places about 80% of the time, or about four seasons out of every five. The league manager would have to make a judgment about whether any team should start a league more likely to get a trophy than not – let alone being this overwhelmingly likely to do so. Meanwhile, team 2 can expect a top-two finish around once every 10 seasons. Over many seasons, the bowlers on team 3 can expect to receive around eight trophies for every one trophy that goes to the bowlers on team 2. By most objective standards (and almost certainly from the viewpoints of the team 2 bowlers!), the playing field does not appear to have been leveled enough.

Let's change the handicap percentage to 95% and see how that affects the odds.

Bowling League Tuneup
Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	37.4	20.9	15.0	10.7	7.4	5.3	3.3
6-Pinheads	218	164	155	191	728	18.2	18.1	15.5	15.7	13.0	11.2	8.2
5-El Capitan	131	164	162	227	684	14.4	16.7	15.2	15.6	14.4	13.2	10.5
1-In The Gutter	230	158	152	137	677	13.6	16.1	14.9	15.8	14.7	13.4	11.5
7-Alley Oops	128	180	190	130	628	10.1	13.6	13.7	16.3	15.5	16.6	14.2
4-Aches & Pains	163	132	163	137	595	8.3	11.6	12.9	15.9	15.9	18.2	17.2
2-Heatwave	131	165	113	170	579	7.3	11.2	12.2	15.6	16.1	18.7	18.9
8-VACANCY												

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season

Handicap: 95 % of 250, Hdcp, Hdcp+score, Caps, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations

Analysis: 5, Analyze League

This is looking much better. Now, all teams have a reasonable chance of success in the league. Yes, team 3 is still about twice as likely to end up in first place as the next-best team, and it is about five times as likely to finish in first place than the lowest-average team is. Given how much better a team they are, the league manager might consider these odds to be appropriate. But if the league manager is reluctant to give any team such a clear advantage, he or she might want to tweak the handicap percentage a little further.

Changing the handicap percentage to 97% gives the analysis below.

Bowling League Tuneup - Pin Pals.xlsx

Bowling League Tuneup

Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	27.7	19.3	15.2	13.3	10.4	8.2	6.0
6-Pinheads	218	164	155	191	728	18.0	17.1	15.1	14.9	12.7	12.3	9.9
5-El Capitan	131	164	162	227	684	15.1	15.7	14.8	15.7	14.1	13.4	11.3
1-In The Gutter	230	158	152	137	677	15.0	15.5	14.6	14.9	13.9	14.0	12.1
7-Alley Oops	128	180	190	130	628	12.7	14.4	13.7	15.4	14.6	15.7	13.5
4-Aches & Pains	163	132	163	137	595	11.0	13.4	13.2	15.8	15.3	16.1	15.3
2-Heatwave	131	165	113	170	579	10.7	12.9	12.9	15.1	15.6	16.5	16.2
8-VACANCY												

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season

Handicap: 97 % of 250, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 5, Analyze League

This playing field is even more level. At this point, the league manager must subjectively decide what competitive balance best suits this league.

Notice that using a handicap percentage of 100% completely levels the playing field.

Bowling League Tuneup - Pin Pals.xlsx

Bowling League Tuneup

Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	15.8	15.3	14.3	15.1	13.6	13.7	12.2
6-Pinheads	218	164	155	191	728	15.8	15.4	14.0	15.2	13.7	14.0	11.9
5-El Capitan	131	164	162	227	684	15.4	15.6	14.4	15.2	14.2	13.5	11.6
1-In The Gutter	230	158	152	137	677	16.0	15.5	14.3	14.5	14.0	13.9	11.9
7-Alley Oops	128	180	190	130	628	15.7	15.8	13.9	15.2	13.8	13.8	11.7
4-Aches & Pains	163	132	163	137	595	15.8	15.5	14.1	15.1	13.6	13.7	12.2
2-Heatwave	131	165	113	170	579	15.4	15.8	14.3	15.0	13.9	13.7	12.0
8-VACANCY												

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season

Handicap: 100 % of 250, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 5, Analyze League

Bowling League Tuneup
Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	90.9	7.1	1.6	0.3	0.1		
6-Pinheads	218	164	155	191	728	7.2	44.9	24.0	13.2	6.6	2.9	1.3
5-El Capitan	131	164	162	227	684	2.1	23.2	25.7	22.2	14.2	8.1	4.5
1-In The Gutter	230	158	152	137	677	1.8	21.2	23.7	23.3	15.5	9.1	5.5
7-Alley Oops	128	180	190	130	628	0.4	8.3	13.0	19.9	23.4	20.6	14.4
4-Aches & Pains	163	132	163	137	595	0.1	3.7	6.9	14.2	20.2	28.9	25.9
2-Heatwave	131	165	113	170	579	0.1	2.5	4.8	11.3	17.3	29.9	34.1
8-VACANCY												

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season

Handicap: 80 % of 250, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 5, Analyze League

Clearly, an 80% handicap percentage is completely inappropriate for this league. Team 3 can be expected to finish in first place more than nine seasons out of every 10, while teams 2 and 4 have few expectations they will ever finish in first place. One can only hope that leagues which use this as their standard handicap percentage don't have teams with such wildly different skill levels!

Capping the handicap

There is another adjustment to handicaps that some leagues implement – mistakenly. Some leagues put an upper limit on bowler handicaps, not allowing them to exceed a specified value, even if the handicap formula assigns a higher handicap to a bowler. Leagues may also limit the handicap score (scratch score plus handicap) that a bowler may achieve in a game.

The primary reason for capping handicaps is as easy to understand as it is wrong. When a league has very high-average bowlers and very low-average bowlers, the high-average bowlers will often voice their disapproval over the huge number of pins of handicap being given to the low-average bowlers. Their perception is invariably that when bowler averages get low enough, their ultra-high handicaps give them an insurmountable advantage.

Perception is not fact. In a league with a handicap formula of 90% of 240, a bowler with a 100 average would have a handicap of 126. Despite this high handicap, we know the handicap percentage of 90% still puts this bowler at a mathematical disadvantage against bowlers with higher averages. But it can be hard to convince some bowlers that adding 126 pins to a bowler's scratch score can ever be considered fair.

The proper response when bowlers complain about such falsely perceived inequities is to explain the math to them – or to just flat-out ignore them. But some leagues are run by people who don't understand the math and just want to keep all the bowlers happy. So they make what seems to them to be a reasonable decision to cap the handicap a bowler can be given. In this example, they

might set a maximum bowler handicap of 100. So the 100-average bowler would only get 100 pins of handicap added to each game, not 126. The poorer bowlers who don't understand the math may accept the cap because they assume league officials know what they're doing. The better bowlers will likely feel that 100 pins is still too high, but they may accept this cap as a compromise.

The problem is, this is not a compromise at all. It is a random, irrational decision that takes a group of bowlers who were already at a disadvantage (due to the 90% handicap percentage) and hands them an even bigger disadvantage. This is the flip side of the problem we discussed before, when a bowler reaches an average that exceeds the handicap base. In that case, the bowler's handicap is artificially floored at zero rather than allowing it to go negative, effectively adding bonus pins to every game that bowler bowls and giving the bowler's team a potentially overwhelming and unfair advantage. Here, handicap is being artificially capped at an arbitrary value, effectively subtracting pins from every game that bowler bowls and giving the bowler's team a potentially overwhelming and unfair disadvantage.

We can illustrate the situation with one example. We'll create a league with just two teams bowling three games per week for 30 weeks, using a handicap formula of 90% of 240. Team 1 has four bowlers averaging 175. Team 2 has three bowlers averaging 200 and one bowler averaging 100. Since both teams have the same average of 700, fairness and logic would dictate that any well-configured league should give both teams an equal chance of success. Indeed, the BLT analysis below shows this to be the case.

Bowling League Tuneup
Capping Handicaps Example

Bowler Averages

Team	1	2	3	4	Total	1	2
1-Team 1	175	175	175	175	700	51.8	48.2
2-Team 2	200	200	200	100	700	51.8	48.2

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 30 Total weeks, 0 Position weeks, Split season

Handicap: 90 % of 240, Caps, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 5 (Low Rigor High), Analyze League

But what if a cap of 100 were placed on bowler handicaps? This would have no effect on any bowlers averaging 128 or more since their handicaps would not exceed 100. But in this example it would reduce the handicap of the 100-average bowler from 126 to 100, effectively imposing a 26-pin penalty on team 2 in each and every game they bowl. The analysis below shows the devastating effect of this penalty over the course of a season.

Bowling League Tuneup
Capping Handicaps Example

Bowler Averages

Team	1	2	3	4	Total	1	2
1-Team 1	175	175	175	175	700	99.9	0.1
2-Team 2	200	200	200	100	700	0.1	99.9

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 30 Total weeks, 0 Position weeks, Split season

Handicap: 90 % of 240, 100 Hdcp, Caps, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always best vacancy team, Win if not below pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations

Analysis: 5, Analyze League

The decision to cap handicaps at 100 deals a death blow to team 2's chances – for no good reason. The only rational motivation for a league to impose caps on handicaps would be to tell low-average bowlers they are not welcome in the league. The proper way to do that would be to simply set a minimum entering average, not to stealthily cheat low-average bowlers and the teams they are on.

Leagues may similarly impose a limit on how high a bowler's handicap score (scratch score plus handicap) can be. This is presumably done to appease people who are for some reason offended when bowler handicap scores go above 300. Fortunately, only under limited circumstances would setting this cap significantly alter league outcomes since it can affect both high-average and low-average bowlers. But, again, setting this cap can only cause a league's fairness to diminish.

Because, lamentably, some leagues set caps on handicaps and handicap game scores, Bowling League Tuneup provides the ability to set one or both of these caps as a way to measure their effects on a league. Hopefully, analysis results will dissuade any league from ever using these caps. We cannot stress strongly enough that there is no mathematical justification to ever impose caps of any sort. Doing so can only work to the detriment of league fairness.

Adjusting season length

The length of the bowling season can have a significant effect on the competitive balance of a league. The longer the league, the greater the chance for the law of averages to produce predictable outcomes. This means that longer leagues will generally need more leveling of the playing field than shorter ones to give poorer teams a reasonable chance of success.

To demonstrate this fact, here are two analyses of the same league with the same bowlers and league attributes. The only difference is that one analysis is for a 12-week season, the other for a 36-week season. (We tripled the position weeks on the 36-week season to preserve the ratio of position weeks to non-position weeks.)

Bowling League Tuneup - Pin Pals

Bowling League Tuneup

Pin Pals

Bowler Averages Place Of Finish Probabilities

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	37.4	20.9	15.0	10.7	7.4	5.3	3.3
6-Pinheads	218	164	155	191	728	18.2	18.1	15.5	15.7	13.0	11.2	8.2
5-El Capitan	131	164	162	227	684	14.4	16.7	15.2	15.6	14.4	13.2	10.5
1-In The Gutter	230	158	152	137	677	13.6	16.1	14.9	15.8	14.7	13.4	11.5
7-Alley Oops	128	180	190	130	628	10.1	13.6	13.7	16.3	15.5	16.6	14.2
4-Aches & Pains	163	132	163	137	595	8.3	11.6	12.9	15.9	15.9	18.2	17.2
2-Heatwave	131	165	113	170	579	7.3	11.2	12.2	15.6	16.1	18.7	18.9
8-VACANCY												

League Management

Load League Define League Save League

Enter Scores Import Scores View League

Week

3 Games bowled per week

1 Points earned per game win

1 Points earned per weekly win

Season

12 Total weeks

2 Position weeks

Split season

Handicap

95 % of 250

Hdcp Hdcp+score Caps

Neg handicaps

Vacancy Teams

Bowl against vacancy scores

Always beat vacancy team

Win if not below 50 pins under team average

Win if not below percent of team average

Computations

Use trend values

Use volatility ratings

Use book average for weeks in handicap computations (leave blank to use all season)

Analysis

5

<< Low Rigor High >>

Analyze League

Bowling League Tuneup - Pin Pals

Bowling League Tuneup

Pin Pals

Bowler Averages Place Of Finish Probabilities

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	54.4	20.3	11.6	6.6	4.0	2.1	1.1
6-Pinheads	218	164	155	191	728	16.7	21.7	18.2	15.3	12.3	9.4	6.4
5-El Capitan	131	164	162	227	684	10.5	16.7	17.4	17.2	15.1	13.2	9.9
1-In The Gutter	230	158	152	137	677	9.5	16.5	17.0	17.3	15.1	13.7	10.9
7-Alley Oops	128	180	190	130	628	5.6	11.8	14.1	16.9	17.3	18.2	16.1
4-Aches & Pains	163	132	163	137	595	3.9	8.8	11.3	15.4	17.7	21.6	21.2
2-Heatwave	131	165	113	170	579	3.2	7.7	10.2	14.5	17.4	22.3	24.8
8-VACANCY												

League Management

Load League Define League Save League

Enter Scores Import Scores View League

Week

3 Games bowled per week

1 Points earned per game win

1 Points earned per weekly win

Season

36 Total weeks

6 Position weeks

Split season

Handicap

95 % of 250

Hdcp Hdcp+score Caps

Neg handicaps

Vacancy Teams

Bowl against vacancy scores

Always beat vacancy team

Win if not below 50 pins under team average

Win if not below percent of team average

Computations

Use trend values

Use volatility ratings

Use book average for weeks in handicap computations (leave blank to use all season)

Analysis

5

<< Low Rigor High >>

Analyze League

It is quite conceivable that a league manager might have looked at the analysis results for the 12-week season and concluded the 95% of 250 handicap formula was acceptable. It is unclear if the 36-week season analysis would have been found equally acceptable, as the chances for the best team are now exceptionally good and for the poorer teams are very bad. The point is, a handicap that works for a league of one length may not work so well for a league of a different length.

Splitting the season

Creating a split season is a commonly used technique for keeping bowler interest up during a long bowling season. Split seasons can give hope to the teams that are floundering hopelessly near the bottom of the standings with many weeks or even months still left in the season.

Splitting a season means dividing a long season into two halves and resetting the standings to start the second half, with the winner of each half of the season bowling in a playoff series at the end of the season to determine which team takes first place overall. Various schemes may be used to reward the other top finishers in each half of the season, including giving prizes for finishes in each half of the season or simply rewarding each team's top place of finish between the two halves.

From a mathematical standpoint, splitting a season levels the playing field in two ways. The obvious advantage for all teams is that they get not one but two chances to do well in the league. If they are at the bottom of the standings at the midpoint of the season, they get to start anew with fresh standings for the second half of the season. And if they are doing well at the midpoint, that achievement is duly noted before the slates are wiped clean for the second half of the season.

The second way that splitting a season levels the playing field was described previously. Shorter seasons have less predictability in their results. So instead of one long, more predictable season, a split season produces two shorter, less predictable seasons.

Here are the results of another analysis of our 36-week Pin Pals league, but this time using a split season.

Bowling League Tuneup
Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7								
3-The Four Shots	181	224	229	237	871	67.0	20.0	8.1	3.3	1.2	0.3	0.1								
6-Pinheads	218	164	155	191	728	32.4	28.0	18.2	11.9	6.1	2.8	0.6								
5-El Capitan	131	164	162	227	684	24.4	26.3	19.6	15.1	9.1	4.5	1.1								
1-In The Gutter	230	158	152	137	677	23.0	25.3	19.9	15.7	9.6	5.1	1.3								
7-Alley Oops	128	180	190	130	628	16.0	21.8	20.0	18.5	13.3	8.2	2.2								
4-Aches & Pains	163	132	163	137	595	13.0	18.8	18.5	19.4	15.7	11.1	3.5								
2-Heatwave	131	165	113	170	579	11.4	17.7	18.4	19.5	16.2	12.6	4.3								
8-VACANCY																				

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 36 Total weeks, 6 Position weeks, Split season

Handicap: 95 % of 250, 95 % of 250, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below .50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 5, <-- Low Rigor High -->, Analyze League

Notice that column totals look very different from before, with the first three columns all totaling way over 100% and the last three columns totaling way under. This is because when a season is split, the analysis results indicate the probability of the higher place of finish for each team between the two halves of the season.

So, if a team finishes in second place in one half of the season and fifth place the other half, the team gets credit for a second-place finish. Finishing in first place in either half counts as a first-place finish, regardless of the team's performance in the other half. The last column has such small numbers because the only way a team can get counted as finishing in last place in a split season is to finish in last place in *both* halves of the season. As we can see, this happens rarely, even for the worst team.

While it appears that team 3 still has a huge advantage over the other teams, with an expectation to finish in first place in at least one of the two halves of the season about two seasons out of every three, notice that the chances for the other teams also went up significantly. Adding the probabilities for finishing first, second, or third, we can see that even the poorest team, team 2, can be expected to have a top-three finish in one of the two halves of the season in almost half of all split seasons. We saw that in a non-split 36-week season, team 2 could expect a top-three finish in about a fifth of all seasons. So we can see that splitting the season does level the playing field, as well as keeping teams' hopes up for a decent finish even after a dismal first half of the season.

Splitting the season with dual handicaps

There is nothing that says a league must use the same handicap in both halves of a split season. Bowling League Tuneup allows you to specify a different handicap for each half. Here, the first half uses the same handicap of 95% of 250, while the second half is set as a 100% league, where good bowlers and bad bowlers all have equal chances of success. Here are the results if the Pin Pals league were set up this way.

The screenshot shows the 'Bowling League Tuneup - Pin Pals.xlsx' window. The main area displays 'Bowler Averages' and 'Place Of Finish Probabilities'. The bowler averages table is as follows:

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181	224	229	237	871	51.2	23.6	12.7	7.3	3.5	1.4	0.3
6-Pinheads	218	164	155	191	728	30.5	25.9	17.9	13.5	7.5	3.8	0.9
5-El Capitan	131	164	162	227	684	27.0	24.4	18.4	14.6	9.3	5.0	1.3
1-in The Gutter	230	158	152	137	677	25.8	24.5	18.8	14.7	9.4	5.3	1.4
7-Alley Oops	128	180	190	130	628	22.4	22.7	18.9	16.1	11.2	6.8	1.9
4-Aches & Pains	163	132	163	137	595	21.1	21.8	18.6	16.8	11.7	7.7	2.3
2-Heatwave	131	165	113	170	579	20.0	20.8	18.8	17.0	12.4	8.4	2.6
8-VACANCY												

The interface also shows a control panel at the bottom with the following settings:

- League Management:** Load League, Define League, Save League, Enter Scores, Import Scores, View League
- Week:** 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win
- Season:** 36 Total weeks, 6 Position weeks, Split season checked
- Handicap:** 95 % of 250, 100 % of 250, Caps checked, Hdcp checked, Hdcp+score checked, Neg handicaps unchecked
- Vacancy Teams:** Bowl against vacancy scores unchecked, Always beat vacancy team unchecked, Win if not below 50 pins under team average checked, Win if not below percent of team average unchecked
- Computations:** Use trend values unchecked, Use volatility ratings unchecked, Use book average for weeks in handicap computations (leave blank to use all season) unchecked
- Analysis:** 5 (on a scale from Low to High), Analyze League button

As always, interpretation of results is subjective. A league manager must decide whether these numbers represent the competitive balance he or she is aiming for. The idea with this league setup is to have a first half of the season which gives better teams a slight advantage, then, once bowlers' averages and handicaps have been established, remove that advantage and reward

bowlers solely for bowling well relative to those established averages. This is one way to solve the eternal conundrum of whether to make a handicap league competitive (favoring better bowlers) or fun (completely leveling the playing field): do both!

Using dual handicaps in a non-split season

Bowling League Tuneup also allows you to specify different handicaps for the first half of a league and the second half – *without* splitting the season. This allows the league manager to make the same compromise as shown above with a dual-handicap split season in a traditional non-split season.

Any two handicap formulas can be used in either half of the season, of course. One suggestion would be to go the same route as with the split season above. Give the first half of the season a handicap formula which rewards better bowlers, then, after bowlers establish their averages, change to a 100% handicap formula for the second half of the season. The idea is that no matter how badly a team is doing in the first half, all teams know that the built-in advantage of the good teams disappears in the second half of the season, so no team should lose hope if things don't go well early in the season.

Here is an analysis of the Pin Pals league, using the same handicap formulas as above, but without splitting the season.

Dual handicaps is a technique that's rarely been used by bowling leagues. Without a tool like Bowling League Tuneup, league managers had a hard enough time choosing a single handicap formula to use. BLT can point the way to some previously unthought-of league setups that can help maximize league competitiveness and fun for all bowlers.

Adjusting other league variables

There are some less-significant league attributes whose settings can affect the competitive balance of a league.

Leagues set the way that wins are counted. Some count only game wins, while some also give credit to the team that has the highest pin total over all games bowled. The weight given to game wins and weekly wins can also vary. For instance, a league may choose to have the pin total count the same as two game wins rather than one. BLT supports any relative weighing of game wins versus weekly wins a league may come up with, using the fields in the Week section of the main screen. This weight may be set to zero for either field if that field should not be counted at all. Under most circumstances, changes to the values of these fields will have a relatively small effect on league competitiveness.

Ditto for position weeks. Leagues periodically schedule position weeks to pair teams which are next to each other in the league standings. While this can make it fun for bowlers, particularly for the teams at the top of the standings, the use of position weeks usually doesn't usually have a very big effect on teams' probabilities of success in a league.

The rule for determining wins and losses versus vacancy teams is also usually of minor importance. The last option, which requires a team to bowl within some percent of its team average in order to get credit for a victory against a vacancy opponent, imposes the same mathematical burden on all teams to earn a win. This option gives high-average and low-average teams approximately the same degree of success against vacancy teams, regardless of the handicap formula used.

The next-to-last option, which requires a team to bowl within some number of pins of its team average to earn a win, technically doesn't do quite as good a job of making it equally difficult for all teams to beat a vacancy opponent, but it is very nearly the same mathematically, and it has the advantage of being easier to determine wins and losses.

The effect of the option to bowl directly against the default vacancy scores is dependent upon the handicap formula. For handicaps under 100%, this option will make it easier for higher-average teams to beat a vacancy team than for lower-average teams to do so – just as the handicap gives higher-average teams an advantage over lower-average teams. When the league's handicap percentage is 100, this option gives all teams an equal shot of beating a vacancy team, the same as the two previously described options.

This leaves the option to always beat a vacancy team – an option which has two significant problems. First, giving automatic wins to the opponents of a vacancy team will give an unfair advantage to any teams which, through the luck of the schedule, may be paired against vacancy teams more weeks than other teams are. Even more significant, though, is this scheme's potential to encourage unethical behavior. If a team knows it will win every game it bowls against a vacancy team, the bowlers on that team have no incentive to bowl well. Put another way, those bowlers have lots of incentive to bowl poorly in order to boost their handicaps for future weeks. And since they are bowling without an opponent, there will be fewer eyes on them to keep them honest. Automatic wins against a vacancy opponent is therefore almost always a bad idea.

In the interest of creating the most accurate results possible, Bowling League Tuneup faithfully simulates all attributes of a league when making its computations – including ones which usually have a small influence on the final results of a league. In fact, BLT can be used to *identify* which league attributes have a large influence on league results and which ones have a small influence.

BOWLER PERFORMANCE MEASURES

In all of the preseason analyses we've done so far, we've tweaked various league attributes to determine their effects on league competitiveness. We have done all these analyses without modifying the assumed performances of the bowlers themselves. We have assumed that league bowlers will all end up at the averages they've historically established, and that they will all bowl their averages consistently throughout the season.

These assumptions are, of course, wrong. Bowlers are not robots.

That fact doesn't diminish the value of the analyses we've performed. Preseason analyses are based on the best information available before the season starts, and that will certainly put us in the ballpark when trying to evaluate league competitiveness. These analyses are valuable because (a) bowlers' past performances are good predictors of their future performances and (b) they provide baselines for subsequent analyses that might be done to determine how changing bowlers' or teams' assumed performances will change expected league results.

In other words, the preseason analyses we've done so far report the expected league results with expected bowler performances. But we don't yet know what kinds of performances bowlers or teams will need to have, relative to the other bowlers and teams, in order to bend the odds in their favor.

In this section, we will discuss the three values which characterize a bowler's performance in any given season: average, trend, and volatility. With an understanding of these measures, changes to assumed performances can be tested as the next part of the preseason tuneup process in order to determine what it might take for a team to have a good shot at success in a league. When a league is properly tuned, standout (but not superhuman) improvement from historical performances should allow even the poorest teams to be competitive in the league.

Average: the measure of ability

Everyone understands the concept of a bowling average. In a league, it is simply the average score over all of a bowler's games in that league. The average is the simplest and best measure of a bowler's ability. After all, the goal in bowling is to get the highest score, so the higher the average score, the better a bowler is considered to be.

If a bowler bowls in different leagues, he or she will maintain a separate average in each league. These averages may differ by a fair amount, especially if the bowler bowls at different bowling centers or in leagues where the lanes are maintained with different lane conditions or oil patterns. So when comparing averages between bowlers, those comparisons are most meaningful when the bowlers have bowled under similar conditions. Likewise, when using previously established averages to tune up a new league, it is best to use averages established under conditions similar to those in the new league.

Bowling averages don't just provide a basis for computing a bowler's handicap during the season. When leagues set upper limits on team strength to prevent a super team from dominating the league, those limits are based on the bowlers' averages (either their established book averages or averages set on the first week of bowling). Also, when a league wants to reduce the effectiveness of sandbagging, bowlers' established book averages can be used to determine handicaps for some

number of weeks. And, of course, when a league manager is trying to tune up a new league, bowlers' established book averages are the measure used to characterize their bowling abilities.

Team averages are merely the sum of the averages of the bowlers on that team. So the arithmetic is very simple when ranking team strength: just sum the averages of each team's bowlers, then arrange the totals from highest (the best team) to lowest (the poorest team).

Before we leave the subject of averages, this is a good time to point out that even in scratch leagues, the team with the highest average doesn't always end up in first place. League standings are determined not by averages but by wins and losses. While a higher team average raises the chances for a first-place finish, it is possible in any type of league for a team with a lower average to win more games. To illustrate this, consider the case of two bowlers bowling scratch against each other for nine games, the winner being the bowler who wins the most games. Shown below are the results of their nine-game match.

Game	Bowler 1	Bowler 2	Winner
1	192	145	Bowler 1
2	184	189	Bowler 2
3	153	162	Bowler 2
4	195	154	Bowler 1
5	211	139	Bowler 1
6	165	180	Bowler 2
7	149	166	Bowler 2
8	204	177	Bowler 1
9	167	173	Bowler 2
Average	180	165	

Bowler 1 averaged 180 over the nine games; bowler 2 averaged 165. And yet, bowling head-to-head, bowler 2 beat bowler 1 in this contest, winning five of the nine games.

The point here is that bowling averages, while being the best measure of bowling ability, do not solely dictate league results. A lot depends on the specific game matchups. If these bowlers bowled more nine-game matches, ending up with these same averages, in more cases than not bowler 1 would end up with more wins than bowler 2. But, as we just saw, not in *all* cases.

It turns out that bowler 1 could expect to win this head-to-head match around 86% of the time. (More details on how we used Bowling League Tuneup to determine that in the Postseason Diagnostics section.) So while the higher average is a significant advantage for bowler 1, it's not a guarantee of success. This lesson applies to both scratch leagues and handicap leagues, although in handicap leagues the advantage of a higher team average decreases as the handicap percentage approaches 100.

Trend: the measure of improvement

We've said that handicap leagues reward bowlers and teams that do well compared with their normal performances, allowing teams with lower averages to be competitive against better teams. Let's examine how this works.

Suppose a league bowler – let's call her Sue – is averaging 140 so far this season. Sue's league has a handicap formula of 90% of 240, so her handicap is 90. This week Sue bowls very well, with games of 150, 170, and 160, for a 480 series and a 160 average.

Suppose another league bowler is averaging 160 so far this season and therefore has a handicap of 72. If that bowler bowled the same 480 series Sue did, he or she would have a 696 handicap series ($480 + 216$), compared with Sue's 750 handicap series ($480 + 270$). Sue would beat the other bowler by 54 pins – reflecting their handicap difference of 18 pins, multiplied by three games.

This is what we want. In a handicap league, if two bowlers bowl the same scratch score, but for one of those bowlers this is an average performance and for the other bowler this is way above average, we want the latter bowler to win. Sue should be rewarded for a series that was quite possibly her best of the season.

In those three games, Sue averaged 160, while her handicap was based on a 140 average. She averaged 20 pins over her handicap basis. Now, what if we made this same calculation – a bowler's average number of pins over or under the handicap basis – not just for one week but for an entire season? That is, for each game a bowler bowls in the season, find the difference (positive or negative) between that game and the average upon which that bowler's handicap was being based when the game was bowled. Then, take the average of all these differences.

The resulting number would represent how much better or worse a bowler did cumulatively over the full season than the average that was being used to set his or her handicap. A value of +5, for instance, would mean that the bowler averaged five pins above the handicap basis. This means that whatever scratch average the bowler achieved – say it's 170 – his or her handicap over the course of the season was effectively being based on an average five pins less than that – in this case, 165. Since the handicap for a 165-average bowler is higher than the handicap for a 170-average bowler, this value of +5 represents a significant advantage for the bowler. A negative value would of course represent a disadvantage.

We need a name for this number we just computed. In the absence of any historical references to such a value, we will call this the bowler's *trend*. This name derives from the fact that, generally speaking, a positive value indicates improvement over the course of the season. That's because when a bowler bests his or her average, the bowler's average goes up, meaning an even better performance will be required next week to maintain that trend value. Conversely, a negative value indicates general degradation over the course of the season.

What this all means is that a bowler's average is not the sole statistic that characterizes his or her value to the team in a handicap league. If one bowler has a season of sub-par performances, eventually bottoming out at, say, a 160 average, while another bowler consistently improves through the season to achieve that same 160 average, the second bowler will have been more valuable to his or her team than the first bowler. Before, we could only state these bowlers' values to their teams subjectively; now, we can compute trends as objective measures of their values.

Understanding league outcomes has always been one of the great mysteries of handicap league bowling. We know that, unlike in scratch leagues, a team's average isn't the sole factor determining its odds of success. Yet the team average is the only relevant number that's ever been computed and published on league sheets. So when league standings don't appear to even roughly correspond with team averages, there has never been any way to explain how that happened. The team trend (which is simply the sum of its bowlers' trends) is the missing piece of the puzzle in understanding handicap league outcomes.

When looking at actual league outcomes, the standings will tend to be correlated with two values to greater or lesser degrees: team averages and team trends. In a scratch league (which can be thought of as a 0% handicap league), outcomes will be solely correlated with team averages, with

team trends having no influence on those outcomes. So while trends can be computed for bowlers in a scratch league, they have no significance. Whether or not a bowler improves as the season goes on has no effect on scratch league results.

In a 100% handicap league, outcomes will be correlated solely with team trends, with team averages having no influence on those outcomes. As we've said, with a handicap percentage of 100%, there is no advantage to being a better bowler; teams which do best relative to their normal performances (i.e., teams with the highest trends) will have the best chances of success.

For anything in between, i.e., for handicap leagues with a handicap percentage below 100%, the final standings will be correlated with both team averages and team trends. How much influence each of these values has is determined by the specific handicap percentage that's used. The higher the percentage, the more team trends will influence the final outcome; the lower the percentage, the more team averages will influence the final outcome. So tuning up a handicap league can be thought of as finding the "sweet spot," i.e., the proper balance to reward high scores and above-average performances in what the league manager decides are the appropriate proportions.

One characteristic of trends is that the longer the period of time they are measured over, the closer to zero they are likely to become. Sue achieved an impressive trend of +20 for one week of bowling, but for a bowler to consistently average scores that are 20 pins over his or her handicap basis, which keeps rising with those lofty scores, would be extremely difficult over the course of a full season. The same would be true for large negative trends. Appendix E contains trend probability tables, which show the likelihoods of a bowler or team achieving various trend values, given the length of the season. This table can be referred to when tuning up a league in order to assure that realistic assumptions are being made about bowler and team performances.

Note that when book averages are not used in a league, everyone's trend after the first week of bowling will be zero. That's because on the first week, handicaps are computed retroactively based on the average of the games that were bowled, so by definition everyone will bowl the exact same average that their handicaps are being based on. Those trend values of zero are included in calculation of each bowler's season trend, the same as all the other trend values that are averaged together for that bowler.

When book averages are used, trends will not automatically be zero after the first week of bowling. For as many weeks as book averages are used, the handicap basis is not the bowler's current league average but rather his or her book average. During that period, a bowler's scores do not affect the handicap basis, making it easier to maintain a large positive or negative trend. (If a bowler doesn't have an established book average in this type of league, this is not the case, as the bowler's handicap basis is then computed retroactively – after each week's games are bowled – to include that week's games, for as many weeks as book averages are used.) So in trying to minimize the effects of sandbagging, the chances of giving a bowler a significant advantage or disadvantage in the league from using a potentially inappropriate book average are increased. That's why book averages are usually used only for the first few weeks of a league, until the bowler's current average can be trusted as a reasonably accurate measure of the bowler's ability.

As we've seen, Bowling League Tuneup allows the trend field to be left empty on supplied bowler averages. An empty trend differentiates the absence of a computed trend value from a computed trend value of zero. Whenever trends are used in computations, an empty trend will be treated as a trend of zero.

Volatility: the measure of consistency

A third measure of a bowler's performance is volatility, the measure of bowler consistency. While not nearly as important as average and trend in determining bowling league results, volatility can nevertheless have a measurable impact on league results under certain circumstances.

Volatility is an intuitive concept. A bowler might average 160 one week by bowling games of 120, 160, and 200. Another bowler might achieve the same 160 average by bowling games of 155, 160, and 165. The first bowler was clearly more volatile (less consistent) than the second.

Under most circumstances, volatility has a minor effect on league outcomes. Greater volatility among bowlers gives less-predictable results, smaller volatility gives more-predictable results. One situation where we can see this is in the previous example of a 180-average bowler versus a 165-average bowler. Bowling League Tuneup told us the 180-average bowler will win a nine-game scratch series almost 86% of the time. But if we tell BLT that both bowlers have high volatility, the winning percentage goes down to under 82%. And if both bowlers have low volatility, that percentage goes up to about 91%.

If it's unclear why this should be the case, let's take this example to its logical extreme. If both bowlers had the lowest possible volatility, zero, that would mean the 180-average bowler would bowl 180 every single game and the 165-average bowler would bowl 165 every single game. This would obviously never happen, and BLT therefore doesn't allow a volatility of zero – but if it did, it would show that the 180-average bowler would win every game and would therefore win the nine-game series 100% of the time.

For most real-world analyses, volatility is a relatively minor concern, but it is nevertheless the third variable that characterizes a bowler's performance. Volatility measures are themselves pretty volatile, because a single game or series can cause a dramatic change in a bowler's volatility rating. So it really doesn't make sense to assign an exact number to characterize a bowler's volatility, as that would place too much significance on the accuracy of that number. Instead, Bowling League Tuneup uses three categories of volatility: low, normal, and high. When volatility data is not included in a BLT analysis, BLT assumes normal volatility for all bowlers. BLT will compute the volatility for a bowler whenever the bowler's actual scores are entered, and a volatility can always be entered manually for any bowler if you know the bowler to be rock-steady (low volatility) or completely unpredictable (high volatility).

Putting it all together

Up until now, we've set the Bowling League Tuneup grid to show only bowlers' averages. But BLT is capable of showing all three bowler performance measures in the grid, with each cell showing the bowler's average, followed by the bowler's trend (in parentheses), followed by a symbol representing the bowler's volatility (• = low, - = normal, ° = high). Whether BLT uses and displays trend and volatility values in its analyses is set by checking or unchecking those options in the Computations section on the main BLT screen.

To see what this looks like, here is the appearance of the main screen for an actual league, called Funseekers.

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1-Bowl-X-ing	187 (-5)	120 (+0)	187 (+0)	197 (-3)	691 (-8)																
2-Hoo Gnu Too!	190 (-3)	188 (-1)	196 (-5)	202 (+0)	776 (-9)																
3-Public Enemy	193 (-7)	129 (+0)	154 (-5)	187 (+1)	663 (-11)																
4-Back In The Alley	147 (-1)	142 (-2)	201 (+0)	207 (-4)	697 (-7)																
5-Team 5	167 (-4)	177 (-1)	180 (-6)	187 (-1)	711 (-12)																
6-Bonnie's Boyz	161 (-1)	173 (+0)	171 (-5)	194 (+0)	699 (-6)																
7-Team 7	163 (-2)	173 (-5)	163 (-2)	211 (-3)	710 (-12)																
8-In The Gutter	163 (-5)	150 (-4)	162 (-3)	187 (-2)	662 (-14)																
9-Team 9	149 (+0)	161 (-1)	172 (+4)	160 (-2)	642 (+1)																
10-Exit Only	157 (+0)	158 (+1)	182 (-1)	176 (-4)	673 (-4)																
11-The Sleepers	145 (+5)	131 (+0)	156 (+2)	169 (+1)	601 (+8)																
12-Up To No Good	154 (-3)	127 (+1)	131 (-5)	140 (-4)	552 (-11)																
13-The Old Folks	148 (-2)	127 (-9)	152 (-2)	186 (-6)	613 (-19)																
14-Bowlingheimers	139 (-2)	182 (+1)	186 (-6)	186 (-2)	693 (-9)																
15-X-MEN+Y	202 (-4)	168 (+3)	172 (+0)	203 (-3)	745 (-4)																
16-Team 16	130 (+2)	116 (-4)	146 (-1)	144 (-4)	536 (-7)																

As you can see, this league has 16 teams which bowl three games per week for a 15-week season, using a handicap formula of 90% of 225. Book averages are used to determine handicap for the first four weeks of the season. The grid entries now appear in blue, not black, which indicates that these values have been calculated by Bowling League Tuneup from the actual recorded scores of each bowler. This is the way the league looked at the end of the season, after all 15 weeks of bowling had been completed.

Notice also that the Total column now contains not just the sum of the bowlers' averages on each team, but also the sum of the bowlers' trends, which shows at a glance how much a team has been overperforming or underperforming. (Bowling League Tuneup makes no attempt to summarize team volatilities.) As always, clicking on the Total column header will sort the teams by team average. But now, because we are using and displaying trend values, clicking a second time in the Total cell will sort the teams by team trend, from highest to lowest.

Before we move on, there are a couple of interesting things to note about the trends in this league. First, only five of the 64 bowlers have a trend which is more than +5 or less than -5. As we said, the longer the season, the harder it is to maintain a very high or very low trend. And this data is taken from a fairly short 15-week season.

Second, this league is quite unusual in that all but two teams have negative trends – with many teams having strongly negative trends. Very few bowlers are bowling above the averages upon which their handicaps are based. It is unclear whether there is a reason for this (e.g., lane conditions became more difficult as the season progressed or book averages were set under much easier lane conditions) or if this is just random chance. Team 11 (The Sleepers) has a team trend of +8, team 9 has a team trend of +1, and all 14 other teams have negative trends – from -4 all the way down to -19. Whatever the reason is for these low numbers, we might expect The Sleepers to have done well in this league, despite having the third-lowest team average, because of its significant lead in trend over all the other teams in the league. Stay tuned. We'll examine this league again in the Postseason Diagnostics section.

USING BOWLING LEAGUE TUNEUP DURING THE SEASON

Up until now, we've been doing preseason analyses using assumed averages for the league bowlers. But once the league has begun, Bowling League Tuneup can be used to record bowler scores each week. With this data, BLT can then produce bowler performance sheets which may be distributed to league bowlers, and it can also perform in-season league analyses based on actual, not assumed, scores. After the season is over, the data gathered during the season can be analyzed by BLT and compared with actual league results to provide valuable insights that may help a league manager improve league setup in future seasons.

Bowler information revisited

We've already used the Edit Bowler window to define bowler averages. Now is a good time to revisit this window to uncover its full capabilities.

Josephine Bowler

Use Supplied Bowler Data

Average Vacancy score

Trend

Volatility Low Normal High

Use Computed Bowler Data

Book average (used for 4 weeks)

Week	1	2	3	4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Clear All Scores Clear Red Scores Convert to Substitute

OK Cancel

Previously, we only populated the Average field and ignored everything else. We now know about trends and volatilities, so those fields should be less of a mystery now. Of course, we'll probably have a lot easier time determining what average to enter for a bowler than figuring out what trend and volatility values to use. Fortunately, Bowling League Tuneup can compute all of these values from the bowler's actual scores – which we'll see shortly. But you can supply these values as well, usually in order to test the effects of various assumptions when running league analyses.

The Use Supplied Bowler Data frame also has a checkbox to denote a vacancy score. This is checked when this entry represents a missing bowler, and it tells BLT what values the league uses when a team is missing a bowler. The average in this case is simply the league's vacancy bowler score. The trend should be left blank (or, equivalently, set to zero) if the missing bowler's handicap is based on the vacancy bowler average. But if the league penalizes teams with missing bowlers by

basing the handicap on a higher average (not common, but possible), the trend should be set to the difference between those two scores. For instance, if the missing bowler average is 140 but the missing bowler's handicap is based on a 150 average, the trend should be set at -10. The Vacancy Score box should be checked *after* the average and trend have been entered, since any change to those fields will automatically uncheck the Vacancy Score box. (Note that volatility is not a valid concept for a vacancy bowler, so it is grayed out when the Vacancy Score box is checked.)

Using computed bowler data

As we just mentioned, you can use Bowling League Tuneup to compute bowler averages, trends, and volatilities for you from the bowler's actual scores. Storing bowler scores in BLT is as easy as keying them into the grid in the bottom half of the Edit Bowler window.

The Use Computed Bowler Data frame is used to record and display bowler scores. Using the grid in this frame will automatically check the Use Computed Bowler Data checkbox (and uncheck the Use Supplied Bowler Data checkbox). When Use Computed Bowler Data is checked, the average, trend, and volatility displayed in the top frame are the values that have been computed from scores entered in the bottom frame. If no data has been entered yet in the bottom frame, those fields will go blank.

To enter bowler scores, click in the grid cell for the week and game you want to enter, which will bring up the Score Entry Mode window. Pressing F3 will also do this, highlighting the game 1 cell immediately after the last week that has recorded scores for this bowler.

Josephine Bowler

Use Supplied Bowler Data

Average Vacancy score

Trend

Volatility Low Normal High

Use Computed Bowler Data

Book average (used for 4 weeks)

Week	1	2	3	4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Clear All Scores Clear Red Scores Convert to Substitute

Score Entry Mode

Score Sub/vacancy bowler; htcp based on avg

Absent bowler; set score pins under avg

OK Cancel

To enter a score for the highlighted grid cell, just type the score into the Score field and click OK or press Enter. The score will be displayed in the grid and the new computed average, trend, and

volatility values will be displayed in the top frame of the Edit Bowler window. If the Score field is empty when you click OK or press Enter, any value in the highlighted grid cell will be deleted.

After entering a score, the next cell will then be highlighted to repeat the process (unless you pressed the Shift key while clicking on a grid cell to limit score entry to a single score). The cursor will move sequentially from one grid cell to the next, for each game in a week (as shown by the number of weeks highlighted in the grid header), then to the next week.

The number of games highlighted in the grid header defaults to the number of games per week in this league. If you want to enter a different number of games per week for a bowler, you can click that number in the grid header before getting into score entry mode, or you can keep tapping F2 until the desired number of games is set. Regardless of the appearance of the header, all grid fields are valid for input. (This can be useful if you want Bowling League Tuneup to compute values for, say, a bowler whose data was obtained from a different league that bowled a different number of games per week.)

Scores can be entered in any order, i.e., for any week in the season, even if there are empty rows above the data being entered. But computations are done only up to the first empty row of data; everything after that is ignored. When score entry mode is exited via the Cancel button and OK is clicked on the Edit Bowler window to enter the bowler's scores into Bowling League Tuneup, if any scores are found after the first empty row, BLT will display a warning that those scores will be ignored and discarded, giving you a chance to go back and fix the problem if you want.

In addition to the bowler's scores, the bowler's book average can be recorded above the score grid. If the league uses book averages to figure handicaps for some portion of the season, this is the value that will be used for each bowler. The label next to the Book Average field indicates whether BLT is currently set to include the book average in the computations of the bowler's handicaps and trends. If a bowler has no book average recorded, a handicap is computed retroactively after each week of bowling for as many weeks as the book average would have been used.

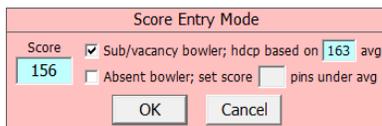
Note that if a book average is typed for a bowler position defined as a vacancy bowler, the Vacancy Bowler checkbox is unchecked and the book average is set as the bowler's supplied average. This is a handy shortcut when you are setting up a new league, allowing you to give a newly defined bowler a supplied preseason average (necessary for doing preseason analyses) and a book average while typing that average only once.

After modification of the bowler's scores is completed by clicking OK in the Edit Bowler window, Bowling League Tuneup will advance to the next bowler in sequence to allow entry or modification of scores for that bowler (unless you pressed the Shift key while clicking on the bowler's cell in the main screen grid to limit bowler editing to just that one bowler). At this point, the display of teams on the main screen temporarily changes to unsorted mode and remains that way until bowler editing is completed by canceling out of the Edit Bowler window. This is done because it would be awfully confusing if teams were sorted by team average and entry of new scores kept changing the sort order of the teams as you progressed through editing of the bowlers' scores. As soon as editing is completed, the original sort order is restored.

Dealing with bowler absences

There will, of course, be weeks when a team is missing one or more bowlers. In league play, some score must be used for each bowler in each game, even if the regular bowler missed the game. Leagues allow for one of three possibilities:

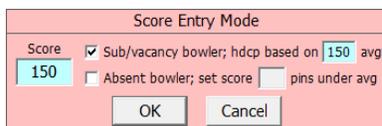
- A substitute bowler bowls in place of a regular bowler. When this happens, the Score field should be filled in with the substitute's score for that game, the Sub/Vacancy Bowler checkbox should be checked, and the associated field should be filled in with the substitute's established average in the league, i.e., the average upon which his or her handicap for that game is being based. (Any subsequent substitute game scores entered for this bowler will default the field to this same average for ease of data entry.)



The screenshot shows a dialog box titled "Score Entry Mode". It has a "Score" field containing the number "156". To the right of the score field, there are two checkboxes. The first checkbox is checked and is labeled "Sub/vacancy bowler; hdcp based on 163 avg". The second checkbox is unchecked and is labeled "Absent bowler; set score [] pins under avg". At the bottom of the dialog box are two buttons: "OK" and "Cancel".

Here, a substitute bowler bowled a 156 game while carrying a 163 average.

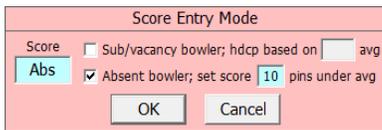
- A vacancy bowler score is used for a missing bowler. Each league defines the score that will be used when a team is missing a bowler because either a full team couldn't be formed, a regular bowler dropped out of the league, or a regular bowler has been absent too long to continue using an absence score. When a vacancy bowler score is used, the Score field should be filled in with the league's standard vacancy bowler score, the Sub/Vacancy Bowler checkbox should be checked, and the associated field should be filled in with the average upon which the vacancy bowler's handicap is being based. That average will be the same as the vacancy bowler score itself if the league imposes no penalty on a team for missing a bowler (the typical case), or a higher average if the league does impose such a penalty. (When this box is checked while the Score field is empty, the league's default vacancy score and average will automatically be filled in for ease of data entry.)



The screenshot shows a dialog box titled "Score Entry Mode". It has a "Score" field containing the number "150". To the right of the score field, there are two checkboxes. The first checkbox is checked and is labeled "Sub/vacancy bowler; hdcp based on 150 avg". The second checkbox is unchecked and is labeled "Absent bowler; set score [] pins under avg". At the bottom of the dialog box are two buttons: "OK" and "Cancel".

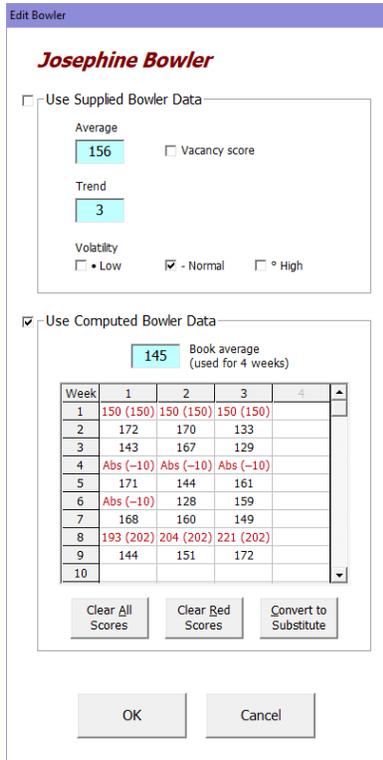
Here, the league's vacancy bowler score of 150 is used, with no penalty imposed for a vacancy.

- An absence score is used for a regular bowler who is unable to bowl one or more games in a week. An absence score is the score upon which the bowler's handicap is currently being based (i.e., the bowler's current league average or book average), often minus some number of pins defined by the league as the penalty for missing a game. A common penalty value leagues use is 10 pins. When an absence score is used, the Absent Bowler checkbox should be checked, which automatically fills in the Score field with "Abs" and the associated field with the league's default absence score pin penalty (although this value can be overwritten).



Here, a missing bowler receives an absence score of 10 pins less than his or her current league average or book average.

Shown below is the way Josephine Bowler's scores appear in the Edit Bowler window after nine weeks of bowling.



Josephine was unable to bowl on the first week of bowling, so the standard vacancy score of 150 appears as "150 (150)" to indicate a vacancy score of 150 is being recorded, using a 150 average (the parenthesized number) when computing handicap scores for the week. Josephine missed all of week 4 and the first game of week 6, with absence scores of 10 pins below her current average at the time being used for those games. Josephine couldn't make it on week 8 either, but that week a substitute bowler with an established league average of 202 bowled games of 193, 204, and 221 in Josephine's place. All of these entries, i.e., the ones that do not represent actual games bowled by Josephine Bowler, are displayed in red.

The average, trend, and volatility displayed at the top of the window include all 27 of these scores. The red values are not included in personal performance records for Josephine (discussed later), but for the purpose of determining team chances in the league, all that matters is the series of scores attributed to that position on the team. So the average of 156 computed from these scores includes not only the games Josephine actually bowled, but the vacancy bowler scores in the first week, the four scores of 10 pins below Josephine's average for the games she missed, and even the scores of the (very good) bowler who substituted for Josephine. Likewise, the trend and volatility reflect all 27 of these scores as well.

After all scores have been entered for a bowler, pressing Escape or clicking Cancel in the Score Entry Mode window will exit score entry mode and return you to the Edit Bowler window. Pressing Enter or clicking OK here updates the bowler's entry on the main screen's grid and proceeds to the next bowler in sequence for editing (unless you pressed Shift while clicking on the bowler's grid cell); pressing Escape or clicking Cancel discards any bowler changes that may have been made (after a warning is displayed to verify your intention).

Editing the bowler grid

You may occasionally need to do more than simply enter and overwrite bowler scores in the grid. For instance, if a week of scores has been inadvertently left out of a bowler's grid entries, you need to be able to insert a row within the existing scores. To do this kind of editing, you can click on a row number at the left of the grid (or press F4) to put you into row edit mode, shown below.

Josephine Bowler

Use Supplied Bowler Data

Average: 156 Vacancy score

Trend: 3

Volatility: Low Normal High

Use Computed Bowler Data

145 Book average (used for 4 weeks)

Week	1	2	3	4
1	150 (150)	150 (150)	150 (150)	
2	172	170	133	
3	143	167	129	
4	Abs (-10)	Abs (-10)	Abs (-10)	
5	171	144	161	
6	Abs (-10)	128	159	
7	168	160	149	
8	193 (202)	204 (202)	221 (202)	
9	144	151	172	
10				

Clear All Scores Clear Red Scores Convert to Substitute

Row Edit Mode

Delete Row Prev Next Insert Row Cancel

This mode allows you to insert and delete rows (weeks) of scores in the grid at the highlighted row (here, week 4) by clicking the Insert Row and Delete Row buttons, respectively. When inserting a row, all rows below the inserted row are shifted down to make room for the new row. When deleting a row, all rows below the deleted row are shifted up to fill in the gap left by the deleted row.

The Prev and Next buttons in the Row Edit Mode window allow you to change the highlighted grid row to the previous or next row without leaving and reentering row edit mode.

Three more grid-editing shortcuts are available on the Edit Bowler window via the buttons underneath the grid.

Josephine Bowler

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

Use Computed Bowler Data

Book average (used for 4 weeks):

Week	1	2	3	4
1	150 (150)	150 (150)	150 (150)	
2	172	170	133	
3	143	167	129	
4	Abs (-10)	Abs (-10)	Abs (-10)	
5	171	144	161	
6	Abs (-10)	128	159	
7	168	160	149	
8	193 (202)	204 (202)	221 (202)	
9	144	151	172	
10				

The Clear All Scores button clears out the entire grid as a convenient alternative to deleting each of the scores from the grid individually, should you ever want to wipe out all recorded scores and start entering them from scratch. If the bowler average was being computed from these scores, that average is preserved as a supplied average.

The Clear Red Scores button removes any absence, substitute, or vacancy scores (which all display in red) for this bowler, automatically closing any gaps in weeks that may be created (or were already there). The average, trend, and volatility values displayed at the top of the window will immediately update, so comparing the before and after values of these fields is a convenient way of determining the effect of bowler absences on these values. You can then click OK to make these changes permanent, which you might want to do in order to run an analysis to determine how profound an effect one or more bowlers' absences had on team prospects that season. You may instead just click Cancel if you only wanted to see the effect of removing the absences without permanently changing the bowler's data.

The Convert To Substitute button changes all entries in the grid to substitute bowler scores in a way that assures that all attributes of the bowler (average, trend, volatility) remain unchanged. This feature comes in handy when a new bowler replaces another bowler on a team. Changing all historical entries to substitute scores preserves those scores for any league analyses that will be done, while ensuring personal statistics for the new bowler do not include any scores recorded before he or she joined the team.

Entering weekly bowler scores

We've seen how the bowler grid in the Use Computed Bowler Data frame can be used to enter bowler scores. But there is an easier way to enter scores when keying in a full week of scores for

the entire league. Clicking on the Enter Scores button on the main screen brings up the Bowler Score Entry window.

The screenshot shows a window titled "Bowler Score Entry". It contains a table with the following structure:

Team / Bowler	1	2	3	4
1-Bowl-X-ing / Martin McGee				
1-Bowl-X-ing / Diana Brown				
1-Bowl-X-ing / George Morgan				
1-Bowl-X-ing / Philip Gray				
2-Hoo Gnu Tool / Fred Rivera				
2-Hoo Gnu Tool / Victor Nelson				
2-Hoo Gnu Tool / Eric Smith				
2-Hoo Gnu Tool / Anthony Thompson				
3-Public Enemy / Bobby Rodriguez				
3-Public Enemy / Margaret Foster				
3-Public Enemy / Kathy Richardson				
3-Public Enemy / Eugene Ramirez				
4-Back In The Alley / Diane Morris				
4-Back In The Alley / Pamela Miller				
4-Back In The Alley / Carl Walker				
4-Back In The Alley / Louis Phillips				
5-Team 5 / Aaron Stewart				
5-Team 5 / Joseph Thomas				
5-Team 5 / Henry Hernandez				
5-Team 5 / Harold Robinson				
6-Bonnie's Boyz / Paula Wilson				
6-Bonnie's Boyz / Lawrence Jenkins				
6-Bonnie's Boyz / Jeremy Taylor				
6-Bonnie's Boyz / Terry Bennett				
7-Team 7 / Ronald Lopez				

At the bottom of the window are two buttons: "OK" and "Cancel".

This window lists all bowlers in the league team-by-team, allowing all scores from a new week of bowling to be entered via a single screen. (We've changed the Funseekers league's actual bowler names to made-up names to preserve their anonymity.) Clicking in a score cell or pressing F3 brings up the Score Entry Mode window, which works in exactly the same way it does in the bowler grid in the Edit Bowler window.

This screenshot is similar to the previous one, but the first cell in the grid (row 1, column 1) is highlighted in light blue. A "Score Entry Mode" dialog box is open over this cell. The dialog box contains the following text and controls:

Score Sub/vacancy bowler; hdp based on avg
 Absent bowler; set score pins under avg

At the bottom of the dialog box are two buttons: "OK" and "Cancel".

After a score has been entered into the highlighted grid cell, the cursor moves to the bowler's next game, or to the next bowler if the number of games indicated in the grid header has been reached. As with the Edit Bowler window's bowler grid, clicking a number in the grid header or tapping F2 will change the default number of games to record for each bowler. Clicking Cancel or pressing

Escape terminates score entry mode. (As always, if you pressed Shift when clicking on a grid cell, score entry is limited to only that cell.)

Once all scores have been entered into the grid, clicking OK (or pressing Enter) will post the entered scores as a new week of scores for each bowler and you will be brought back to the main screen. A pop-up window will indicate how many bowlers have had their scoring records updated.

Importing weekly bowler scores

Bowling League Tuneup supports the ability to import bowler scores from computerized league management systems that can make weekly scores available electronically, e.g., via PDF files, text files, or spreadsheet files. The main screen's Import Scores button brings up the Bowler Score Extraction window that will allow you to do this.

Bowler Score Extraction

1-Stupid Ball
2-Enterprise
3-Bowling 4 Oscars
4-Give Me A Break
5-Where's Jim?
6-Panther Spice
7-Don't Give A Split
8-Strikes Of Fire
9-BOWLING STONES
10-Bowl In The USA
11-WTF
12-What R The Odds?
13-No Expectations
14-Eddie's Angels
15-Team 15
16-Bowl 4 Fun
17-Team 17
18-VACANCY

STEP 1 - EXTRACT scores from league sheet

1. Define the format of extracted league sheet data below. (Definitions will be remembered for this league.)
2. Copy (Ctrl+C) the bowlers' weekly results section from an online league sheet and then paste (Ctrl+V) into the box above, examining results, editing, and/or repeating as desired to conform to the format definitions.
3. Click Extract to extract bowler scores to the box at the right, repeating as desired until results are acceptable.

Extract Format Definitions (Save changes)

Numeric fields per bowler: Maximum Minimum

Score field numbers: Game 1 Game 2 Game 3 Game 4

Prefixes used
 Suffixes used

Prefix chars: Absence Substitute Vacancy

Chars to treat as spaces:

Each row contains exactly one team
 Each row contains at most one bowler
 Bowlers do not span multiple rows
 Row boundaries should be ignored

Scan rows and number fields left-to-right
 Scan rows and number fields right-to-left

STEP 2 - POPULATE the import form

1. Examine extracted text above and go back to Step 1 if necessary to correct problems. Or skip Step 1 and type scores here directly, one team per row, as described in item 3 below.
2. If the rows above are not in the team order at the left, click on a team name or press F4, then use arrow keys or the pop-up form to reorder the teams to match the rows of scores.
3. Edit extracted text as necessary to correct any problems found. Assume there is one team per row, matched to the team names at the left, that commas separate the bowlers on a team, and that spaces or prefix characters separate each bowler's scores. (Prefixes are always used here, not suffixes, and are the same characters as those defined in Step 1.)
4. Click Populate to populate the Import form with the above scores for final inspection and editing of this new week of league scores. (You will be able to enter substitutes' averages on the Import form.)

Populate Cancel

Here we see the Bowler Score Extraction window for a 17-team league called Kings & Queens. The team names (including the 18th vacancy team) are listed in between the two empty boxes.

The import process begins by opening the league's recap sheet that includes the past week's bowler scores. You can do this using any app that's appropriate for viewing the sheet. For instance, if the recap sheet is a PDF file, you can use Adobe Acrobat Reader to view it; if it's a text file, you can use Notepad or Microsoft Word; if it's a spreadsheet, you can use Microsoft Excel. Whatever app you're using, as long as you can highlight text in the bowler score section using standard Windows techniques, you should be able to import the scores.

Let's demonstrate the process by viewing the week 10 recap sheet for the Kings & Queens league. This sheet was produced by Bowling League Secretary from CDE Software. (We're showing only a portion of the sheet and blurring bowler names to preserve their anonymity.)

Season High Scores - Continued

Women	501	762	191	273
	476	718	177	253

Most Improved Average

Men	138	to	165.43	=	+27.43	Women	107	to	120.57	=	+13.57
	100	to	127.40	=	+27.40		111	to	120.67	=	+9.67

Team Rosters

Name	Avg	HDCP	Pins	Gms	High Game	High Sers	HDCP Game	HDCP Sers	-1-	-2-	-3-	Total	HDCP Total
1 - Stupid Ball! Lane 24 HDCP=288 Avg=575													
Michelle Davis	107	107	2910	27	132	360	241	684	108	100	101	309	627
Michelle Davis	170	47	3575	21	257	593	307	743	161	162	150	473	608
Scott Buchanan	125	90	2251	18	195	447	284	714	a115	a115	a115	345	615
Tracy Telfer	173	44	5192	30	257	578	304	719	157	164	257	578	719
2 - Enterprise Lane 18 HDCP=264 Avg=600													
Bill Combs	127	88	3054	24	175	413	267	689	159	114	118	391	658
Michelle Davis	139	76	3353	24	181	503	263	749	122	154	133	409	637
Steve Ryan	194	24	5834	30	259	696	296	807	194	151	199	544	613
John Williams	140	76	2114	15	174	449	243	680	a130	a130	a130	390	618
3 - Bowling 4 Oscars Lane 20 HDCP=163 Avg=706													
Michelle Davis	152	64	4570	30	193	528	268	729	116	178	161	455	647
Richard Williams	170	47	3584	21	232	595	282	745	137	148	189	474	609
Michelle Davis	179	38	5395	30	248	658	282	760	202	147	198	547	661
Michelle Davis	205	14	6178	30	246	664	260	712	210	212	208	630	672
4 - OMG Give Me a Break Lane 26 HDCP=268 Avg=596													
Michelle Davis	154	62	4627	30	213	570	279	768	155	202	213	570	768
Michelle Davis	142	74	4278	30	180	476	258	697	115	169	134	418	640
VACANT	150	66	0	0	0	0			v150	v150	v150	450	648
Bill Buchanan	150	66	3169	21	179	485	246	691	143	179	163	485	686
5 - Where's Jim? Lane 16 HDCP=232 Avg=634													
Michelle Davis	120	95	3620	30	160	468	258	762	109	121	120	350	632
Michelle Davis	150	66	4505	30	189	500	255	702	147	177	168	492	696
Michelle Davis	158	58	4289	27	193	521	255	707	178	151	145	474	648
Michelle Davis	206	13	5572	27	258	682	273	712	215	258	194	667	712
6 - Panther Spice Lane 22 HDCP=299 Avg=564													
Michelle Davis	182	36	4938	27	244	611	284	734	158	163	151	472	568
Michelle Davis	143	73	2153	15	216	487	296	727	a133	a133	a133	399	618
VACANT	126	89	0	0	0	0			136	139	137	372	639
VACANT	150	66	0	0	0	0			v150	v150	v150	450	648
13 - No Expectations Lane 25 HDCP=398 Avg=459													
Michelle Davis	85	128	1538	18	115	279	246	681	a75	a75	a75	225	609
Michelle Davis	98	115	2668	27	130	331	245	718	76	91	104	271	613
Michelle Davis	84	129	2019	24	120	315	253	714				0	0
Michelle Davis	192	26	2888	15	235	701	271	809	235	231	235	701	809
14 - Eddie's Angels Lane 32 HDCP=317 Avg=543													
Michelle Davis	115	99	2087	18	159	364	259	664	v150	v150	v150	450	648
Michelle Davis	139	76	4189	30	185	436	261	685	132	145	153	430	658
Michelle Davis	139	76	3761	27	191	481	270	718	146	144	178	468	702
VACANT	150	66	0	0	0	0			v150	v150	v150	450	648
15 - Team 15 Lane 21 HDCP=281 Avg=582													
Michelle Davis	127	88	3822	30	163	454	254	745	143	131	152	426	696
Michelle Davis	136	79	4108	30	190	465	282	730	128	123	159	410	647
Michelle Davis	169	48	5094	30	212	561	262	712	167	192	109	468	606
VACANT	150	66	0	0	0	0			v150	v150	v150	450	648
16 - Bowl 4 Fun Lane 27 HDCP=285 Avg=579													
VACANT	150	66	0	0	0	0			v150	v150	v150	450	648
Michelle Davis	124	91	3736	30	160	413	250	680	151	131	111	393	669
Michelle Davis	120	95	3617	30	178	421	273	718	106	118	108	332	614
Michelle Davis	185	33	5567	30	232	626	269	737	180	170	183	533	629
17 - Team 17 Lane 29 HDCP=206 Avg=661													
Michelle Davis	135	80	1221	9	211	476	302	749	118	147	211	476	749
Michelle Davis	191	27	3449	18	235	602	261	683	146	235	182	563	641
Michelle Davis	185	33	3334	18	206	594	235	690	186	198	177	561	663
VACANT	150	66	0	0	0	0			v150	v150	v150	450	648
18 - BYE Lane 23 HDCP=0 Avg=0													

The format of league recap sheets can of course vary significantly from what we see here. This truncated view of the Team Rosters section of the recap sheet shows that a lot of information is given for each bowler. What's important for us is that within the 13 columns of bowler data are three columns (under the column headings -1-, -2-, and -3-) that contain last week's scores.

Bowling League Secretary produced this league's recap sheets as PDF files. Opening the Kings & Queens recap sheet in Adobe Acrobat Reader, we can highlight and copy all the text from the beginning of the Team Rosters section down to team 18's entry using standard Windows techniques. The text can be highlighted by dragging the mouse (i.e., moving the mouse while keeping the left mouse button pressed down) from the start to the end of the section of text we want to copy. Or we can click the mouse at the start of the section, then shift-click at the end of the section. Once the text is highlighted, we can right-click on the highlighted text and select Copy, or we can just press Ctrl+C on the keyboard to copy the highlighted text to the Windows clipboard.

The exact starting and ending positions of the highlighted text is generally not important. The extract mechanism looks for uninterrupted sequences of numbers to identify bowler data, so if extra text before or after bowler data is included – or other completely irrelevant text that might appear within the text, like headers and footers at page boundaries, for instance – that shouldn't matter. Here, there would be no problem starting our highlighted text at the top of page 2 since nothing prior to the first bowler on team 1 contains uninterrupted sequences of numbers.

If the format of the bowler data on the recap sheet is too convoluted and it's hard to copy all the bowler scores via a single copy, you may need to perform multiple copy-and-paste operations to bring all bowler data into the Bowler Score Extraction window. But that kind of complication should usually be unnecessary.

The next step is to paste the copied text from the Windows clipboard into the left-hand box on the Bowler Score Extraction window. That's done either by right-clicking in the box and selecting the Paste option or by pressing Ctrl+V on the keyboard after positioning the cursor in the box. Shown here are the results of pasting our text copied from the Kings & Queens recap sheet. (We've replaced the bowlers' names with some made-up names to continue to preserve their anonymity.)

Bowler Score Extraction

1 - Stupid Ball! Lane 24 HDCP=288 Avg=575
 Corey Barrett 107 107 2910 27 132 360 241 684 108 100 101 309 627
 Guadalupe Wise 170 47 3575 21 257 593 307 743 161 162 150 473 608
 Alberta Rivera 125 90 2251 18 195 +47 284 714 a115 a115 a115 345 615
 Ray Mann 173 44 5192 30 257 578 304 719 157 164 257 578 719
 2 - Enterprise Lane 18 HDCP=264 Avg=600
 Tammy Chandler 127 88 3054 24 175 413 267 689 159 114 118 391 658
 Chad McGee 139 76 3353 24 181 503 263 749 122 154 133 409 637
 Oscar Sherman 194 24 5834 30 259 696 296 807 194 151 199 544 613
 Vernon French 140 76 2114 15 174 449 243 680 a130 a130 a130 390 618
 3 - Bowling 4 Oscars Lane 20 HDCP=163 Avg=706
 Ramiro Higgins 152 64 4570 30 193 328 268 729 116 178 161 455 647
 Jeremy Sims 170 47 3584 21 232 595 282 745 137 148 189 474 609
 Joanne Barnett 179 38 5395 30 248 658 282 760 202 147 198 547 661
 Bradley Hall 205 14 6178 30 246 664 260 712 210 212 208 630 672
 4 - OMG Give Me a Break Lane 26 HDCP=268 Avg=596
 Wendell Montgomery 154 62 4627 30 213 570 279 768 155 202 213 570 768
 Wesley Ferguson 142 74 4278 30 180 476 258 697 115 169 134 418 640
 VACANT 150 66 0 0 0 v150 v150 v150 480 648
 Wilfred Matthews 150 66 3169 21 179 485 246 691 143 179 163 485 686
 5 - Where's Jim? Lane 16 HDCP=232 Avg=634
 Peggy Roberts 120 95 3620 30 160 468 258 762 109 121 120 350 632
 Stewart Lloyd 150 66 4505 30 189 500 255 702 147 177 168 492 696
 Duane Burton 158 58 4289 27 193 521 255 707 178 151 145 474 648

1-Stupid Ball
 2-Enterprise
 3-Bowling 4 Oscars
 4-Give Me A Break
 5-Where's Jim?
 6-Panther Spice
 7-Don't Give A Split
 8-Strikes Of Fire
 9-BOWLING STONES
 10-Bowl In The USA
 11-WTF
 12-What R. The Odds?
 13-No Expectations
 14-Eddie's Angels
 15-Team 15
 16-Bowl 4 Fun
 17-Team 17
 18-VACANCY

STEP 1 - EXTRACT scores from league sheet

- Define the format of extracted league sheet data below. (Definitions will be remembered for this league.)
- Copy (Ctrl+C) the bowlers' weekly results section from an online league sheet and then paste (Ctrl+V) into the box above, examining results, editing, and/or repeating as desired to conform to the format definitions.
- Click Extract to extract bowler scores to the box at the right, repeating as desired until results are acceptable.

Extract -->

Extract Format Definitions (Save changes)

Numeric fields per bowler: Maximum Minimum

Score field numbers: Game 1 Game 2 Game 3 Game 4

Prefixes used Suffixes used

Prefix chars: Absence Substitute Vacancy

Chars to treat as spaces:

Each row contains exactly one team
 Each row contains at most one bowler
 Bowlers do not span multiple rows
 Row boundaries should be ignored

Scan rows and number fields left-to-right
 Scan rows and number fields right-to-left

STEP 2 - POPULATE the import form

- Examine extracted text above and go back to Step 1 if necessary to correct problems. Or skip Step 1 and type scores here directly, one team per row, as described in item 3 below.
- If the rows above are not in the team order at the left, click on a team name or press F4, then use arrow keys or the pop-up form to reorder the teams to match the rows of scores.
- Edit extracted text as necessary to correct any problems found. Assume there is one team per row, matched to the team names at the left, that commas separate the bowlers on a team, and that spaces or prefix characters separate each bowler's scores. (Prefixes are always used here, not suffixes, and are the same characters as those defined in Step 1.)
- Click Populate to populate the Import form with the above scores for final inspection and editing of this new week of league scores. (You will be able to enter substitutes' averages on the Import form.)

We've scrolled up to the top of the pasted text, as indicated by the vertical scroll bar at the right of the box, and can see that it shows up as one row of information for each bowler, with some non-bowler rows interspersed in there as well. The pasted text's appearance is often dependent on the app from which the text was copied. For example, text copied from a PDF file displayed in a browser may paste with new-line characters stripped from it, leaving a long string of characters that is hard to read, while text copied from the same PDF file displayed in a PDF reader may include the new-line characters when pasted. It may be easier to work with text copied from one app over another, so you may want to experiment to find the app that works best for your recap sheets. But the extraction process is designed to work just about any way the pasted text may appear here.

Bowling League Tuneup needs information about how to extract the bowler scores out of all this text. That information is typed into the Extract Format Definitions frame below the box. The information typed into this frame will be saved when the league is saved, so once the definitions produce good results, you should be able to import this league's data each subsequent week of the season without having to deal with the definitions again.

The basic idea behind extraction is that the pasted text will be searched for consecutive sequences of numbers that identify bowlers' data. Within that set of numbers are the bowler's scores, which are extracted, using the given extract format definitions, into the right-hand box when the Extract button is clicked.

Let's start setting those definitions by determining how many consecutive numbers constitute one bowler's entry. From the recap sheet and the pasted text, we see that most bowlers' entries contain 13 consecutive numbers, which correspond to the 13 columns of values on the recap sheet. But we also see that some bowlers (like the vacancy bowler on team 4) are missing values in columns 7 and 8, while other bowlers (like the third bowler on team 13) are missing values in columns 9, 10, and 11. Every bowler seems to have at least eight consecutive numbers. We can see that some of

these numbers are preceded by letters, like "a" and "v." We'll deal with those letters soon, but for right now we can record that a bowler has a maximum of 13 numeric fields and a minimum of 8.

We can see that the bowlers' scores are in positions 9, 10, and 11 within the sequence of numbers, but only when all 13 numbers are given. Fortunately, it appears the last two numbers are always given, meaning the bowlers' three scores can always be found in positions 5, 4, and 3 when counting from right to left. So we can record these three numbers as representing games 1, 2, and 3, respectively, while also checking that we want to scan the rows and number the fields by reading the data from right to left.

Now let's consider those letters that sometimes show up within the scores. We can see that numbers immediately preceded by the letter "a" (with no space between the "a" and the number) indicate an absence score. Similarly, numbers preceded by a "v" indicate a vacancy score. We sometimes see (though not on this recap sheet) the number in position 1 (the bowler's average) preceded by the letters "bk" to indicate it's a book average. And we see some games (though, again, none on this sheet) preceded by an "i" to indicate an incomplete game. So we can type "a" into the Absence field (this is all case-insensitive, so it doesn't matter whether you type letters as upper-case or lower-case) and "v" into the Vacancy field. And we want to type the letters "b," "k," and "i" in the Chars To Treat As Spaces field so those characters will not be interpreted as terminating a consecutive sequence of numbers. Since all of these letters *precede* the numbers, we want to make sure the Prefixes Used checkbox is checked. (The use of suffix characters which immediately follow the numbers is also supported.)

We haven't typed a prefix character in the Substitute field. That's because it appears this league does not precede substitute scores with a letter. Instead, this league's recap sheets omit a bowler's scores when a substitute bowled in his or her place (which is why the third bowler on team 13 is missing numbers in positions 9, 10, and 11), and instead show the substitute's scores in a separate section of the sheet that we haven't shown here. That recap sheet format will require us to type substitute scores in manually. Let's fill in the Substitute field with the letter "s" to allow us to indicate the scores we type in manually are substitute scores.

Finally, we need to characterize the way the data appears in the left-hand box. Sometimes, you'll get one row for each team, with each row containing the scores of all bowlers on the team. Sometimes (as in this example), each bowler appears on a separate row, possibly intermingled with non-bowler rows. If neither of those situations is true, the contents of the left-hand box will be treated as one long, continuous string of characters, with row boundaries either being used only to prevent a single bowler's data from spanning multiple rows or being ignored entirely. Whichever characterization fits the data that was pasted into the left-hand box, the corresponding checkbox should be checked in the lower-left section of the Extract Format Definitions frame.

We are now ready to click the Extract button to extract scores from the pasted text.

Bowler Score Extraction

1 - Stupid Ball! Lane 24 HDCP=288 Avg=575
 Corey Barrett 107 107 2910 27 132 360 241 684 108 101 101 309 627
 Guadalupe Wise 170 47 3575 21 257 593 307 743 161 162 150 473 608
 Alberta Rivera 125 90 2251 18 195 447 284 714 a115 a115 a115 345 615
 Ray Mann 173 44 5192 30 257 578 304 719 157 164 257 578 719

2 - Enterprise Lane 18 HDCP=264 Avg=600
 Tammy Chandler 127 88 3054 24 175 413 267 689 159 114 118 391 658
 Chad McGee 139 76 3353 24 181 503 263 749 122 154 133 409 637
 Oscar Sherman 194 24 5834 30 259 696 296 807 194 151 199 544 613
 Vernon French 140 76 2114 15 174 449 243 680 a130 a130 a130 390 618

3 - Bowling 4 Oscars Lane 20 HDCP=163 Avg=706
 Ramiro Higgins 152 64 4570 30 193 328 268 729 116 178 161 455 647
 Jeremy Sims 170 47 3584 21 232 595 282 745 137 148 189 474 609
 Joanne Barnett 179 38 5395 30 248 658 282 760 202 147 198 547 661
 Bradley Hall 205 14 6178 30 246 664 260 712 210 212 208 630 672

4 - OMG Give Me a Break Lane 26 HDCP=268 Avg=596
 Wendell Montgomery 154 62 4627 30 213 570 279 768 155 202 213 570 768
 Wesley Ferguson 142 74 4278 30 180 476 258 697 115 169 134 418 640
 VACANT 150 66 0 0 0 0 v150 v150 v150 480 648
 Wilfred Matthews 150 66 3169 21 179 485 246 691 143 179 163 485 686

5 - Where's Jim? Lane 16 HDCP=232 Avg=634
 Peggy Roberts 120 95 3620 30 160 468 258 762 109 121 120 350 632
 Stewart Lloyd 150 66 4505 30 189 500 255 702 147 177 168 492 696
 Duane Burton 158 58 4289 27 193 521 255 707 178 151 145 474 648

1-Stupid Ball
 2-Enterprise
 3-Bowling 4 Oscars
 4-Give Me A Break
 5-Where's Jim?
 6-Panther Spice
 7-Don't Give A Split
 8-Strikes Of Fire
 9-BOWLING STONES
 10-Bowl In The USA
 11-WTF
 12-Where R The Odds?
 13-No Expectations
 14-Eddie's Angels
 15-Team 15
 16-Bowl 4 Fun
 17-Team 17
 18-VACANCY

108	100	101,	161	162	150,	a	a	a,	157	164	257
159	114	118,	122	154	133,	194	151	199,	a	a	a
116	178	161,	137	148	189,	282	147	198,	210	212	288
155	282	213,	115	169	134,	v150	v150	v150,	143	179	163
109	121	128,	147	177	168,	178	151	145,	215	258	194
158	163	151,	a	a	a,	131	136	150,	123	158	131
170	148	154,	166	142	137,	235	190	176,	203	164	153
213	194	158,	126	165	136,	140	122	133,	154	221	166
288	178	185,	164	151	168,	138	137	189,	225	225	199
152	181	189,	a	a	a,	123	125	171,	183	180	150
84	121	123,	168	165	137,	153	180	168,	159	283	153
67	84	98,	133	185	152,	136	139	97,	v150	v150	v150
a	a	a,	76	91	104,				235	231	235
v150	v150	v150,	132	145	153,	146	144	178,	v150	v150	v150
143	131	152,	128	123	159,	167	192	109,	v150	v150	v150
v150	v150	v150,	151	131	111,	186	118	188,	180	170	183
118	147	211,	146	235	182,	186	198	177,	v150	v150	v150

STEP 1 - EXTRACT scores from league sheet

- Define the format of extracted league sheet data below. (Definitions will be remembered for the league.)
- Copy (Ctrl+C) the bowlers' weekly results section from an online league sheet and then paste (Ctrl+V) into the box above, examining results, editing, and/or repeating as desired to conform to the format definitions.
- Click Extract to extract bowler scores to the box at the right, repeating as desired until results are acceptable.

Extract Format Definitions (Save changes)

Numeric fields per bowler	Maximum: 13	Minimum: 8	Score field numbers	Game 1: 5	Game 2: 4	Game 3: 3	Game 4: 4
<input checked="" type="checkbox"/> Prefixes used	Prefix chars: a s v		Absence Substitute Vacancy				
<input type="checkbox"/> Suffixes used			Chars to treat as spaces: bki				
<input type="checkbox"/> Each row contains exactly one team		<input checked="" type="checkbox"/> Each row contains at most one bowler		<input type="checkbox"/> Scan rows and number fields left-to-right		<input checked="" type="checkbox"/> Scan rows and number fields right-to-left	
<input type="checkbox"/> Bowlers do not span multiple rows							
<input type="checkbox"/> Row boundaries should be ignored							

Extract -->

STEP 2 - POPULATE the import form

- Examine extracted text above and go back to Step 1 if necessary to correct problems. Or skip Step 1 and type scores here directly, one team per row, as described in item 3 below.
- If the rows above are not in the team order at the left, click on a team name or press F4, then use arrow keys or the pop-up form to reorder the teams to match the rows of scores.
- Edit extracted text as necessary to correct any problems found. Assume there is one team per row, matched to the team names at the left, that commas separate the bowlers on a team, and that spaces or prefix characters separate each bowler's scores. (Prefixes are always used here, not suffixes, and are the same characters as those defined in Step 1.)
- Click Populate to populate the Import form with the above scores for final inspection and editing of this new week of league scores. (You will be able to enter substitutes' averages on the Import form.)

Populate Cancel

These results look great. The right-hand box should contain bowler scores corresponding to the team names on the left, with scores separated by blanks and bowlers separated by commas. Scores with prefix or suffix characters in the left-hand box should show up with those same characters as prefixes in the right-hand box. This is all exactly what we're seeing here, meaning we did a good job setting the extract format definitions. If there are any problems with the extraction, we can tweak the definitions and keep repeating the extraction until results look good.

You may notice that absence scores in the left-hand box appear in the right-hand box with only the absence character, i.e., without the accompanying score given in the left-hand box. This will always be the case since Bowling League Tuneup automatically determines the average upon which each absence score should be based. Both absence scores and vacancy scores may be given with or without an accompanying score in the left-hand box. If no score accompanies a vacancy character in the left-hand box, the league's default vacancy score will be used. If a vacancy score is given that is different from the league's default vacancy score, the given score will be used and the average upon which it is based will be set based on the league's default vacancy values. For example, if the league has a default vacancy score of 150 with the vacancy handicap being based on a 150 average, then a vacancy score of 130 will have a handicap based on a 130 average.

One potential problem can occur if a league recap sheet shows vacancy scores for vacancy bowlers rather than just leaving those positions empty. If these vacancy scores are imported, the bowlers will be changed from being vacancy bowlers to being real bowlers with computed averages (albeit computed from just vacancy scores), and vacancy teams will no longer be shown or treated as vacancy teams. In this example, if team 18 had been listed on the recap sheet with vacancy scores for its four bowlers, you would want to either exclude those scores from the left-hand box or simply erase them from the right-hand box after the extraction is done. A bowler position is not considered to be a vacancy bowler in Bowling League Tuneup unless the Vacancy Score box is checked in the Use Supplied Bowler Data frame.

Sometimes it may be difficult or impossible to get a perfect extraction, but you can always edit the contents of either the left-hand box or the right-hand box to get the desired results. The extreme example of this is to skip the extraction process entirely and just type bowler scores manually into the right-hand box. Of course if you're going to do this, it'll probably be easier to use the Enter Scores window instead of the Import Scores window.

There is one change we'll have to make to this extraction. Bowler 3 on team 13 has no scores listed in the three games columns on the recap sheet because a substitute bowler bowled in his place in week 10. Since this bowler's entry on the recap sheet still had more than the minimum of eight consecutive numeric fields, Bowling League Tuneup recognized it as a bowler entry, albeit one with invalid score values when extracted according to the rules given. So the extraction left a blank space in this bowler's place – which is what we wanted to happen. But we still have to include the substitute bowler scores here.

We have three ways to supply the substitute scores. We could type them into the proper place in the left-hand box, preceding each score with the substitute code of "s," then click the Extract button again to repopulate the right-hand box. Or we could type them directly into the blank space in the right-hand box following an extraction, again preceding each score with "s" (mimicking the results we'd get from a successful extraction that included the substitute's scores). Or we could wait until we click Populate (the next step of the process) to bring up the Bowler Score Import window, which also allows manual data entry. Choosing the second option, the extraction window looks like this.

Bowler Score Extraction

1 - Stupid Ball Lane 24 HDCP=288 Avg=575
 Corey Barrett 107 107 2910 27 132 960 241 684 108 100 101 309 627
 Guadelupe Wise 170 47 3575 21 257 593 307 745 161 162 150 473 608
 Alberta Rivera 125 90 2251 18 195 447 284 714 115 a115 s115 345 615
 Ray Mann 173 44 5192 30 257 578 304 719 157 164 257 578 719
 2 - Enterprise Lane 18 HDCP=264 Avg=600
 Tammy Chandler 127 88 3054 24 175 413 267 689 159 114 118 391 658
 Chad McGee 139 76 3353 24 181 503 263 749 122 154 133 409 637
 Oscar Sherman 194 24 5834 30 259 696 296 807 194 151 199 544 613
 Vernon French 140 76 2114 15 174 449 243 680 a130 a130 a130 390 618
 3 - Bowling 4 Oscars Lane 20 HDCP=163 Avg=706
 Ramiro Higgins 152 64 4570 30 193 528 268 729 116 178 161 455 647
 Jeremy Sims 170 47 3584 21 232 595 282 745 137 148 189 474 609
 Joanne Barnett 179 38 5395 30 248 658 282 760 202 147 198 547 661
 Bradley Hall 205 14 6178 30 246 664 260 712 210 212 208 630 672
 4 - OMG Give Me a Break Lane 26 HDCP=268 Avg=596
 Wendell Montgomery 154 62 4627 30 213 570 279 768 155 202 213 570 768
 Wesley Ferguson 142 74 4278 30 180 476 259 697 115 169 134 418 640
 VACANT 150 66 0 0 0 v140 v130 450 648
 Wilfred Matthews 150 66 3169 21 179 485 246 691 143 179 163 485 686
 5 - Where's Jim? Lane 16 HDCP=232 Avg=634
 Peggy Roberts 120 95 3620 30 160 468 258 762 109 121 120 350 632
 Stewart Lloyd 150 66 4505 30 189 500 255 702 147 177 168 492 696
 Duane Burton 158 58 4289 27 193 521 255 707 178 151 145 474 648

1-Stupid Ball
 2-Enterprise
 3-Bowling 4 Oscars
 4-Give Me A Break
 5-Where's Jim?
 6-Panther Spice
 7-Don't Give A Split
 8-Strikes Of Fire
 9-BOWLING STONES
 10-Bowl In The USA
 11-WTF
 12-What R The Odds?
 13-No Expectations
 14-Eddie's Angels
 15-Team 15
 16-Bowl 4 Fun
 17-Team 17
 18-VACANCY

108 100 101, 161 162 150, a a a, 157 164 257
 159 114 118, 122 154 133, 194 151 199, a a a
 116 178 161, 137 148 109, 282 147 198, 218 212 288
 155 282 213, 115 169 134, v v140 v138, 143 179 163
 189 121 128, 147 177 168, 178 151 145, 215 258 194
 158 163 151, a a a, 131 136 150, 123 158 131
 170 148 154, 166 142 137, 235 190 176, 283 164 153
 213 194 158, 126 165 136, 140 122 133, 154 221 166
 288 178 185, 164 151 168, 138 137 189, 225 225 199
 152 181 189, a a a, 123 125 171, 183 188 158
 84 121 123, 168 165 137, 153 180 168, 159 283 153
 67 84 98, 133 185 152, 136 139 97, v150 v150 v150
 a a a, 76 91 184, s88 s184 s183, 235 231 235
 v150 v150 v150, 132 145 153, 146 144 178, v150 v150 v150
 143 131 152, 128 123 159, 167 192 189, v150 v150 v150
 v150 v150 v150, 151 131 111, 186 118 188, 180 170 183
 118 147 211, 146 235 182, 186 198 177, v150 v150 v150

STEP 1 - EXTRACT scores from league sheet

1. Define the format of extracted league sheet data below. (Definitions will be remembered for this league.)
2. Copy (Ctrl+C) the bowlers' weekly results section from an online league sheet and then paste (Ctrl+V) into the box above, examining results, editing, and/or repeating as desired to conform to the format definitions.
3. Click Extract to extract bowler scores to the box at the right, repeating as desired until results are acceptable.

Extract Format Definitions (Save changes)

Numeric fields per bowler: Maximum: 13, Minimum: 8
 Score field numbers: Game 1: 5, Game 2: 4, Game 3: 3, Game 4: 2
 Prefixes used, Suffixes used
 Prefix chars: a, s, v (Absence Substitute Vacancy)
 Chars to treat as spaces: bki
 Each row contains exactly one team
 Each row contains at most one bowler
 Bowlers do not span multiple rows
 Row boundaries should be ignored
 Scan rows and number fields left-to-right
 Scan rows and number fields right-to-left

STEP 2 - POPULATE the import form

1. Examine extracted text above and go back to Step 1 if necessary to correct problems. Or skip Step 1 and type scores here directly, one team per row, as described in item 3 below.
2. If the rows above are not in the team order at the left, click on a team name or press F4, then use arrow keys or the pop-up form to reorder the teams to match the rows of scores.
3. Edit extracted text as necessary to correct any problems found. Assume there is one team per row, matched to the team names at the left, that commas separate the bowlers on a team, and that spaces or prefix characters separate each bowler's scores. (Prefixes are always used here, not suffixes, and are the same characters as those defined in Step 1.)
4. Click Populate to populate the Import form with the above scores for final inspection and editing of this new week of league scores. (You will be able to enter substitutes' averages on the Import form.)

Populate Cancel

We are lucky that this league's recap sheet shows bowler scores in team order. This is not always the case. For instance, some recap sheets include bowler scores in the same order that shows last week's results, meaning that the teams are ordered according to last week's team pairings. This problem can be handled by clicking on a team name (or pressing F4) in the Bowler Score Extraction window to bring up the Reorder Mode window.

Bowler Score Extraction

1 - Stupid Ball! Lane 24 HDCP=288 Avg=575
 Corey Barrett 107 107 2910 27 132 360 241 684 108 100 101 309 627
 Guadalupe Wise 170 47 3575 21 257 593 307 743 161 162 150 473 608
 Alberta Rivera 125 90 2251 18 195 *47 284 714 a115 a115 a115 345 615
 Ray Mann 173 44 5192 30 257 578 304 719 157 164 257 578 719

2 - Enterprise Lane 18 HDCP=264 Avg=600
 Tammy Chandler 127 88 3054 24 175 413 267 689 159 114 118 391 658
 Chad McGee 139 76 3353 24 181 503 263 749 122 154 133 409 637
 Oscar Sherman 194 24 5834 30 259 696 296 807 194 151 199 544 613
 Vernon French 140 76 2114 15 174 449 243 680 a130 a130 a130 390 618

3 - Bowling 4 Oscars Lane 20 HDCP=163 Avg=706
 Ramiro Higgins 152 64 4570 30 193 528 268 729 116 178 161 455 647
 Jeremy Sims 170 47 3584 21 232 595 282 745 137 148 189 474 609
 Joanne Barnett 179 38 5395 30 248 658 282 760 202 147 198 547 661
 Bradley Hall 205 14 6178 30 246 664 260 712 210 212 208 630 672

4 - OMG Give Me a Break Lane 26 HDCP=268 Avg=596
 Wendell Montgomery 154 62 4627 30 213 570 279 768 155 202 213 570 768
 Wesley Ferguson 142 74 4278 30 180 476 258 697 115 169 134 418 640
 VACANT 150 66 0 0 0 v v140 v130 450 648
 Wilfred Matthews 150 66 3169 21 179 485 246 691 143 179 163 485 686

5 - Where's Jim? Lane 16 HDCP=232 Avg=634
 Peggy Roberts 120 95 3620 30 160 468 258 762 109 121 120 350 632
 Stewart Lloyd 150 66 4505 30 189 500 255 702 147 177 168 492 696
 Duane Burton 158 58 4289 27 193 521 255 707 178 151 145 474 648

1-Stupid Ball! 108 100 101, 161 162 150, a a a, 157 164 257
 2-Enterprise 159 114 118, 122 154 133, 194 151 199, a a a
 3-Bowling 4 Oscars 116 178 161, 137 148 189, 202 147 198, 210 212 288
 4-Give Me A Break 155 282 213, 115 169 134, v v140 v130, 143 179 163
 5-Where's Jim? 189 121 128, 147 177 168, 170 151 145, 215 258 194
 6-Parther Spice 158 163 151, a a a, 131 136 150, 123 158 131
 7-Don't Give A Split 170 148 154, 166 142 137, 235 190 176, 203 164 153
 8-Strikes Of Fire 213 194 158, 126 165 136, 140 122 133, 154 221 166
 9-BOWLING STONES 288 178 185, 164 151 168, 138 137 189, 225 225 199
 10-Bowl In The USA 152 181 189, a a a, 123 125 171, 183 180 150
 11-WTF 84 121 123, 160 165 137, 153 180 168, 159 203 153
 12-What R The Odds? 67 84 98, 133 105 152, 136 139 97, v150 v150 v150
 13-No Expectations a a a, 76 91 104, 588 s104 s103, 235 231 235
 14-Eddie's Angels v150 v150 v150, 132 145 153, 146 144 178, v150 v150 v150
 15-Team 15 143 131 152, 128 123 159, 167 192 109, v150 v150 v150
 16-Bowl 4 Fun v150 v150 v150, 151 131 111, 106 118 108, 180 170 183
 17-Team 17 118 147 211, 146 235 182, 186 198 177, v150 v150 v150
 18-VACANCY

STEP 1 - EXTRACT scores from league sheet

- Define the format of extracted league sheet data below. (Definitions will be remembered for this league.)
- Copy (Ctrl+C) the bowlers' weekly results section from an online league sheet and then paste (Ctrl+V) into the box above, examining results, editing, and/or repeating as desired to conform to the format definitions.
- Click Extract to extract bowler scores to the box at the right, repeating as desired until results are acceptable.

Extract Format Definitions (Save changes)

Numeric fields per bowler: Maximum 13, Minimum 8
 Score field numbers: Game 1 5, Game 2 4, Game 3 3, Game 4 4
 Prefixes used, Prefix chars: a, s, v
 Suffixes used, Absence Substitute Vacancy
 Each row contains exactly one team
 Each row contains at most one bowler
 Bowlers do not span multiple rows
 Row boundaries should be ignored
 Scan rows and number fields left-to-right
 Scan rows and number fields right-to-left

Reorder Mode

Move Up, Move Down, Prev, Next, Cancel

STEP 2 - POPULATE the import form

- Examine extracted text above and go back to Step 1 if necessary to correct problems. Or skip Step 1 and type scores here directly, one team per row, as described in item 3 below.
- If the rows above are not in the team order at the left, click on a team name or press F4, then use arrow keys or the pop-up form to reorder the teams to match the rows of scores.
- Edit extracted text as necessary to correct any problems found. Assume there is one team per row, matched to the team names at the left, that commas separate the bowlers on a team, and that spaces or prefix characters separate each bowler's scores. (Prefixes are always used here, not suffixes, and are the same characters as those defined in Step 1.)
- Click Populate to populate the import form with the above scores for final inspection and editing of this new week of league scores. (You will be able to enter substitutes' averages on the Import form.)

Populate, Cancel

Using either the Reorder Mode buttons or the four keyboard arrow keys (usually the faster option), you can rearrange the team list to match the order in which the teams appear in the right-hand box. Move Up and Move Down (or the Up and Down arrow keys) move the highlighted team up and down in the team list. Prev and Next (or the Left and Right arrow keys) change the highlighted team. Once the team list corresponds to the rows of scores to the right, you can click Cancel (or press Escape) to exit reorder mode.

Extraction is probably one of those activities that is easier to learn by trial-and-error than by reading detailed instructions that make it seem more complicated than it is. Nevertheless, we'll give some of those details here in case there are extraction results you're having trouble understanding.

- When the recap sheet contains only a large array of numbers, with no embedded text to separate one bowler's entry from another, the extraction engine uses the value given as the maximum number of numeric fields per bowler to determine when it has reached the end of one bowler's entry and the beginning of the next bowler's entry.
- In many cases (particularly if data is copied-and-pasted from a spreadsheet), pasted values may be separated by tabs instead of spaces. The extraction process treats spaces and tabs the same. Tabs can be entered manually by typing Ctrl+Tab.
- When scanning right-to-left, rows of text in the left-hand box are read from the end, one row at a time, starting with the first row. But if either of the last two options (Bowlers Do Not Span Multiple Rows or Row Boundaries Should Be Ignored) is selected, the text in the left-hand box is treated as a single row containing one long sequence of characters. That means text is read from right-to-left starting with the last character in the box and working backwards. The first bowler found is presumed to be the last bowler on the last team, the next bowler found is presumed to be the next-to-last bowler on the last team, and so on.

- The boxes have a limit of a little over 1000 characters per line before they wrap the text over to the next line. When this happens, the extraction engine still treats this as a single row of text since there is no new-line character separating the two lines.
- If you make a mistake when typing into either box, an Undo option is available. You can right-click in the box and select Undo, or you can press Ctrl+Z. This is a very limited option, however, as only the last change made can be undone.
- All changes made to extract format definitions will be remembered, even if you cancel out of the Bowler Score Extraction screen without using those changes, as long as the Save Changes checkbox is checked. If you want to try different definitions without affecting the values saved for the league, you can uncheck the checkbox.

The last step of the import process is to populate the Bowler Score Import window with the extracted scores in the right-hand box by clicking the Populate button. Shown below are two views of this window after we click Populate, one scrolled up to the top of the grid, the other scrolled down to the bottom.

Bowler Score Import

Team / Bowler	1	2	3	4
1-Stupid Ball / Corey Barrett	108	100	101	
1-Stupid Ball / Guadalupe Wise	161	162	150	
1-Stupid Ball / Alberta Rivera	Abs (-10)	Abs (-10)	Abs (-10)	
1-Stupid Ball / Ray Mann	157	164	257	
2-Enterprise / Tammy Chandler	159	114	118	
2-Enterprise / Chad McGee	122	154	133	
2-Enterprise / Oscar Sherman	194	151	199	
2-Enterprise / Vernon French	Abs (-10)	Abs (-10)	Abs (-10)	
3-Bowling 4 Oscars / Ramiro Higgins	116	178	161	
3-Bowling 4 Oscars / Jeremy Sims	137	148	189	
3-Bowling 4 Oscars / Joanne Barnett	202	147	198	
3-Bowling 4 Oscars / Bradley Hall	210	212	208	
4-Give Me A Break / Wendell Montgomery	155	202	213	
4-Give Me A Break / Wesley Ferguson	115	169	134	
4-Give Me A Break / Team 4 Bowler 3	150 (150)	150 (150)	150 (150)	
4-Give Me A Break / Wilfred Matthews	143	179	163	
5-Where's Jim? / Peggy Roberts	109	121	120	
5-Where's Jim? / Stewart Lloyd	147	177	168	
5-Where's Jim? / Duane Burton	178	151	145	
5-Where's Jim? / Dave Fitzgerald	215	258	194	
6-Panther Spice / Kelli Harris	158	163	151	
6-Panther Spice / Bennie Davis	Abs (-10)	Abs (-10)	Abs (-10)	
6-Panther Spice / Ricardo Lopez	131	136	150	
6-Panther Spice / Perry Jefferson	123	158	131	
7-Don't Give A Split / Anne Jordan	170	148	154	

STEP 3 - IMPORT scores into Bowling League Tuneup

1. Examine scores above that were populated from the previous screen and make any required changes.
2. Edit substitute scores (shown in blue) to assure handicaps are correctly based on the substitute's average.
3. Click OK to post all scores above as a new week of league scores.

OK Cancel

Bowler Score Import

Team / Bowler	1	2	3	4
12-What R The Odds? / Team 12 Bowler 4	150 (150)	150 (150)	150 (150)	
13-No Expectations / Francis Rivera	Abs (-10)	Abs (-10)	Abs (-10)	
13-No Expectations / Hannah Wolfe	76	91	104	
13-No Expectations / Alfred Mullins	98	104	103	
13-No Expectations / Don Duncan	235	231	235	
14-Eddie's Angels / Tracy Ford	131	102	117	
14-Eddie's Angels / Floyd Ortega	132	145	153	
14-Eddie's Angels / Josh Wise	146	144	178	
14-Eddie's Angels / Team 14 Bowler 4	150 (150)	150 (150)	150 (150)	
15-Team 15 / Bruce Padilla	143	131	152	
15-Team 15 / Freddie Patton	128	123	159	
15-Team 15 / Betty Jennings	167	192	109	
15-Team 15 / Team 15 Bowler 4	150 (150)	150 (150)	150 (150)	
16-Bowl 4 Fun / Team 16 Bowler 1	150 (150)	150 (150)	150 (150)	
16-Bowl 4 Fun / Clark Ball	151	131	111	
16-Bowl 4 Fun / Wilson Buchanan	106	118	108	
16-Bowl 4 Fun / Rita McLaughlin	180	170	183	
17-Team 17 / Tanya Daniel	118	147	211	
17-Team 17 / Harry Frank	146	235	182	
17-Team 17 / Chelsea Harrington	186	198	177	
17-Team 17 / Team 17 Bowler 4	150 (150)	150 (150)	150 (150)	
18-VACANCY / Team 18 Bowler 1				
18-VACANCY / Team 18 Bowler 2				
18-VACANCY / Team 18 Bowler 3				
18-VACANCY / Team 18 Bowler 4				

STEP 3 - IMPORT scores into Bowling League Tuneup

1. Examine scores above that were populated from the previous screen and make any required changes.
2. Edit substitute scores (shown in blue) to assure handicaps are correctly based on the substitute's average.
3. Click OK to post all scores above as a new week of league scores.

OK Cancel

This window is almost identical to the Bowler Score Entry window we saw earlier. The only difference here is that we skipped most of the typing we previously had to do to get all these scores here. Ideally, once the extract format definitions have been set for the league, getting all of a week's scores into this window will just be a matter of opening the recap sheet, highlighting and copying the bowler scores section, pasting the copied text into the Bowler Score Extraction window, clicking Extract, and clicking Populate. Even when some typing has to be done (the extract format definitions can't possibly handle all situations), importing will almost always be quicker than keying in all the scores by hand.

Editing in the Bowler Score Import window works exactly as it did on the Bowler Score Entry window. That is why we could have waited until now to type in the substitute's scores. But even

though we typed substitute scores in the Bowler Score Extraction window, we still have to edit those entries here because we had no way to indicate the substitute bowlers' averages there.

As we see with the third bowler on team 13, the Bowler Score Import window displays substitute scores in blue as a reminder that those entries need to be edited in order to set them as substitute scores and include the substitutes' averages in the Score Entry Mode window. If any blue scores remain when OK is clicked, a message will warn that editing still needs to be done. If blue scores are not edited, they will be entered as actual (not substitute) bowler scores.

Once you've verified the imported scores are correct, clicking OK (or pressing Enter) will post them as a new week of scores for each bowler. You will return to the main screen and a pop-up message will indicate how many bowlers had their scoring records updated.

Changing a league's roster of teams

Over the course of a bowling season, it is inevitable that bowlers and maybe even entire teams will come and go. Bowling League Tuneup can easily deal with these changes.

Since there must be an even number of teams in a league, the removal of a single team is done by turning the team into a vacancy team if there isn't a second team that can also be removed. To remove a team this way, simply edit the bowlers on the team to be removed, clicking the Vacancy Score checkbox for each bowler. When all bowlers on a team are designated as vacancy bowlers, the team itself becomes a vacancy team that is not included in league analyses. This method of removing a team keeps the recorded scores and bowler performance sheets of the team's bowlers, so this technique can also be used whenever it's important to preserve the historical record.

To remove or add an even number of teams, click the Define League button on the main screen.

Define League

League Settings

Number of teams: 18

Bowlers per team: 4

Default vacancy score: 150 with handicap based on a 150 average

Default absence score: 10 pins under average

Fill in league attributes with stored default values

New Bowler Template

Average: 150

Vacancy score

Trend: [Empty]

Volatility: Low Normal High

Mass Change Options

Change all bowlers with scores to computed data

Change all bowlers to supplied data

Set supplied averages to book averages if given

Apply new bowler trend to supplied data

Apply new bowler volatility to supplied data

OK Cancel

Bowling League Tuneup - Kings & Queens.xlsx

Bowling League Tuneup

Kings & Queens

Bowler Averages Place Of Finish Probabilities

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1-Stupid Ball	106 (-1)•	164 (+2)•	126 (-7)•	173 (+0)•	569 (-6)																		
2-Enterprise	124 (+1)•	137 (-1)•	194 (+4)•	141 (-2)•	596 (+2)																		
3-Bowling 4 Oscars	152 (+9)•	169 (+1)•	179 (-3)•	205 (+1)•	705 (+8)																		
4-Give Me A Break	154 (+4)•	142 (+0)•	150 (+0)•	147 (+1)•	593 (+5)																		
5-Where's Jim?	120 (+1)•	150 (+2)•	157 (-1)•	200 (-4)•	627 (-2)																		
7-Don't Give A Split	165 (-2)•	139 (+6)•	199 (+3)•	186 (+2)•	689 (+9)																		
8-Strikes Of Fire	170 (-4)•	133 (+7)•	151 (+0)•	169 (+3)•	623 (+6)																		
9-BOWLING STONES	186 (+5)•	165 (+2)•	157 (+0)•	190 (-2)•	698 (+5)																		
10-Bowl In The USA	166 (+0)•	150 (-1)•	138 (+0)•	195 (-8)•	649 (-9)																		
11-WTF	119 (-3)•	136 (-1)•	148 (+3)•	163 (+2)•	566 (+1)																		
12-What R The Odds?	129 (-5)•	116 (+0)•	124 (-4)•	155 (+2)•	524 (-7)																		
13-No Expectations	86 (-1)•	101 (+1)•	91 (+2)•	166 (+7)•	444 (+9)																		
14-Eddie's Angels	129 (+0)•	139 (+2)•	140 (+0)•	150 (+0)•	538 (+2)																		
15-Team 15	127 (+2)•	136 (+3)•	169 (+3)•	155 (+4)•	587 (+12)																		
16-Bowl 4 Fun	165 (-1)•	124 (-2)•	120 (+0)•	185 (-4)•	594 (-7)																		
17-Team 17	153 (-1)•	152 (+7)•	192 (+4)•	180 (+0)•	677 (+10)																		
18-VACANCY																							
6-Panther Spice	181 (+8)•	141 (-3)•	105 (+2)•	137 (+0)•	564 (+7)																		

League Management

Load League Define League Save League

Enter Scores Import Scores View League

Week

3 Games bowled per week

1 Points earned per game win

1 Points earned per weekly win

Season

12 Total weeks

1 Position weeks

Split season

Handicap

90 % of 220

Hdcp Hdcp+score Caps

Neg handicaps

Vacancy Teams

Bowl against vacancy scores

Always beat vacancy team

Win if not below 50 pins under team average

Win if not below percent of team average

Computations

Use trend values

Use volatility ratings

Use book average for 2 weeks in handicap computations (leave blank to use all season)

Analysis

5

<-- Low Rigor High -->

Analyze League

All that's left to do is to click Define League and reset the number of teams from 18 to 16.

Define League

League Settings

Number of teams: 16 Bowlers per team: 4

Default vacancy score: 150 with handicap based on a 150 average

Default absence score: 10 pins under average

Fill in league attributes with stored default values

New Bowler Template

Average: 150 Vacancy score

Trend: []

Volatility: Low Normal High

Mass Change Options

Change all bowlers with scores to computed data

Change all bowlers to supplied data

Set supplied averages to book averages if given

Apply new bowler trend to supplied data

Apply new bowler volatility to supplied data

OK Cancel

When you click OK (or press Enter), the last two teams (team 6 and the vacancy team) are removed from the league, leaving 16 teams.

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1-Stupid Ball	106 (-1)•	164 (+2)•	126 (-7)•	173 (+0)•	569 (-6)																	
2-Enterprise	124 (+1)•	137 (-1)•	194 (+4)•	141 (-2)•	596 (+2)																	
3-Bowling 4 Oscars	152 (+9)•	169 (+1)•	179 (-3)•	205 (+1)•	705 (+8)																	
4-Give Me A Break	154 (+4)•	142 (+0)•	150 (+0)•	147 (+1)•	593 (+5)																	
5-Where's Jim?	120 (+1)•	150 (+2)•	157 (-1)•	200 (-4)•	627 (-2)																	
7-Don't Give A Split	165 (-2)•	139 (+6)•	199 (+3)•	186 (+2)•	689 (+9)																	
8-Strikes Of Fire	170 (-4)•	133 (+7)•	151 (+0)•	169 (+3)•	623 (+6)																	
9-BOWLING STONES	186 (+5)•	165 (+2)•	157 (+0)•	190 (-2)•	698 (+5)																	
10-Bowl In The USA	166 (+0)•	150 (-1)•	138 (+0)•	195 (-8)•	649 (-9)																	
11-WTF	119 (-3)•	136 (-1)•	148 (+3)•	163 (+2)•	566 (+1)																	
12-What R The Odds?	129 (-5)•	116 (+0)•	124 (-4)•	155 (+2)•	524 (-7)																	
13-No Expectations	86 (-1)•	101 (+1)•	91 (+2)•	166 (+7)•	444 (+9)																	
14-Eddie's Angels	129 (+0)•	139 (+2)•	140 (+0)•	150 (+0)•	538 (+2)																	
15-Team 15	127 (+2)•	136 (+3)•	169 (+3)•	155 (+4)•	587 (+12)																	
16-Bowl 4 Fun	165 (-1)•	124 (-2)•	120 (+0)•	185 (-4)•	594 (-7)																	
17-Team 17	153 (-1)•	152 (+7)•	192 (+4)•	180 (+0)•	677 (+10)																	

This method of removing a team removes the definitions and scoring records of the bowlers on the team as well. If you want to keep the bowlers' scoring records, the team should be turned into a vacancy team, as previously described.

If teams are numbered, you may want to reassign team numbers after a team is deleted. To do this, just click on a team name (or press F4) to bring up the Team Entry Mode window, which will allow you to rename the teams.

It is common for leagues to change their roster of teams during the first week or two of the season. Teams often get created or removed as league officers try to assemble a lineup of full teams. Leagues may also be forced to change the roster of teams when, for example, the first week of bowling causes some teams to exceed the league's maximum entering team average. These kinds of changes pose no problem for Bowling League Tuneup.

Dealing with team roster changes made later in the season, however, can create a bit of a conundrum when using Bowling League Tuneup. League analyses assume the defined team lineup is in place for the entire season, so when a team drops out in midseason, that can adversely affect the accuracy of league analyses. Analyses performed after a team is removed from Bowling League Tuneup (regardless of the removal method) will not be able to take into account the effects that team had on league results before it left the league. If, on the other hand, a team that drops out is left in place (obviously without entering new scores for any of the team's bowlers), analyses for the rest of the season will incorrectly reflect the influence of a team that's no longer there.

The later in the season that a team drops out of the league, the more you may want to consider leaving the team in place in Bowling League Tuneup for the remainder of the season. Whether to delete a team or leave it in place after it leaves in midseason is a judgment call. Fortunately, it's rarely a call that will make a significant difference in analysis results.

Changing team lineups

While the set of teams in a league generally remains stable over the course of a season, it's quite common for bowlers to drop out or join the league throughout the season. Bowling League Tuneup handles these situations effortlessly.

If a bowler leaves and is not replaced, you should continue entering the scores assigned to the missing bowler (either absence or vacancy scores) each week rather than converting him or her to a vacancy bowler. This will assure that all the games bowled in this bowler position will be properly considered in league analyses.

If a bowler is permanently replaced by another bowler, it's important to preserve the original bowler's results for the same reason. The Edit Bowler window makes it easy to do this. Here is the bowling record for Josh Bowler.

Josh Bowler

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

Use Computed Bowler Data

Book average (used for 2 weeks):

Week	1	2	3	4
1	130 (130)	130 (130)	130 (130)	
2	181	136	101	
3	Abs (-10)	Abs (-10)	Abs (-10)	
4	128	153	150	
5	129	124	118	
6	146	112	193	
7	141	179	135	
8				
9				
10				

Clear All Scores Clear Red Scores Convert to Substitute

OK Cancel

Josh didn't start the league until week 2 (so week 1 uses the league's vacancy score), he missed week 3, and he had to drop out of the league after week 7. Including the vacancy and absence scores from his two missed weeks, Josh contributed a 136 average, a trend of +3, and normal volatility to his team.

Josh's team replaced him with Joe Ringer, an experienced house bowler. In Bowling League Tuneup, clicking the Convert To Substitute button turns Josh Bowler's stint on the team into a set of weeks in which he effectively served as a substitute bowler for Joe Ringer.

Josh Bowler

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

Use Computed Bowler Data

Book average (used for 2 weeks)

Week	1	2	3	4
1	130 (130)	130 (130)	130 (130)	
2	181 (128)	136 (128)	101 (128)	
3	118 (128)	118 (128)	118 (128)	
4	128 (128)	153 (128)	150 (128)	
5	129 (141)	124 (141)	118 (141)	
6	146 (135)	112 (135)	193 (135)	
7	141 (139)	179 (139)	135 (139)	
8				
9				
10				

Clear All Scores Clear Red Scores Convert to Substitute

OK Cancel

We can see that Josh Bowler’s historical record has been changed to a series of substitute bowler scores which preserve the average, trend, and volatility that were achieved during those seven weeks. Now we can change Josh’s name and book average to the new bowler’s name and book average. Here is the Edit Bowler window for Joe Ringer after his first two weeks on the team.

Joe Ringer

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

Use Computed Bowler Data

Book average (used for 2 weeks)

Week	1	2	3	4
1	130 (130)	130 (130)	130 (130)	
2	181 (128)	136 (128)	101 (128)	
3	118 (128)	118 (128)	118 (128)	
4	128 (128)	153 (128)	150 (128)	
5	129 (141)	124 (141)	118 (141)	
6	146 (135)	112 (135)	193 (135)	
7	141 (139)	179 (139)	135 (139)	
8	240	208	191	
9	204	219	242	
10				

Clear All Scores Clear Red Scores Convert to Substitute

OK Cancel

The Reorder Bowlers fields let you enter the new order for the bowlers on the selected team. Here, let's say team 2 wants to move bowler 4 to position 1 on the team, moving bowlers 1, 2, and 3 to positions 2, 3, and 4, respectively. This is done by typing the new order as 4, 1, 2, 3.

Bowling League Tuneup - Kings & Queens

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1-Stupid Ball	106 (-1)•	164 (+2)•	126 (-7)•	173 (+0)•	569 (-6)																		
2-Enterprise	124 (+1)•	137 (-1)•	194 (+4)•	141 (-2)•	596 (+2)																		
3-Bowling 4 Oscars	152 (+9)•	169 (+1)•	179 (-3)•	205 (+1)•	705 (+8)																		
4-Give Me A Break	154 (+4)•	142 (+0)•	150 (+0)•	147 (+1)•	593 (+5)																		
5-Where's Jim?	120 (+1)•	150 (+2)•	157 (-1)•	200 (-4)•	627 (-2)																		
6-Panther Spice	181 (+8)•	141 (-3)•	105 (+2)•	137 (+0)•	564 (+7)																		
7-Don't Give A Split	165 (-2)•	139 (+6)•	199 (+3)•	186 (+2)•	689 (+9)																		
8-Strikes Of Fire	170 (-4)•	133 (+7)•	151 (+0)•	169 (+3)•	623 (+6)																		
9-BOWLING STONES	186 (+5)•	165 (+2)•	157 (+0)•	190 (-2)•	698 (+5)																		
10-Bowl In The USA	166 (+0)•	150 (-1)•	138 (+0)•	195 (-8)•	649 (-9)																		
11-WTF	119 (-3)•	136 (-1)•	148 (+3)•	163 (+2)•	566 (+1)																		
12-What R The Odds?	129 (-5)•	116 (+0)•	124 (-4)•	155 (+2)•	524 (-7)																		
13-No Expectations	86 (-1)•	101 (+1)•	91 (+2)•	166 (+7)•	444 (+9)																		
14-Eddie's Angels	129 (+0)•	139 (+2)•	140 (+0)•	150 (+0)•	558 (+2)																		
15-Team 15	127 (+2)•	136 (+3)•	169 (+3)•	155 (+4)•	587 (+12)																		
16-Bowl 4 Fun	165 (-1)•	124 (-2)•	120 (+0)•	185 (-4)•	594 (-7)																		
17-Team 17	153 (-1)•	152 (+7)•	192 (+4)•	180 (+0)•	677 (+10)																		
18-VACANCY																							

Team Entry Mode

Team name: 2-Enterprise
 Reorder bowlers: 4 1 2 3

Week: 3 Games bowled per week
 Season: 12 Total weeks
 Handicap: 90 % of 220
 Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average
 Computations: Use trend values, Use volatility ratings, Use book average for 2 weeks in handicap computations (leave blank to use all season)
 Analysis: 5 (Low to High scale)

OK Cancel

Clicking OK or pressing Enter shows that the reordering was successful.

Bowling League Tuneup - Kings & Queens

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1-Stupid Ball	106 (-1)•	164 (+2)•	126 (-7)•	173 (+0)•	569 (-6)																		
2-Enterprise	141 (-2)•	124 (+1)•	137 (-1)•	194 (+4)•	596 (+2)																		
3-Bowling 4 Oscars	152 (+9)•	169 (+1)•	179 (-3)•	205 (+1)•	705 (+8)																		
4-Give Me A Break	154 (+4)•	142 (+0)•	150 (+0)•	147 (+1)•	593 (+5)																		
5-Where's Jim?	120 (+1)•	150 (+2)•	157 (-1)•	200 (-4)•	627 (-2)																		
6-Panther Spice	181 (+8)•	141 (-3)•	105 (+2)•	137 (+0)•	564 (+7)																		
7-Don't Give A Split	165 (-2)•	139 (+6)•	199 (+3)•	186 (+2)•	689 (+9)																		
8-Strikes Of Fire	170 (-4)•	133 (+7)•	151 (+0)•	169 (+3)•	623 (+6)																		
9-BOWLING STONES	186 (+5)•	165 (+2)•	157 (+0)•	190 (-2)•	698 (+5)																		
10-Bowl In The USA	166 (+0)•	150 (-1)•	138 (+0)•	195 (-8)•	649 (-9)																		
11-WTF	119 (-3)•	136 (-1)•	148 (+3)•	163 (+2)•	566 (+1)																		
12-What R The Odds?	129 (-5)•	116 (+0)•	124 (-4)•	155 (+2)•	524 (-7)																		
13-No Expectations	86 (-1)•	101 (+1)•	91 (+2)•	166 (+7)•	444 (+9)																		
14-Eddie's Angels	129 (+0)•	139 (+2)•	140 (+0)•	150 (+0)•	558 (+2)																		
15-Team 15	127 (+2)•	136 (+3)•	169 (+3)•	155 (+4)•	587 (+12)																		
16-Bowl 4 Fun	165 (-1)•	124 (-2)•	120 (+0)•	185 (-4)•	594 (-7)																		
17-Team 17	153 (-1)•	152 (+7)•	192 (+4)•	180 (+0)•	677 (+10)																		
18-VACANCY																							

League Management

Load League Define League Save League
 Enter Scores Import Scores View League

Week: 3 Games bowled per week
 Season: 12 Total weeks
 Handicap: 90 % of 220
 Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average
 Computations: Use trend values, Use volatility ratings, Use book average for 2 weeks in handicap computations (leave blank to use all season)
 Analysis: 5 (Low to High scale)

Analyze League

Producing bowler performance sheets

As discussed previously, leagues are stored as Microsoft Excel workbook files. The easiest way to view the workbook for the currently loaded league is to click the View League button on the main screen. But any league's workbook may be viewed at any time – without the use of Bowling League Tuneup – by simply opening the league workbook file via Microsoft Excel.

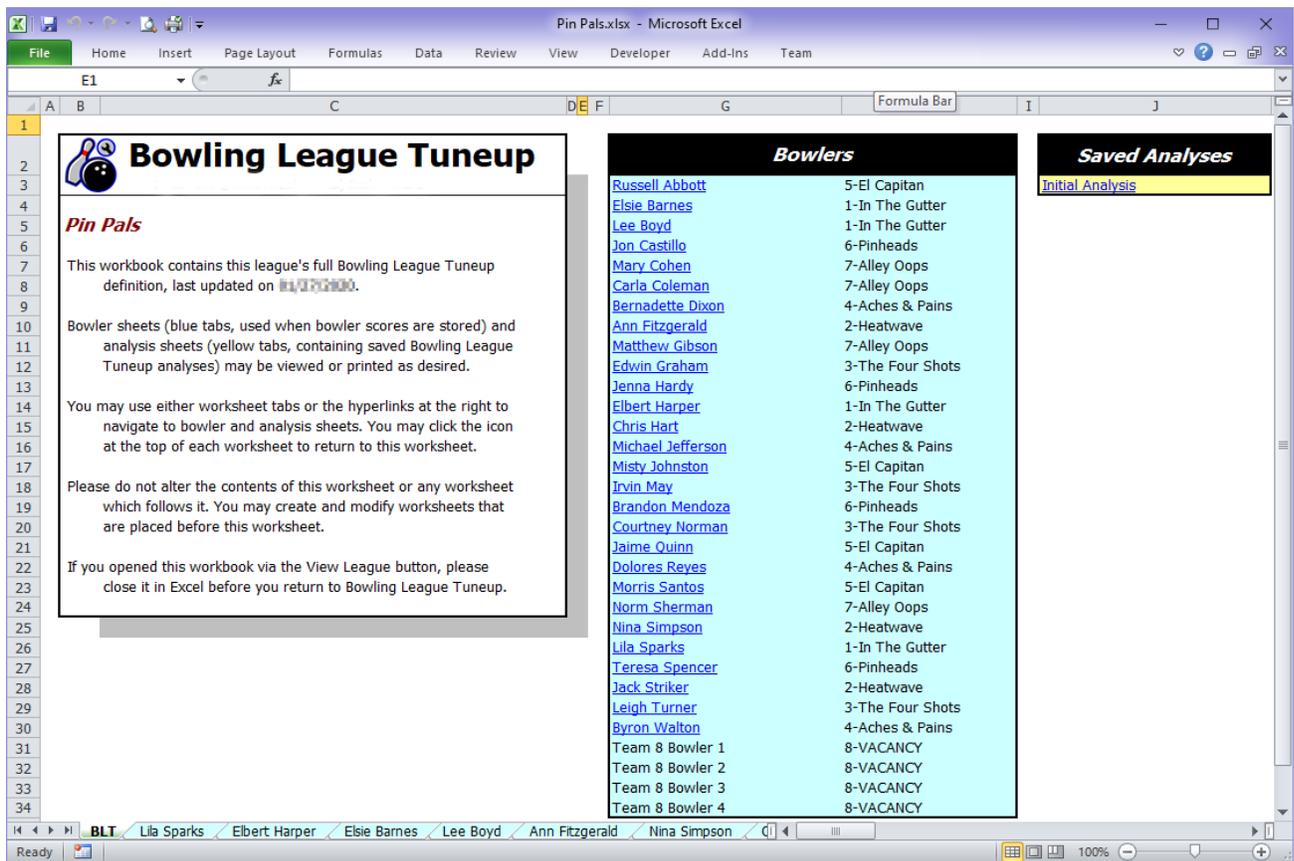
In the same way that Bowling League Tuneup stores each saved league analysis as a separate spreadsheet in the league workbook, a spreadsheet is automatically created for each league bowler with recorded scores. Each bowler spreadsheet contains a grid which shows the bowler's season performance and statistics at a glance and includes four graphs which illustrate different aspects of the bowler's performance.

Bowler performance sheets may be examined by a league manager who may be interested in seeing how bowlers are doing in a league. A performance sheet may also help the league manager diagnose unexpected averages or trends. For instance, a sheet may show that a bowler's unusually high trend is attributable to great recent performances or perhaps to a very low book average used at the start of the season – or it may show it's attributable to extremely poor performances at the start of the season, raising suspicions of sandbagging.

Bowler sheets are also suitable for distribution to the bowlers themselves, whether weekly, occasionally, or just at the end of the season, as a perk for their membership in the league. Experience has shown that bowlers love to receive personalized bowling summaries and analyses, and they can be expected to be a popular feature in any league that gives them out.

Bowler sheets are preformatted for output on letter-size paper via the Excel Print command. And since all bowler sheets are grouped together after the BLT sheet, printing all sheets can be done simply by clicking on the first bowler sheet tab, then scrolling across to the last bowler sheet tab and shift-clicking it, thus highlighting all the bowler sheet tabs. The Excel Print command can then be used to print all highlighted sheets, one per page.

Each bowler spreadsheet is identified by a blue tab in the league's Excel workbook and can be accessed either by clicking the Excel tab or using the bowler's hyperlink on the workbook's cover page.



On the first sheet of the Pin Pals league, we see from the colored and underlined entries that all the bowlers (except for those on vacancy team 8) have hyperlinks to their bowler sheets. We'll look at Jack Striker's sheet. (As always, we've replaced actual bowler names with made-up names.)

Pin Pals.xlsx - Microsoft Excel

Bowling League Tuneup

Jack Striker

League: Pin Pals
 Team: 2-Heatwave
 Book: 170 (not used in handicap/trend computations)
 Date: 11/11/2008 (week 12 of 12)

Week	1	2	3	Total	Avg	High	Low	Season Avg*
1	150	185	207	542	180.6	207	150	180.6 (+0)-
2	179	210	184	573	191.0	210	179	185.8 (+5)•
3	133	212	203	548	182.6	212	133	184.7 (+3)-
4	157	152	170	479	159.6	170	152	178.5 (-3)-
5	143	173	197	513	171.0	197	143	177.0 (-4)-
6	161	122	189	472	157.3	189	122	173.7 (-6)-
7	177	147	172	496	165.3	177	147	172.5 (-7)-
8	115	228	178	521	173.6	228	115	172.6 (-5)-
9		177	221	398	199.0	221	177	174.6 (-3)-
10	158	105	158	421	140.3	158	105	171.1 (-6)°

Games	9	10	10	29	Effective†	172 (-6)-
Total	1373	1711	1879	4963		
Avg	152.5	171.1	187.9	513.4	171.1	196.9
High	179	228	221	573	199.0	228
Low	115	105	158	421	140.3	158

* Includes trend (average pins per game above or below the average that handicap is based upon) and volatility (variability of game scores: • low, - normal, or ° high)
 † Includes any undisplayed absence, substitute, and vacancy scores for this bowler

Season Average

Weekly Scores

Weekly vs. Season

Weekly vs. Handicap Basis

Lee Boyd Ann Fitzgerald Nina Simpson Chris Hart **Jack Striker** Irvin May

The information window at the upper left shows that this is a bowler performance sheet for Jack Striker, who is bowling on team 2, named Heatwave, in the Pin Pals league. Jack has a 170 book average, but book averages are not used to set handicaps in this league. This sheet documents the results at the end of the 12-week season.

Jack's scores show only 10 weeks of bowling, which means that Jack missed two weeks of bowling (plus game 1 in the next-to-last week that he bowled). Absence, substitute, and vacancy scores do not appear in the performance sheet.

The 29 games Jack bowled are listed beside weeks 1 through 10 and under games 1 through 3. To the right of the games are Jack's weekly series totals and average, his high and low game for the week, and his cumulative season average, trend, and volatility. This season, Jack's average started out in the mid 180s, but ends up in the low 170s. This negative trend is reflected in his season-ending trend of -6.

Note that analysis sheets include one decimal place on displayed averages. Leagues remove the decimal portion when recording bowler averages, but the decimal place is included here to show how close the bowler is to the next-higher (or next-lower) average.

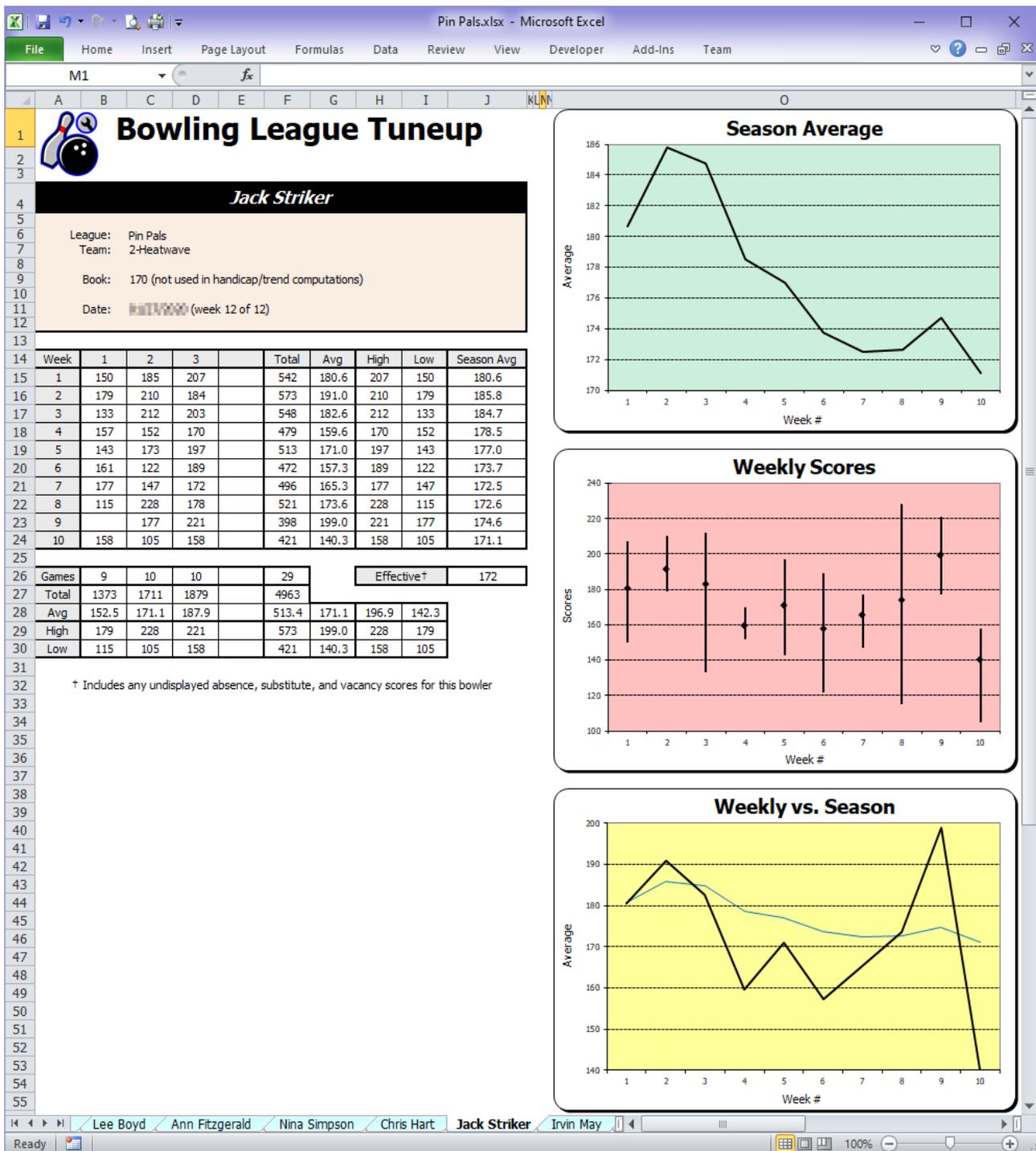
Beneath the games are the summarized totals, averages, high scores, and low scores for games 1, 2, and 3 each week. Based on his season averages for games 1, 2, and 3 (152.5, 171.1, and 187.9, respectively), we can see that Jack has a strong tendency to improve with each game each week.

To the right of these summarized numbers are a number of interesting statistics, including the bowler's high and low series and games for the season. Note that only weeks in which all games were bowled are considered when determining the low series.

Below the season average, trend, and volatility are the effective season average, trend, and volatility. These effective values reflect all scores for this position on the team, including absence, substitute, and vacancy scores. Effective values are the values that appear on the Bowling League Tuneup main screen and are used in all analyses. After all, when analyzing a team's performance, every single score registered by this position on the team must be included, regardless of the origin of that score.

Here, we see that Jack's effective average (which is always shown without the decimal place) is actually a pin higher than his official final league average. Since absence scores can't increase a bowler's average, and since this league's vacancy bowler score is lower than Jack's average, this has to mean that a substitute bowler helped boost the effective average for Jack's position on the team – although the substitute does not appear to have bowled great relative to his or her own league average, since he or she did not help increase this team position's trend rating from the -6 trend that Jack established.

A league that wants to distribute these performance sheets to bowlers may decide it's inappropriate – or too confusing – for league bowlers to be given their trend and volatility information. For these cases, this data and the Weekly vs. Handicap Basis chart can be excluded from bowler sheets by checking the option labeled Exclude Trend And Volatility Data From Bowler Sheets in the Save League window. When this is done, the Season Avg column of the sheets will contain *only* season averages, as shown below.



The last part of the performance sheet is the four graphs on the right side of the sheet (or three if trend and volatility data have been excluded). Each graph is designed to give at-a-glance information about the bowler's performance that may not be quite as apparent from the raw numbers.

Graph 1 simply shows the bowler's average through the course of the season. This graph clearly shows that Jack's season peaked by week 2 and didn't go great after that. The predominantly downward slope of this graph indicates a negative trend – exactly the opposite of what a bowler wants in a handicap league. Indeed, we see that Jack ended the season with a trend of -6.

Graph 2 shows the bowler's scoring week-by-week. Each vertical bar shows the ranges of scores for the week, while the mark on each bar shows the average for the week. Shorter bars in a consistent range indicate low volatility; longer bars in varied ranges indicate high volatility.

Graph 3 graphs the bowler's weekly averages (in a bold black line) along with the cumulative season average (in a lighter blue line), showing the effect of each week of bowling on the bowler's season average. When the bowler bowls above his/her current season average, the black line goes above the blue line, which will in turn rise from the better-than-average performance. Bowling below the current average is shown by the black line going below the blue line, which will fall from the poorer-than-average performance.

Graph 4 is similar to graph 3, but instead of showing weekly performances in relation to the bowler's season average, it shows weekly performances in relation to the average upon which the bowler's handicap is based. Each dot represents the bowler's average that week, while the line represents the handicap basis for that week. Any dot above the line, in the light blue area, represents a positive trend for the week, while any dot below the line, in the dark blue area, represents a negative trend. Here, Jack had three weeks doing better than his handicap basis (one week barely better) and six weeks doing worse than his handicap basis (three weeks significantly worse). At a glance, it is apparent that this bowler's trend is negative because of the predominance of dots deeply in the dark blue area.

Note that in leagues that use book averages, graph 4 is a much better indicator of trend than graph 1 since graph 1 does not account for the bowler's book average. Here is what Jack Striker's performance sheet would look like if the league used book averages for the first four weeks of the season, and if Jack's book average were just 156.

Pin Pals.xlsx - Microsoft Excel

Bowling League Tuneup

Jack Striker

League: Pin Pals
 Team: 2-Heatwave
 Book: 156 (used for 4 weeks in handicap/trend computations)
 Date: 11/11/2011 (week 12 of 12)

Week	1	2	3	Total	Avg	High	Low	Season Avg*
1	150	185	207	542	180.6	207	150	180.6 (+24)-
2	179	210	184	573	191.0	210	179	185.8 (+29)*
3	133	212	203	548	182.6	212	133	184.7 (+28)-
4	157	152	170	479	159.6	170	152	178.5 (+22)-
5	143	173	197	513	171.0	197	143	177.0 (+16)-
6	161	122	189	472	157.3	189	122	173.7 (+10)-
7	177	147	172	496	165.3	177	147	172.5 (+7)-
8	115	228	178	521	173.6	228	115	172.6 (+7)-
9		177	221	398	199.0	221	177	174.6 (+8)-
10	158	105	158	421	140.3	158	105	171.1 (+4) ^o

Games	9	10	10	29	Effective†	172 (+2)-
Total	1373	1711	1879	4963		
Avg	152.5	171.1	187.9	513.4	171.1	196.9
High	179	228	221	573	199.0	228
Low	115	105	158	421	140.3	158

* Includes trend (average pins per game above or below the average that handicap is based upon) and volatility (variability of game scores: • low, - normal, or ^o high)
 † Includes any undisplayed absence, substitute, and vacancy scores for this bowler

Season Average

Weekly Scores

Weekly vs. Season

Weekly vs. Handicap Basis

Lee Boyd | Ann Fitzgerald | Nina Simpson | Chris Hart | **Jack Striker** | Irvin May

The first three graphs are unchanged, so graph 1 still shows Jack's steady downward slide through the season. But graph 4 shows that Jack did phenomenally well for the first four weeks in relation to the (very low) book average he was using. He did well enough in those weeks to give him a positive trend for the season, despite the downward slope of graph 1.

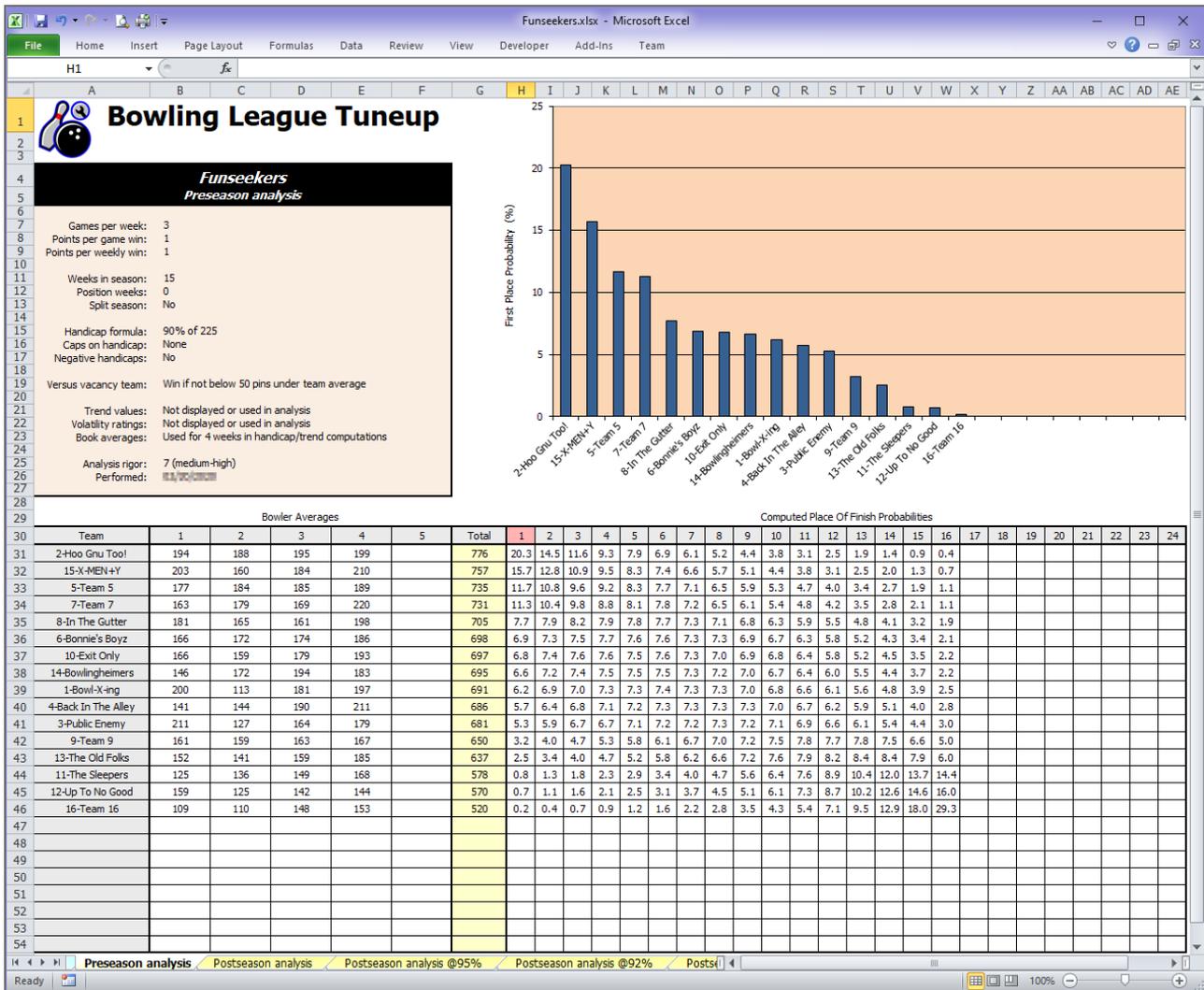
POSTSEASON DIAGNOSTICS

If you recorded bowler scores in Bowling League Tuneup during the season, you've produced a trove of data you can mine when the season is over. The goal is to learn from what happened in this league so you can apply those lessons to future leagues.

Comparing league analyses with actual results

The first thing you'll probably want to do at the end of the season is to compare the final results with your Bowling League Tuneup league analyses – both preseason and postseason, if available. Specifically, you'll want to determine if the actual standings appear to reflect your sought-after balance between rewarding high scores and good personal performances.

Let's reexamine the Funseekers league we previewed previously. This was an actual league, but Bowling League Tuneup was not used to tune up this league. Shown below is the preseason league analysis sheet as the league manager would have seen it, using the actual league attributes and the entering book averages of the league's bowlers. (Three bowlers had no book averages, so their first-week averages were used.)



It is unclear if the league manager would have stayed with these league attributes had he seen this analysis. No one team is an overwhelming favorite, but the poorer teams look to be fairly big longshots. In the preseason, the next step would have been to determine what kinds of performances the poorer teams would need to put themselves in contention. But that was never done in this league.

Let's eliminate the suspense and skip right to the actual final standings for this league. Since in this league teams bowl three games per week, with one point awarded for each game win and an additional point awarded for each weekly win, team win-loss records reflect a total of four wins and losses awarded to each team each week.

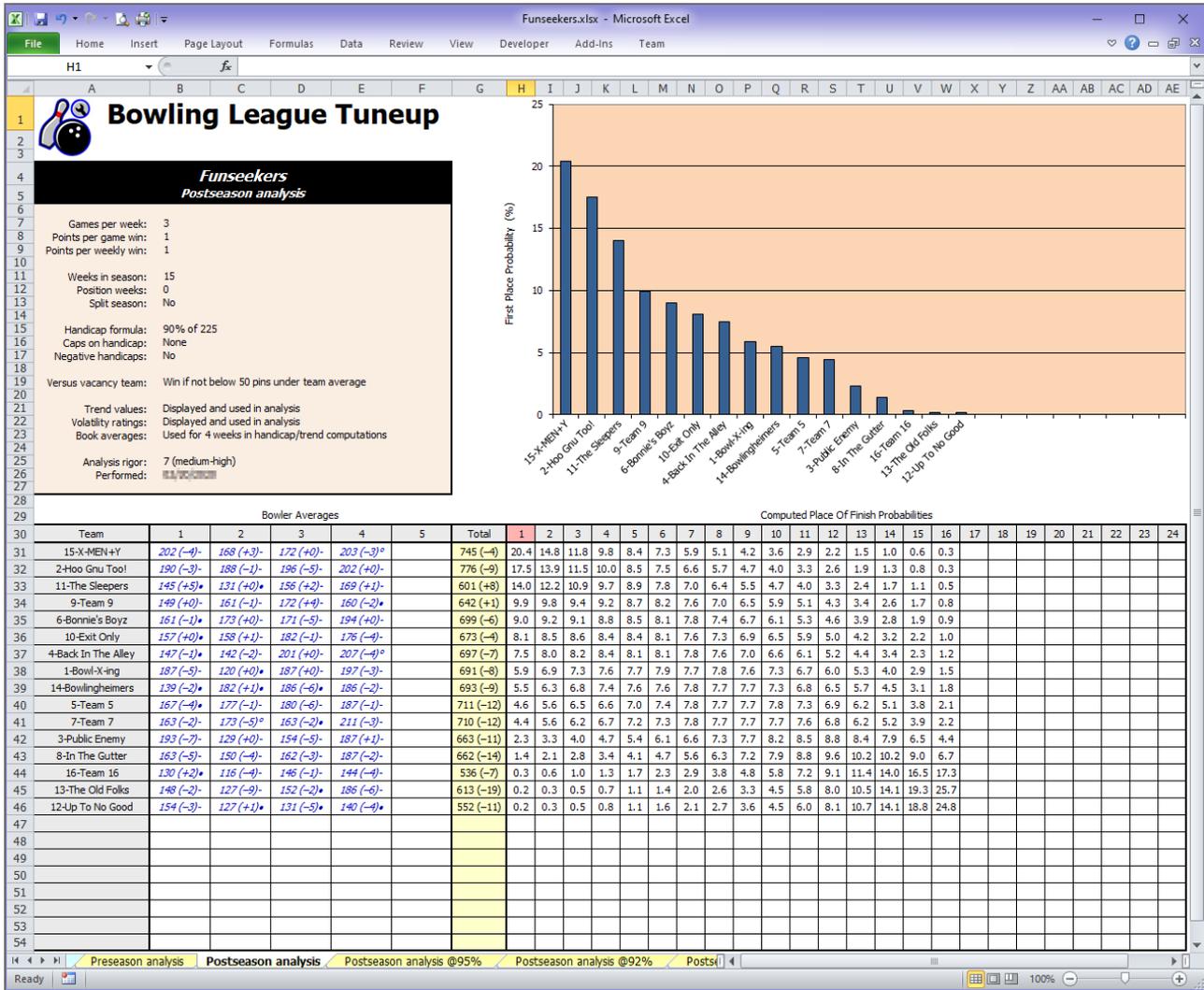
Place	Team	Record
1	14-Bowlingheimers	39-21
2	11-The Sleepers	37-23
3	2-Hoo Gnu Too!	36-24
3	6-Bonnie's Boyz	36-24
5	1-Bowl-X-ing	35-25
6	10-Exit Only	34-26
7	5-Team 5	32-28
7	9-Team 9	32-28
7	15-X-MEN+Y	32-28
10	4-Back In The Alley	29-31
10	7-Team 7	29-31
12	3-Public Enemy	27-33
13	16-Team 16	24-36
14	8-In The Gutter	22-38
15	12-Up To No Good	18-42
15	13-The Old Folks	18-42

It appears there are a couple of surprises right at the top of the standings. The winning team was only in the middle of the pack in our preseason analysis. More shockingly, one of those longshot teams we just mentioned actually came in second place!

Once we look past these teams, it looks like the results resemble our preseason analysis fairly closely. Team 8 finished well below expectations, but otherwise nothing appears to be terribly surprising.

Let's do a postseason analysis, i.e., an analysis that uses the final averages, trends, and volatilities of the league bowlers, to determine how actual performances differed from expected performances and what effects those differences had on expected outcomes.

Shown below is the analysis sheet we saved from that postseason analysis. The Bowler Averages section of this analysis sheet includes trends and volatilities because they were displayed on the main screen when the analysis was created, and the sort order matches the sort order on the screen when the analysis was saved. (Note that computed data is not only displayed in blue, but it is also italicized in case the analysis is printed in black-and-white. For the same reason, vacancy averages, though there are none in this league, are displayed in red and underlined.)

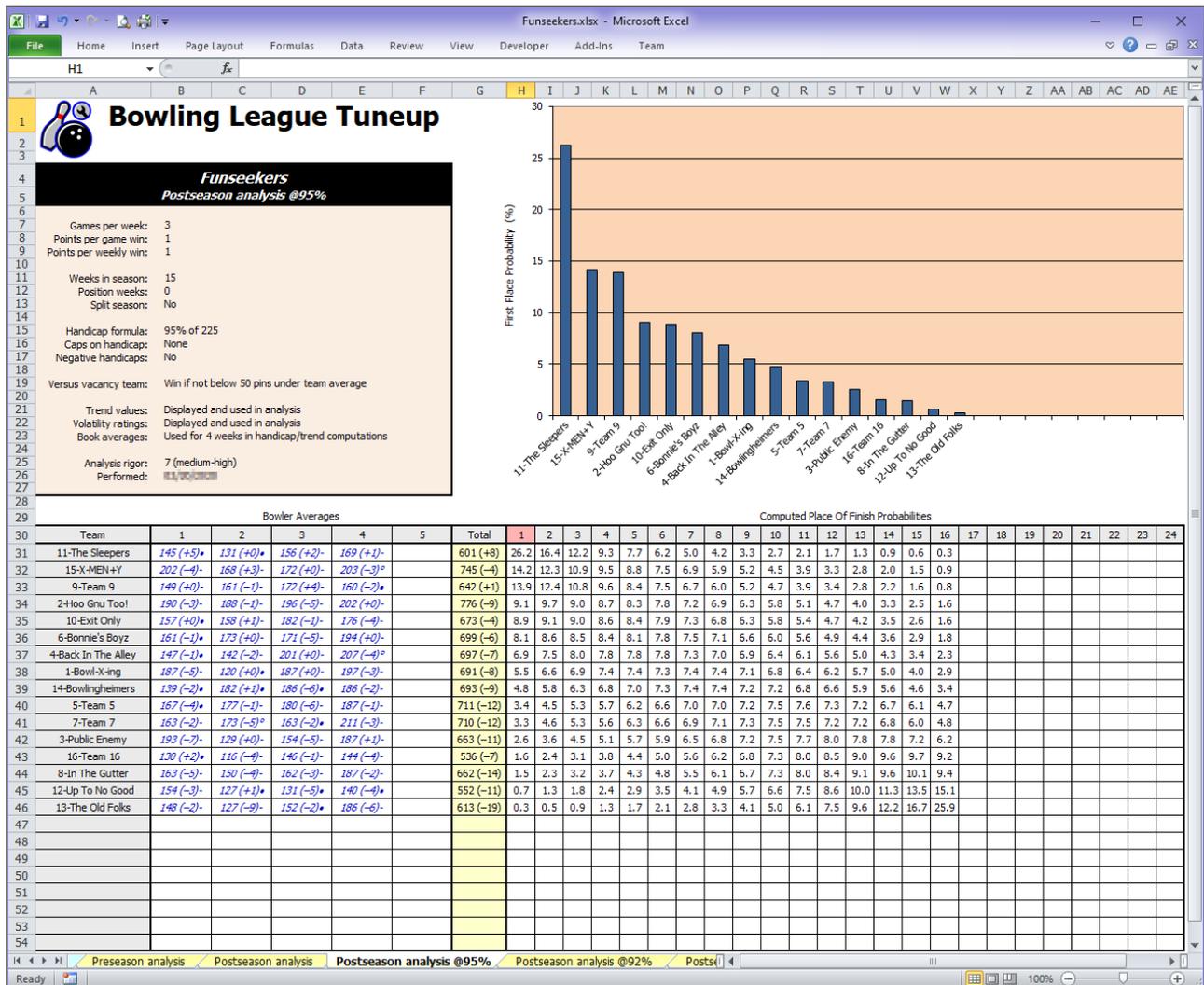


Aha! The mystery of team 11's unexpectedly high finish can now be explained. Not only did the team improve its team average by 23 pins from its preseason book average of 578, but, surely more importantly, it achieved a team trend of +8, which is significantly higher than every other team's in the league. As we can see, using season-ending averages and trends, team 11's evaluation improved radically, going from a third-worst ranking of first-place chances (0.8%) all the way up to a third-best ranking (14.0%).

We pointed out earlier the unusual aspect of this league, namely that all but two teams have negative trends, and many are strongly negative. Whatever the reason for this anomaly, team 11 had a great season compared to all the other teams. Where most teams' averages went down from their initial book averages, team 11 raised their average more than any other team did, and their trend was 12 or more higher than all but one team's. This accomplishment (which surely would have gone unnoticed if the league had not been evaluated with Bowling League Tuneup) is reflected in the BLT postseason analysis, which otherwise changed relatively little from the preseason analysis.

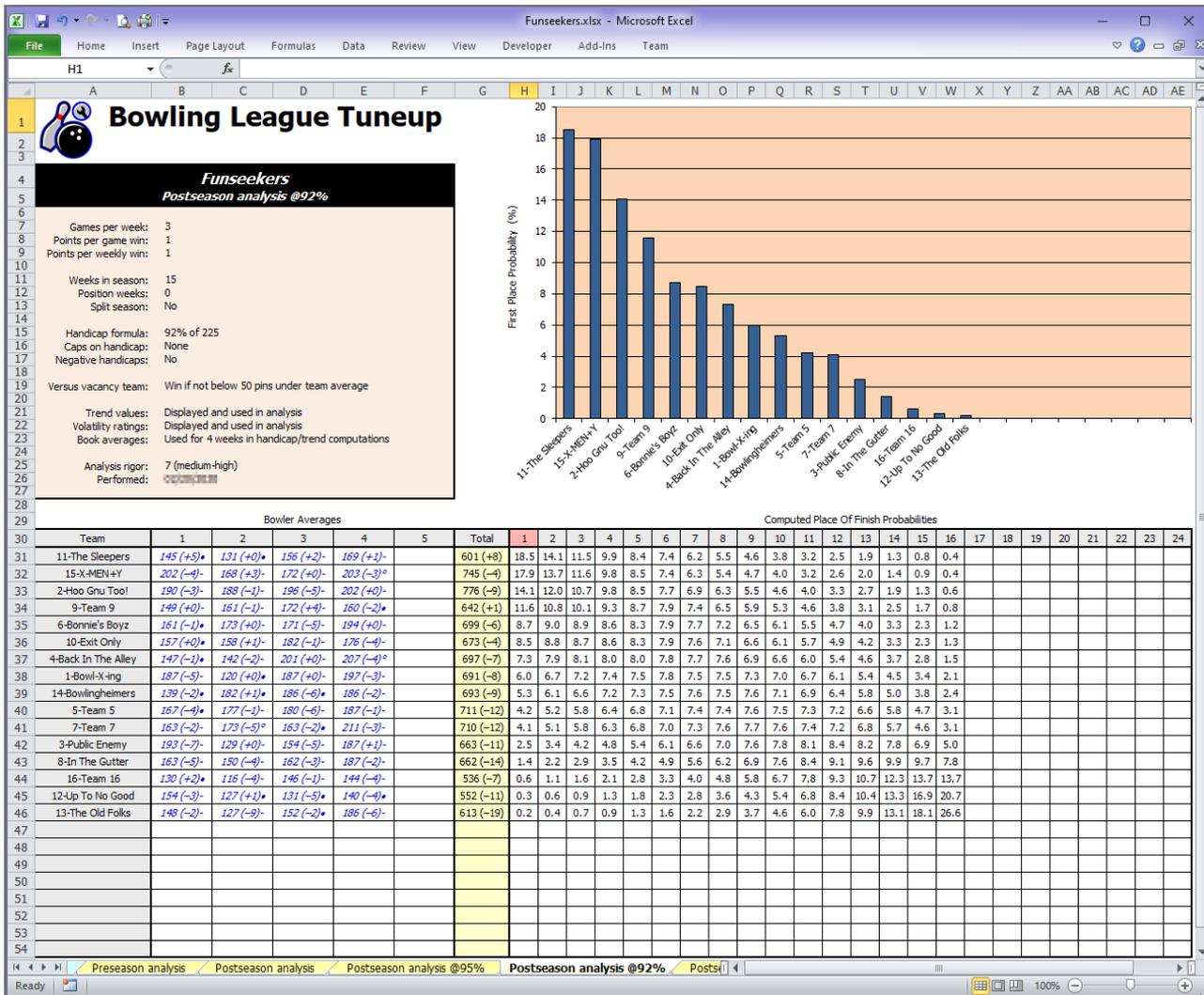
The question is, was team 11's performance rewarded appropriately? Did their excellent season, which definitely stood out from the performances of the other 15 teams, warrant better than a 14% chance of winning the league?

It would be reasonable to take the position that team 11 deserved a better chance of success in this league. Let's see how its chances would have improved had this been, say, a 95% league.



By raising the handicap percentage, a higher emphasis is put on above-average performances and a lower emphasis is put on high scores. This makes team 11 a distinct favorite – though far from a shoo-in – in this league.

We can see that the leap from 90% to 95% of the handicap formula had a fairly profound effect on expected results. Some might think this is too big an effect. Let's do one more analysis using a compromise percentage of 92%.



With this handicap formula, we have created approximate parity between a team with the second-best average but a trend of -4 and a team with the third-worst average but a league-best trend of +8. The league's best team and the team with the second-best trend follow closely behind.

Which of these handicap formulas produces probabilities that do the best job of rewarding the league's best performances? That is a subjective call for the league manager to make. But now the manager has these league analyses, not just a blind guess, to base that decision on should next season's lineup feature a similar mix of bowlers and teams.

We should note that through this whole discussion, we've made no reference at all to the team that actually won in this league: team 14. In all of our preseason and postseason analyses, team 14 was stuck solidly in the middle of the expected results as a result of its solid-but-not-spectacular team average and its average (for this league) trend value. Its preseason first-place probability was 6.6% and its performance during the season lowered that probability slightly to 5.5%. Team 14 may not have done anything spectacular this season, but it clearly benefited from a fortuitous ordering of its games, much like the 165-average bowler did against the 180-average bowler we discussed earlier.

This outcome serves as a good reminder that these analyses, whether made for handicap leagues or scratch leagues, show odds, not guaranteed results. Higher odds translates to a better chance of success; lower odds translates to a smaller chance of success. Even a team like team 13, with a low

average and terrible trend value, can be expected to come out on top in this league, given these league attributes and this exact set of performances, a couple times every thousand seasons. Luck stands right beside skill in playing an important role in determining final league outcomes. No team can guarantee itself a successful outcome; it can only try to bend luck in its favor by bowling well.

On the other hand, a league manager must guard against considering a league to be properly tuned just because every team has some measurable chance of success. Everyone who enters a state lottery has a measurable chance of success too, but that doesn't mean they should expect to win the lottery every now and then. All teams need realistic, not just measurable, chances of success when they have decent season performances.

What-if analyses and mass changes

As we've seen, the process of tuning a league will often require more than just the adjustment of league attributes. Bowlers' assumed performances may also need to be changed to determine whether a team with dim prospects can nevertheless succeed with reasonably good performances – or whether an excellent team has any realistic chance to be knocked off the top of the heap.

When we ask hypothetical questions about how a league's odds would change if the league's attributes or bowlers' results were changed, we call those "what-if" questions – as in, "What if this team could raise its average to 720?" or "What if the handicap percentage were changed to 95?"

Bowling League Tuneup makes it easy to create and test what-if scenarios, whether you're tuning a league at the start of a new season, evaluating a league in the middle of a season, or doing diagnostics at the end of a season to gain insight for setting up a new league. Essentially, you want to conduct a controlled experiment in which you fix most all the league attributes and bowler values, and then adjust a small number of these settings to determine the effects of those changes on the league analysis. If after doing this you find that, say, an underdog doesn't have a fighting chance to succeed until you create a highly unlikely set of circumstances, the league has not been tuned up well.

If you're starting with averages, trends, and volatilities that have been computed from recorded bowler scores rather than with supplied values, it will often be easier to proceed by first changing all those computed values to supplied values. That will allow you to, for instance, wipe out bowler trend or volatility values to start all bowlers out with the assumption of normal performances, then tweak individual average, trend, or volatility values to test various what-if settings.

You could individually edit each bowler to change everyone to using supplied values, but the Define League window includes a set of "mass change" options that can make it a lot easier to do this kind of thing. To demonstrate this, we'll use an actual league called Manager's Invite. This league recorded bowler scores in Bowling League Tuneup, so all averages, trends, and volatilities were computed by BLT. Now that the season is over, we want to do some what-if analyses in preparation for next season. We'll start by converting each bowler's computed average to a supplied average, while removing all computed trends and resetting all volatilities to normal.

The window below does all of these things. The checked mass change options are executed in order, from top to bottom.

Define League

League Settings

Number of teams: Bowlers per team:

Default vacancy score: with handicap based on a average

Default absence score: pins under average

Fill in league attributes with stored default values

New Bowler Template

Average: Vacancy score

Trend:

Volatility: Low Normal High

Mass Change Options

Change all bowlers with scores to computed data

Change all bowlers to supplied data

Set supplied averages to book averages if given

Apply new bowler trend to supplied data

Apply new bowler volatility to supplied data

After doing this, the league looks like this on the main BLT screen.

Bowling League Tuneup - Manager's Invite.xlsx

Bowling League Tuneup
Manager's Invite

Place Of Finish Probabilities

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
1-Ta Dowd	160	159	155	201	675																							
2-Mind The Gap	152	172	171	202	697																							
3-B's Embroidery Inc	180	196	176	172	724																							
4-DiversifiedBowlers	152	137	144	175	608																							
5-Follow That Cab	193	131	120	189	633																							
6-Six Of It	202	161	168	203	734																							
7-10 In The Pit	174	191	226	150	741																							
8-Dirt Junkies	139	152	180	201	672																							
9-Gimme An X	155	161	176	201	693																							
10-X Men&XXX Women	180	175	192	192	739																							
11-Suckerrrr	197	171	193	208	769																							
12-Team 12	140	119	120	156	535																							
13-Gutter Busters	147	164	160	203	674																							
14-Slops In Again	177	218	200	222	817																							
15-Bowlficators	181	138	179	198	696																							
16-Team 16	127	146	178	150	601																							
17-Team 17	161	127	150	150	588																							
18-Not Gutter	122	155	139	177	593																							
19-Stealth Bowlers	184	103	184	204	675																							
20-Team 20	135	96	174	184	589																							
21-AV Sunrise Rotary	155	143	150	150	598																							
22-VACANCY																												

League Management:

Week: Games bowled per week

Season: Total weeks Position weeks Split season

Handicap: % of Hdcp Hdcp+score Neg handicaps

Vacancy Teams: Bowl against vacancy scores Always beat vacancy team Win if not below pins under team average Win if not below percent of team average

Computations: Use trend values Use volatility ratings Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: <-- Low Rigor High -->

The display of bowler averages in black tells us these are now supplied, not computed averages. And although we're using and displaying both trends and volatilities, no trends are shown because we removed trends from all bowlers (by giving bowlers the blank trend value in the new bowler template, which is computationally the same as setting a zero trend). Likewise, we set all bowlers to have normal volatilities (the checked value in the new bowler template). Since that is the

assumed value if volatility ratings are not used, we will simplify the display further by unchecking the option to use volatility ratings. (If we decide later to experiment by changing volatility ratings, we'll turn that option back on at that time.)

Before we try some what-if analyses, let's sort the teams by average by clicking on the Total column header and do an initial analysis to establish a baseline for comparison of results.

Bowling League Tuneup
Manager's Invite

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
14-Slops In Again	177	218	200	222	817	40.4	18.9	11.7	8.2	5.7	4.2	3.1	2.3	1.5	1.3	0.9	0.6	0.4	0.3	0.2	0.1	0.1					
11-Suckerrrr	197	171	193	208	769	16.6	16.1	12.8	10.9	8.8	7.4	5.9	4.8	3.7	3.3	2.5	2.1	1.6	1.2	0.8	0.6	0.4	0.3	0.1	0.1		
7-10 In The Pit	174	191	226	150	741	9.7	11.5	10.8	10.5	9.1	8.0	6.9	6.4	5.5	4.6	3.8	3.3	2.5	2.3	1.6	1.2	1.0	0.6	0.4	0.2	0.1	
10-X Men&XXX Women	180	175	192	192	739	8.5	10.7	10.5	10.1	8.8	8.3	7.3	6.7	5.4	4.9	4.2	3.5	2.8	2.3	1.8	1.4	0.9	0.8	0.5	0.3	0.1	
6-Six Of It	202	161	168	203	734	7.6	10.2	9.7	9.6	8.8	8.2	7.2	6.9	5.9	5.3	4.4	3.9	3.2	2.7	1.9	1.6	1.2	0.9	0.6	0.3	0.1	
3-B's Embroidery Inc	180	196	176	172	724	5.9	8.4	8.7	9.6	8.5	8.3	7.5	7.2	6.1	5.9	4.6	4.3	3.6	3.0	2.5	2.0	1.5	1.0	0.8	0.4	0.2	
2-Mind The Gap	152	172	171	202	697	3.0	5.0	6.0	6.7	7.1	7.5	7.3	7.3	6.6	6.9	6.0	6.1	4.9	4.7	3.9	3.4	2.6	2.2	1.4	1.0	0.5	
15-Bowlficators	181	138	179	198	696	2.9	4.9	5.5	6.8	6.7	7.5	7.0	7.5	6.8	7.1	6.2	5.8	5.2	4.6	4.1	3.3	2.8	2.1	1.6	1.0	0.6	
9-Gimme An X	155	161	176	201	693	2.7	4.6	5.4	6.5	6.3	7.1	6.9	7.4	7.1	6.9	6.3	6.2	5.3	5.0	4.0	3.6	2.8	2.6	1.7	1.1	0.7	
19-Stealth Bowlers	184	103	184	204	675	1.6	3.1	3.9	4.9	5.0	5.8	6.3	6.9	6.7	7.1	6.5	6.9	6.3	5.2	4.8	3.9	3.4	2.7	1.8	1.1		
1-Ta Dow!	160	159	155	201	675	1.5	3.0	3.9	5.0	5.4	5.9	6.0	6.8	6.7	7.2	6.7	6.9	6.2	6.0	5.3	4.6	4.1	3.3	2.7	1.8	1.0	
13-Gutter Busters	147	164	160	203	674	1.4	2.9	4.0	4.6	5.1	6.3	5.9	6.9	6.6	6.9	6.6	6.7	6.4	6.1	5.5	5.1	4.2	3.4	2.7	1.8	1.1	
8-Dirt Junkies	139	152	180	201	672	1.3	2.9	3.5	4.5	5.0	6.0	5.9	6.8	6.4	7.0	6.9	6.9	6.4	6.1	5.6	5.0	4.3	3.6	2.7	2.0	1.2	
5-Follow That Cab	193	131	120	189	633	0.4	0.8	1.4	1.9	2.5	3.5	3.7	4.6	4.8	5.5	5.9	6.9	6.8	7.5	7.3	7.7	7.3	6.9	5.9	5.3	3.5	
4-DiversifiedBowlers	152	137	144	175	608	0.1	0.5	0.7	1.1	1.4	1.9	2.4	3.1	3.4	4.3	4.9	5.7	5.9	7.3	7.4	8.4	8.6	9.2	8.7	8.4	6.6	
16-Team 16	127	146	178	150	601	0.1	0.3	0.5	1.0	1.2	1.7	2.1	2.7	3.3	3.9	4.3	5.5	5.9	6.8	7.4	8.2	8.5	9.8	9.3	9.6	8.0	
21-AV Sunrise Rotary	155	143	150	150	598	0.1	0.3	0.5	0.7	1.0	1.5	1.9	2.5	2.6	3.7	4.0	5.1	5.3	7.0	7.2	8.9	8.8	10.2	10.0	10.5	8.3	
18-Not Gutter	122	155	139	177	593	0.1	0.2	0.4	0.7	0.9	1.3	1.7	2.4	2.7	3.6	4.1	5.2	5.4	6.5	7.1	8.4	8.5	10.1	10.4	11.0	9.3	
20-Team 20	135	96	174	184	589	0.1	0.2	0.4	0.6	0.9	1.4	1.6	2.2	2.5	3.3	3.5	4.6	5.2	6.8	6.7	8.5	8.8	10.5	10.5	11.4	10.2	
17-Team 17	161	127	150	150	588		0.1	0.3	0.6	0.8	1.1	1.5	1.9	2.4	3.2	3.5	4.6	5.2	6.2	6.8	8.3	9.0	10.6	11.0	11.8	11.1	
12-Team 12	140	119	120	156	535				0.1	0.2	0.3	0.3	0.5	0.8	1.1	1.2	2.0	2.3	3.6	4.1	6.1	6.8	10.1	12.5	19.3	28.7	
22-VACANCY																											

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 40 Total weeks, 2 Position weeks, Split season

Handicap: 90 % of 240, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 5, Analyze League

Without even creating an analysis sheet graph, we can see this league is seriously out of tune. The best team can expect to finish in first place about four seasons out of every 10, and can expect to finish in the top three places about seven seasons out of every 10. It seems crazy that any one team should come in with those kinds of odds in a huge league of 21 teams. Meanwhile, the bottom eight teams appear likely to almost always finish very low in the standings. But this is the initial analysis, which assumes teams will bowl their listed averages with normal volatility and will show no improvement or degradation during the season. We need to find out whether a terrific performance by one of the poorer teams can give it any chance for a good finish.

Before we set up that scenario, let's save the baseline analysis we just performed. But we want to save only the analysis, not the bowler and league changes we made only for the purpose of producing the analysis.

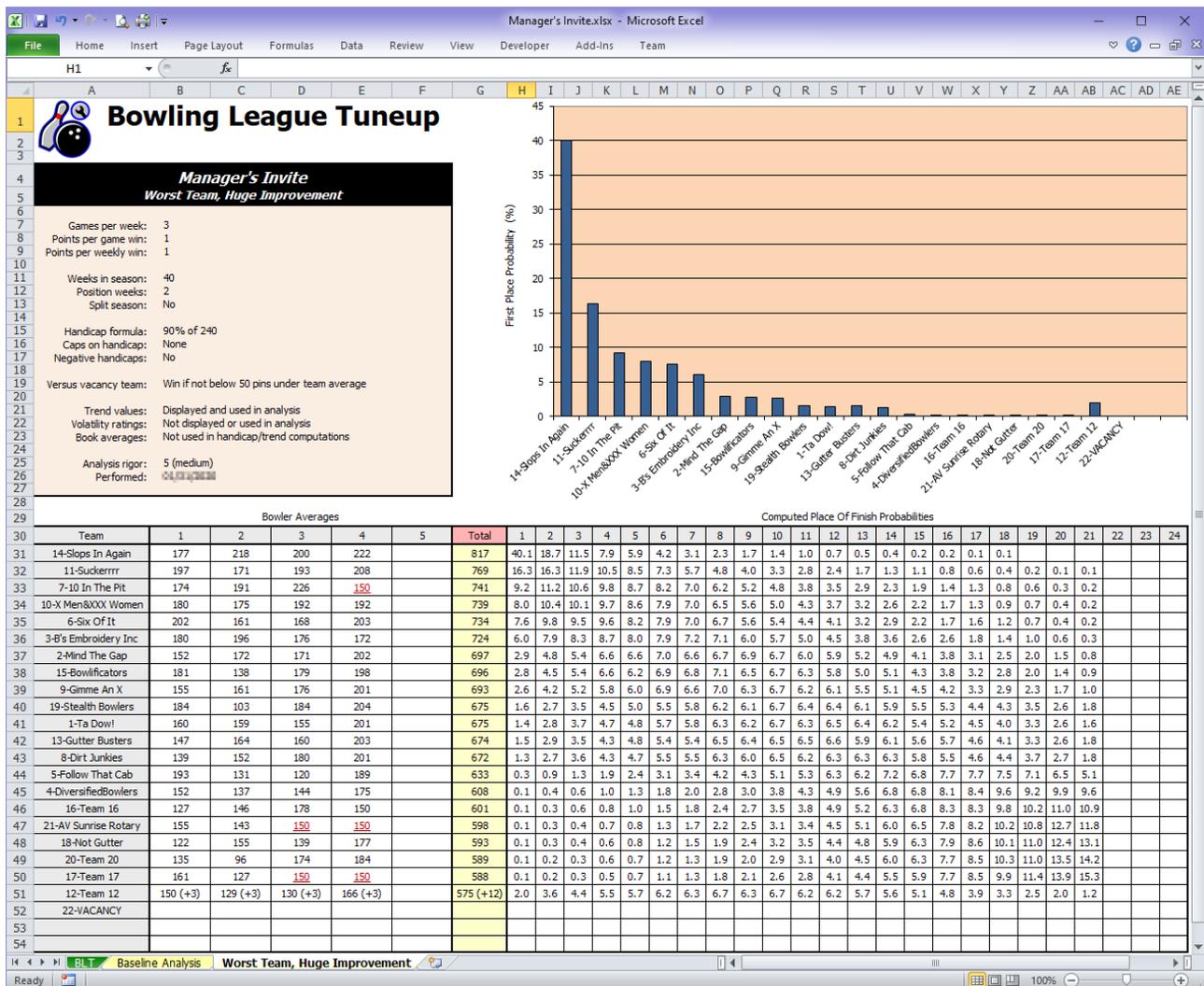
The Save League window lets us do this. If we save the analysis as usual but uncheck the Save League & Bowler Data checkbox, as shown below, none of the bowler or league changes we've made will be saved. This can also result in saves taking much less time since only an analysis is being saved. If you subsequently try to load another league or leave the program before saving league and bowler data, a prompt will remind you that you'll be permanently discarding the bowler and league changes you've made.

Now let's set up a scenario in which the team with the league's lowest average has a phenomenal season. We'll assume that team raises its average by 40 pins (an increase of 10 pins for each bowler) and achieves a trend of +12 (a trend of +3 for each bowler) for the upcoming season.

Both of these accomplishments would be nothing short of amazing. Intuitively, we know that a bowler raising his or her average by 10 pins from the previous season would be a huge accomplishment. For all four bowlers on a team to do that would defy the odds in a big way. Similarly, we can see from the trend probability tables in Appendix E that a four-bowler team ending with a trend of +12 or greater in a 40-week season could be expected to happen only in about one season in 500.

In other words, a team having a season with such incredible numbers would be extremely rare. So if this team doesn't become the odds-on league favorite after a performance like this, especially assuming all other teams in the league merely have average performances, something is surely wrong with the way the league is set up.

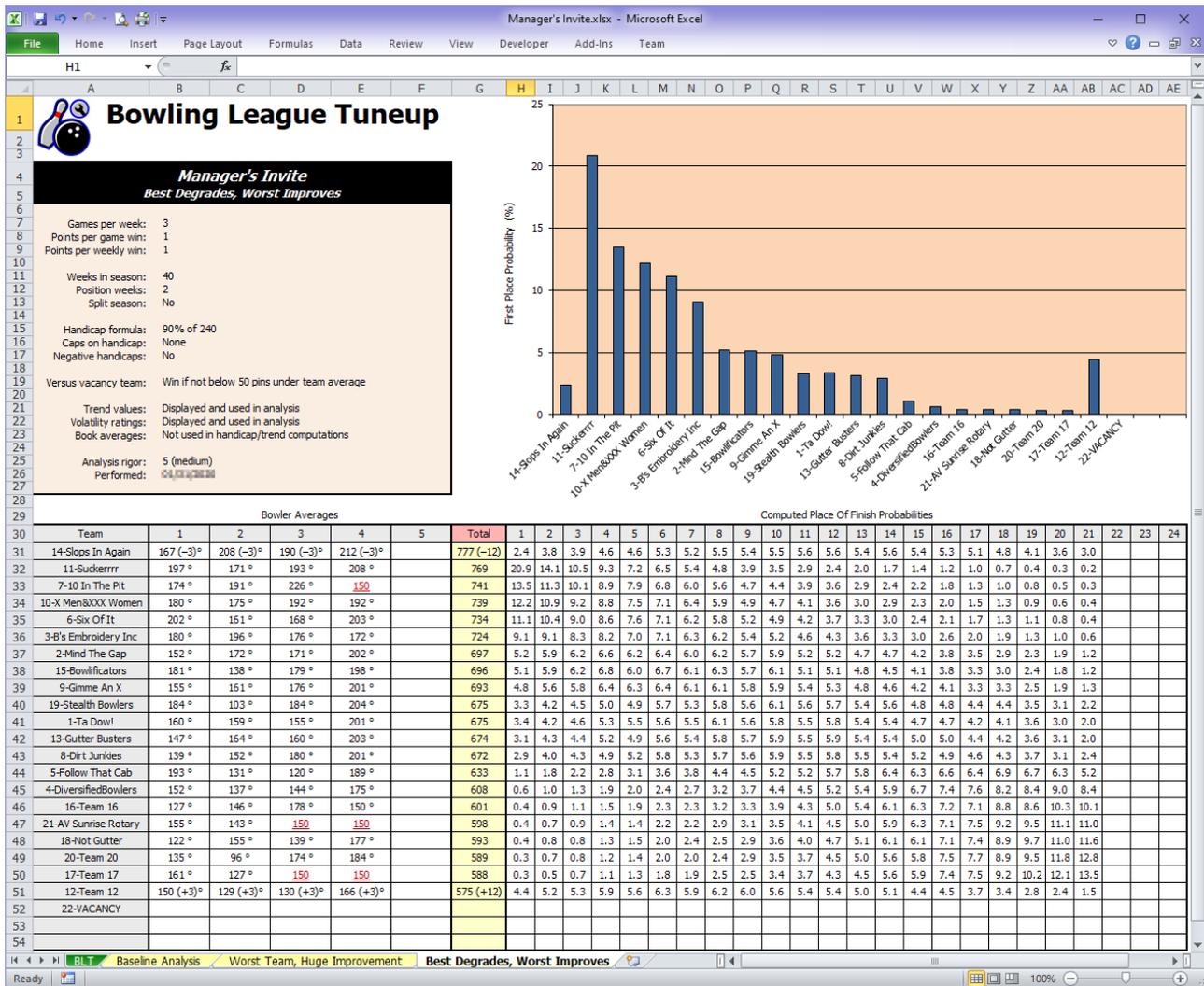
Modeling this scenario in Bowling League Tuneup, running the analysis, and then saving it (again without checking the Save League & Bowler Data checkbox), gives us the saved analysis sheet shown below.



It still doesn't look like there's much hope for team 12, especially given the unlikely assumption that not even one of the other 20 teams does better than average. Given how big an accomplishment this would be for team 12, we can see that there is virtually no hope it could ever be successful in this league, no matter how great it does.

Before we explore potential changes to the league's settings, we might first want to determine whether the league's problem is primarily caused by having a team in the league that is so much better than all the other teams. If that were the problem, the solution might simply be to limit the entering average a team can have.

To test this theory, let's add on to our previous analysis by assuming team 14 has the opposite kind of season that we assumed for team 12, with its team average going down 40 pins and ending the season with a poor trend of -12. We'll also do another mass change via the Define League window to set all bowlers to high volatility, since bowlers in this league showed a lot of volatility the previous season. We can do this by changing the new bowler template to high volatility and applying new bowler volatility to supplied data (which currently applies to all bowlers). Higher volatilities make outcomes in league matchups a bit less predictable, so this should even out expected results even more. After checking on the main screen that we're now using volatility ratings, running a new analysis, and then saving only the analysis (not the changes), let's see how these changes might affect the league's expectations.

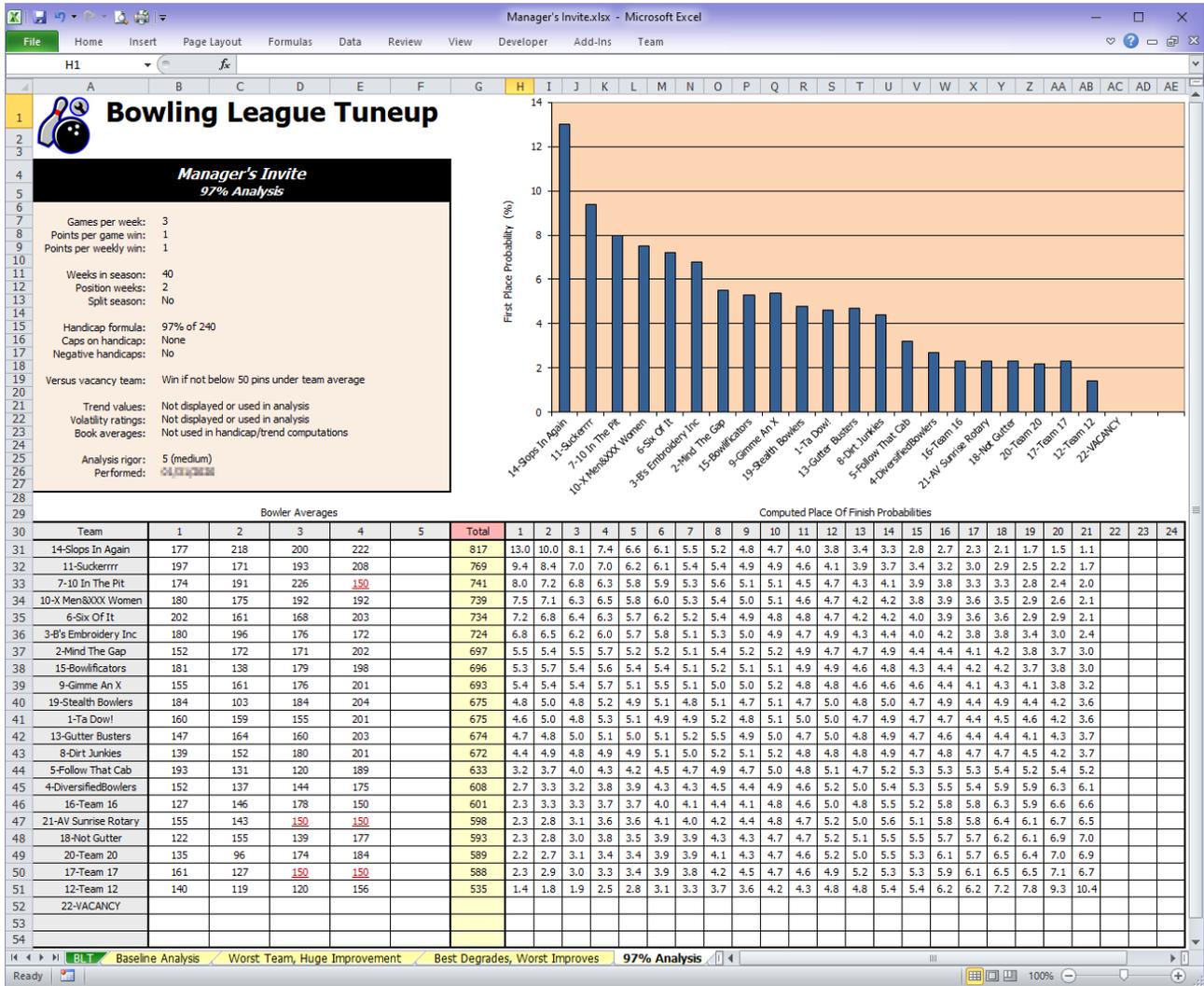


This shows that with a really terrible season, team 14 can be knocked way out of its position as a favorite. But this doesn't seem to help poor team 12 very much, with eight teams still having a better chance to finish first, even with the assumption of a great team 12 performance and average performances by all the other teams. It's clear a lot of the best teams would have to have horrible seasons before team 12 will see much benefit. It appears the size of the league, the length of the season, and the large disparity between the best and worst teams all seem to be working against this being a competitive league.

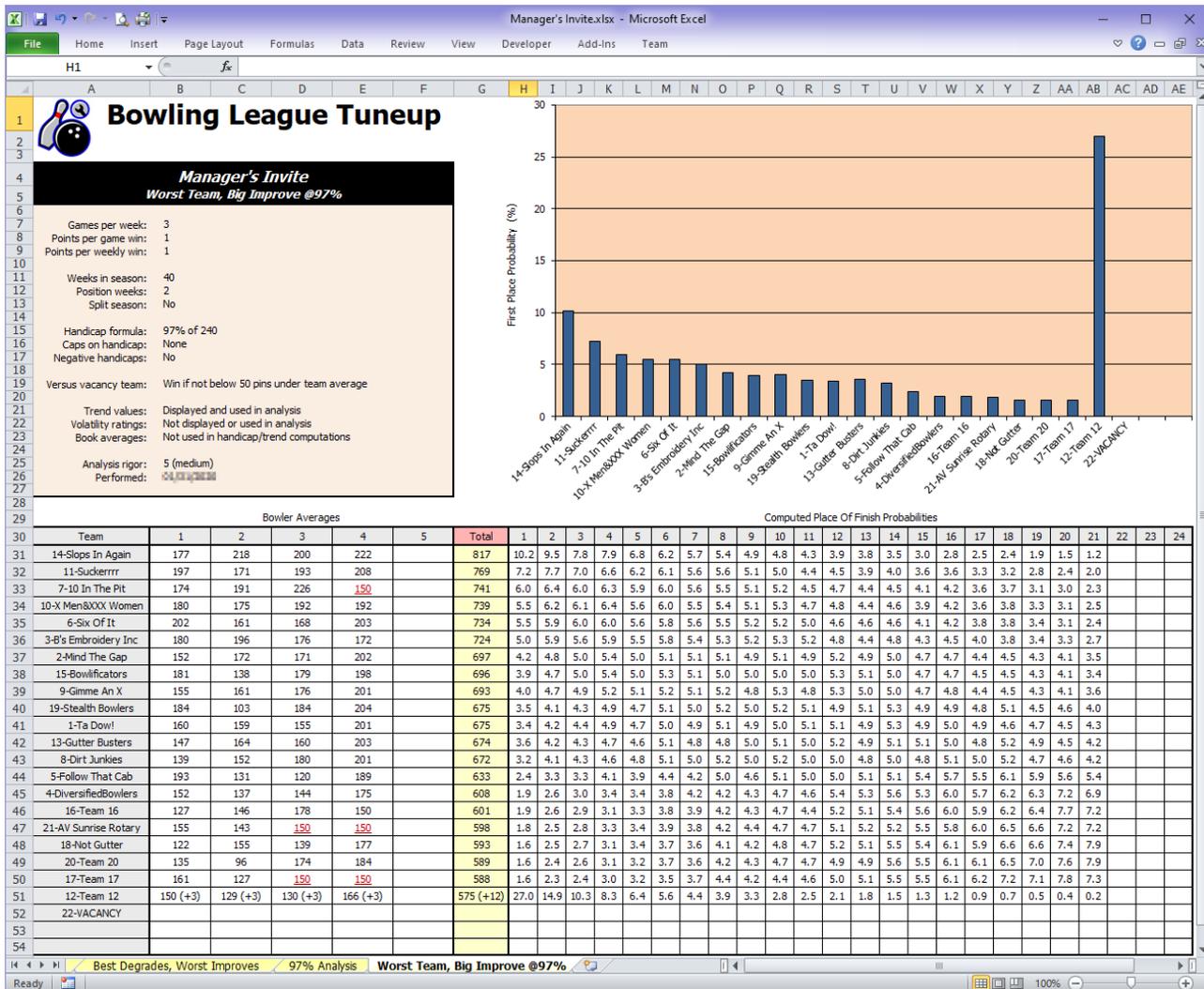
As a result of these analyses, the inescapable conclusion is that the league has not been set up well. At this point, the league manager could try having a split season and/or changing the handicap formula to tune this league up. If those results look promising, some more what-if analyses could be used to verify a proper tuning was done.

The tuneup process for this league showed that even with a 95% handicap, that same fantastic performance by team 12 would only boost its chances to slightly more than team 14's if team 14 did nothing more than perform exactly to expectations. And with a slew of high-average teams at the top, the chances that none of them would have above-average performances would be low.

Ultimately, the Manager's Invite league found that a non-split season with a handicap formula of 97% of 240 worked well. Shown below is the initial analysis at 97%.



This chart looks much more balanced than our initial analysis at 90% showed. The best teams still have an advantage over the poorer ones, all things being equal. Now let's again perform a what-if analysis with team 12 having a super-great season. We're hoping to see that such a season would be rewarded with good chances of success.



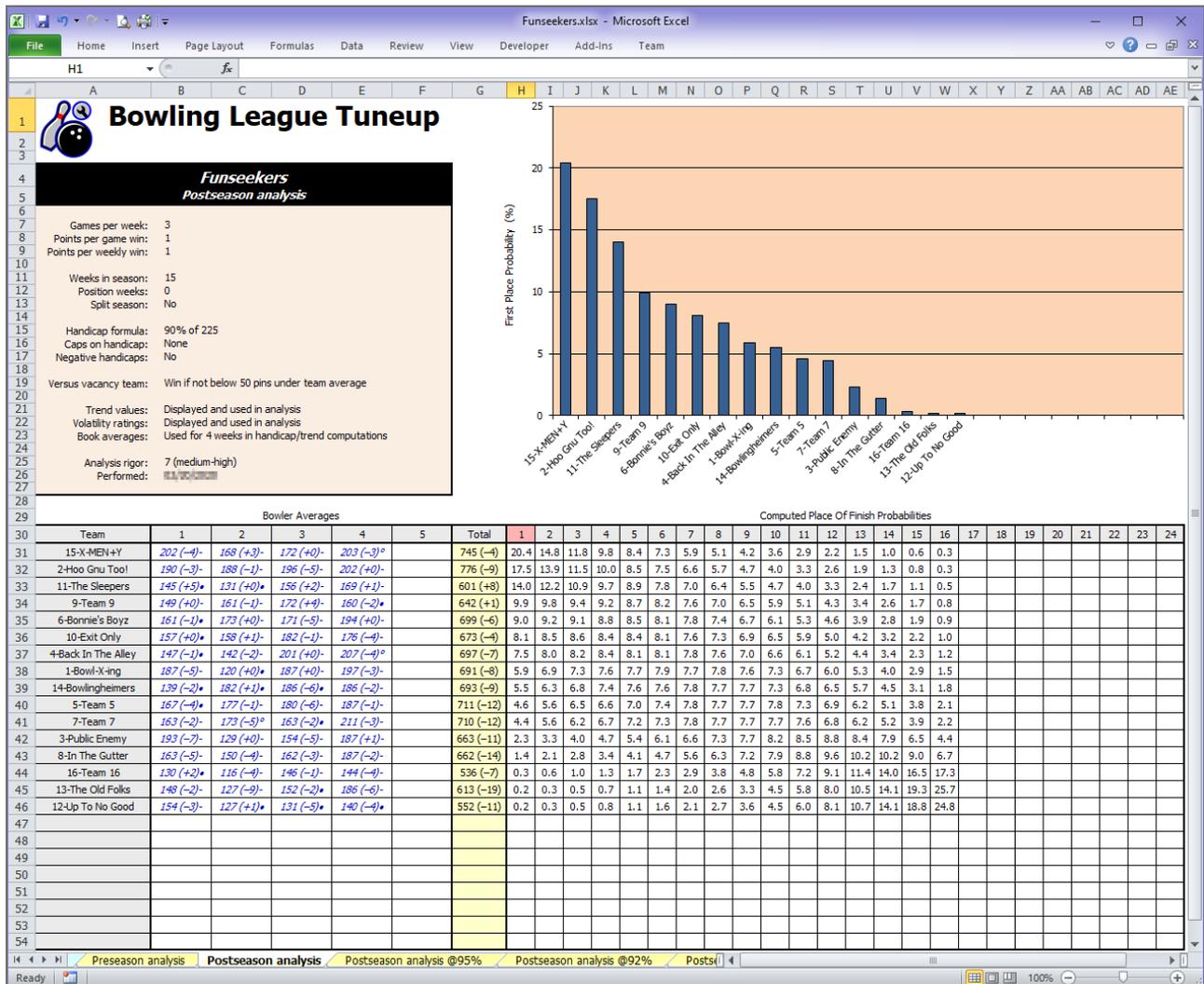
At first glance, it looks like team 12 just became a prohibitive favorite. But don't be fooled. Even doing amazingly better than all other teams relative to their skill levels, team 12 can only be expected to finish in first place around a quarter of the time. Some league managers might decide that their once-in-a-lifetime performance should warrant much better odds than these. These are the subjective decisions league managers must make when deciding on league attributes for an upcoming season. Bowling League Tuneup's analytical capabilities now allow those decisions to be based on mathematics, not just guesses.

Postseason inquiries

After a season is over, postseason league analyses can help answer questions about league results that could never be answered before. And the answers to those inquiries might point out potential changes to the league's setup in subsequent seasons.

Let's take one specific example. Looking back at the Funseekers league, we can see that team 5, which ended the season with the third-best team average, underperformed. Bowling League Tuneup's postseason analysis picked them to finish in the middle of the pack, and that's just where they ended up, despite their high team average. Surely, their team trend of -12 had a lot to do with

their mediocre results, but it appears the low trend value may have had as much to do with team attendance as it did with team scoring.



It turns out that team 5's four members missed a total of 33 games during the season. In all 33 games, the team took the absence penalty of 10 pins below the bowler's average rather than using a substitute bowler. The question is, how much of an effect did all those absences have on their chances during the season?

Bowling League Tuneup can easily answer this question. Bringing up team 5's first bowler, Izzy Missing, we see from these two views of the Edit Bowler window (scrolled to view weeks 1 through 10 and weeks 11 through 20) that Izzy missed five of the 15 weeks of bowling.

Izzy Missing

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

Use Computed Bowler Data

Book average (used for 4 weeks):

Week	1	2	3	4
1	166	157	151	
2	Abs (-10)	Abs (-10)	Abs (-10)	
3	Abs (-10)	Abs (-10)	Abs (-10)	
4	147	173	166	
5	190	157	182	
6	168	170	165	
7	Abs (-10)	Abs (-10)	Abs (-10)	
8	177	181	166	
9	187	158	166	
10	159	213	172	

Izzy Missing

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

Use Computed Bowler Data

Book average (used for 4 weeks):

Week	1	2	3	4
11	209	146	230	
12	Abs (-10)	Abs (-10)	Abs (-10)	
13	Abs (-10)	Abs (-10)	Abs (-10)	
14	150	151	124	
15	162	188	178	
16				
17				
18				
19				
20				

Having 15 absence games with a 10-pin penalty surely affected both Izzy's effective season average and trend. (Effective values include all games for Izzy's position on his team, including absence, substitute, and vacancy scores.) To determine how much the absences influenced these effective values, we can just click the Clear Red Scores button to remove the absence scores from his record.

Izzy Missing

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

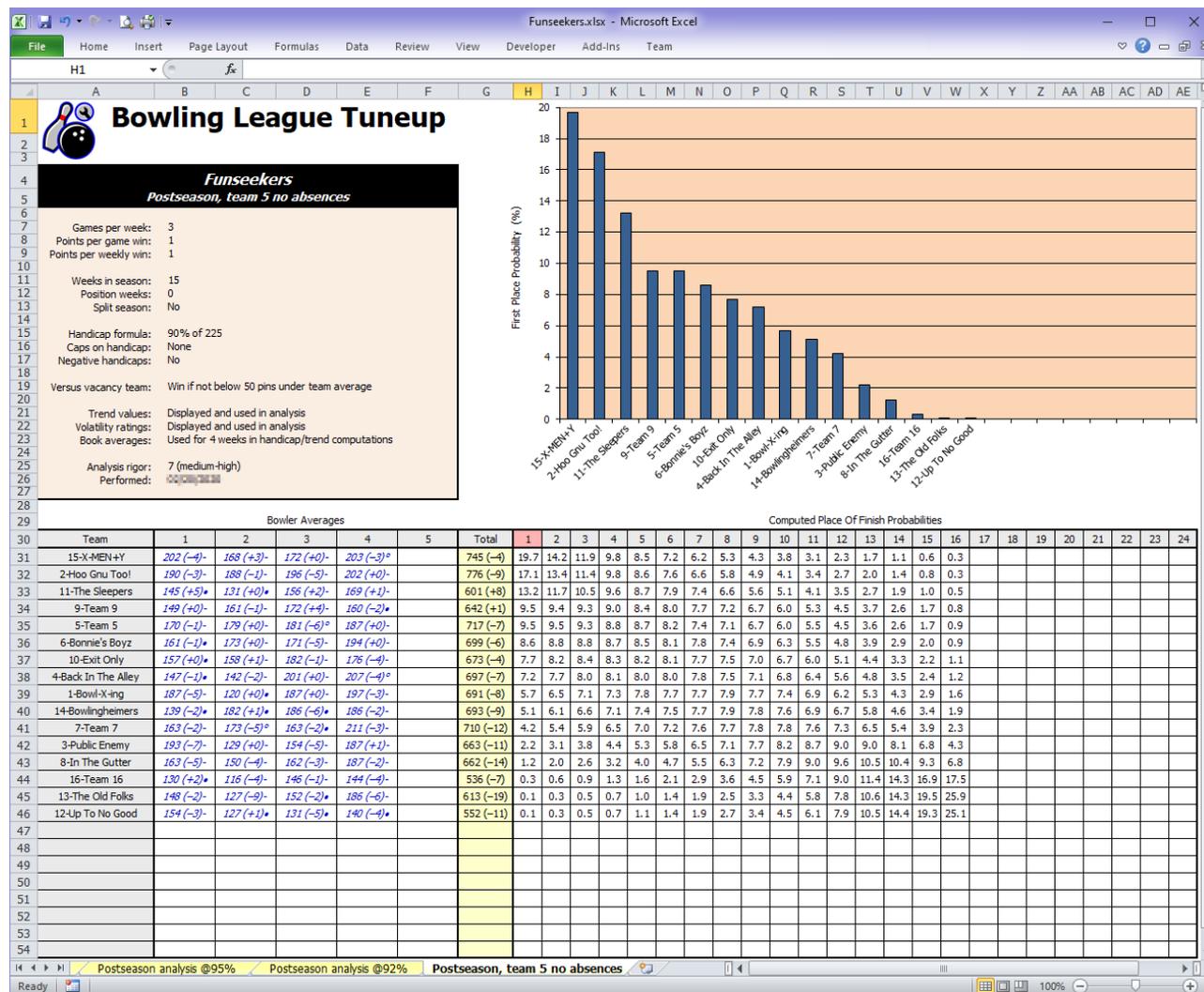
Use Computed Bowler Data

Book average (used for 4 weeks):

Week	1	2	3	4
1	166	157	151	
2	147	173	166	
3	190	157	182	
4	168	170	165	
5	177	181	166	
6	187	158	166	
7	159	213	172	
8	209	146	230	
9	150	151	124	
10	162	188	178	

We can see immediately that being absent for a third of the season reduced Izzy's effective season average by three pins and his trend by three as well. The absences certainly had a negative impact on Izzy's statistics – and therefore on the team. If that's all we wanted to find out, we could press Escape or click Cancel at this point to discard the changes. But we want to continue by pressing Enter or clicking OK, then proceeding to remove the absences from the other three bowlers on Izzy's team. Our goal is to determine what the team's prospects would have been if these bowlers had never been absent and instead had typical performances on the dates they missed.

So, with all of team 5's bowlers' absences being removed and all other league and bowler attributes remaining the same, let's do another postseason analysis using the league's actual settings.



Before, team 5 had a team average of 711 and a trend of -12, giving it a first-place probability of 4.6%, 10th best in the league. With typical performances in place of all the absences, we can see team 5 would have had a team average of 717 and a trend of -7, giving it a first-place probability of 9.5%, tied for fourth best in the league.

So what can we learn from this experiment? First, teams can see how much their chances in the league may have been hurt by poor attendance – something there has never been a way to find out before. But perhaps more significantly, the league manager can use these results to determine whether the absence penalty of 10 pins seemed to be appropriate for the league, or whether the

10-pin penalty should be raised to promote better league attendance or lowered to reduce the punishment for missing bowling nights.

Identifying potential cheating

We've mentioned the problems of sandbagging and dumping quite a bit. If a league records bowler scores in Bowling League Tuneup, the league manager can use BLT to look for signs of these activities.

When a bowler sandbags, i.e., intentionally establishes an artificially low average early in the season in order to make it easier to keep exceeding his or her established average throughout the season, we know by now that this bowler should stand out with a suspiciously high trend value.

The Pin Pals league we discussed earlier is shown below with a postseason analysis done after the full season was completed. This league has one super team, several teams in the middle of the pack, and a couple of teams at the bottom.

Bowling League Tuneup
Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7
5-El Capitan	131 (+4)-	177 (+17)*	155 (-2)*	224 (+0)*	687 (+19)	41.9	24.6	15.2	9.3	5.3	2.6	1.1
3-The Four Shots	181 (+3)*	220 (+5)*	236 (+0)*	234 (-11)-	871 (-3)	31.3	25.4	17.4	12.0	7.6	4.0	2.3
6-Pinheads	231 (-1)*	131 (+8)-	134 (+5)*	187 (-5)*	683 (+7)	13.6	18.8	18.5	18.6	14.3	10.2	6.0
1-In The Gutter	235 (+2)*	143 (+8)*	155 (+2)-	137 (-5)-	670 (+7)	12.1	17.8	18.4	18.9	15.0	11.1	6.7
2-Heatwave	131 (+1)-	165 (+3)-	113 (+10)-	172 (-6)-	581 (+8)	4.8	9.9	12.8	18.6	20.0	19.8	14.1
7-Alley Oops	169 (-9)-	180 (+2)*	190 (+10)*	130 (-6)-	669 (-3)	3.8	8.4	11.0	17.1	19.5	22.0	18.2
4-Aches & Pains	162 (+0)*	132 (+0)-	162 (+3)*	137 (-8)*	593 (-5)	0.9	2.9	5.0	10.4	15.2	28.4	37.2
8-VACANCY												

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season

Handicap: 90 % of 250, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always beat vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 7, <-- Low Rigor High -->, Analyze League

What stands out here is that team 5, with its very high trend value, actually has a higher chance of finishing in first place than team 3, with a season-ending average 184 pins above team 5's. The next thing that stands out is that the high trend value is most definitely not the result of a team effort, but rather the very high trend of bowler number 2. If we right-click on that cell, we can see above the left side of the grid that this bowler's name is Sarah Dipity.

To achieve a trend of +17 over a 12-week season is an amazing accomplishment – so amazing that the trend probability tables in Appendix E show us that we could pretty much never expect that to happen under normal circumstances. Let's take a look at Sarah's performance sheet.

Pin Pals.xlsx - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer Add-Ins Team

M1

Bowling League Tuneup



Sarah Dipity

League: Pin Pals
 Team: 5-El Capitan
 Book: 181 (not used in handicap/trend computations)
 Date: 10/11/2010 (week 12 of 12)

Week	1	2	3	Total	Avg	High	Low	Season Avg*
1	80	138	177	395	131.6	177	80	131.6 (+0)°
2	126	149	155	430	143.3	155	126	137.5 (+6)°
3	180	183	231	594	198.0	231	180	157.6 (+24)°
4	163	182	185	530	176.6	185	163	162.4 (+23)°
5	168	201	122	491	163.6	201	122	162.6 (+19)°
6	199	210	243	652	217.3	243	199	171.7 (+25)°
7	179	204	148	531	177.0	204	148	172.5 (+22)°
8	181	177	161	519	173.0	181	161	172.5 (+19)°
9	221	207	177	605	201.6	221	177	175.8 (+20)°
10	144	188	167	499	166.3	188	144	174.8 (+17)°
11	155	244	205	604	201.3	244	155	177.2 (+18)°
12	181	199	174	554	184.6	199	174	177.8 (+17)°

Games	12	12	12	36	Effective†	177 (+17)°
Total	1977	2282	2145	6404		
Avg	164.7	190.1	178.7	533.6	177.8	202.4
High	221	244	243	652	217.3	244
Low	80	138	122	395	131.6	80

* Includes trend (average pins per game above or below the average that handicap is based upon) and volatility (variability of game scores: • low, - normal, or ° high)
 † Includes any undisplayed absence, substitute, and vacancy scores for this bowler

Season Average

Weekly Scores

Weekly vs. Season

Weekly vs. Handicap Basis

Ready | Dolores Reyes | Michael Jefferson | Jaime Quinn | Sarah Dipity | Morris Santos | 100%

Given that Sarah ended the season with a 177 average, those first couple of weeks, and in particular the very first game of the season, look awfully suspicious.

To get an idea about the effect that first horrible game had on Sarah and her team, let's edit her scores, adding 100 pins to that first game score, bringing it to approximately her season average.

Sarah Dipity

Use Supplied Bowler Data

Average: Vacancy score

Trend:

Volatility: Low Normal High

Use Computed Bowler Data

Book average (not currently used):

Week	1	2	3	4
1	180	138	177	
2	126	149	155	
3	180	183	231	
4	163	182	185	
5	168	201	122	
6	199	210	243	
7	179	204	148	
8	181	177	161	
9	221	207	177	
10	144	188	167	

Clear All Scores Clear Red Scores Convert to Substitute

OK Cancel

This shows us immediately that by changing that one game, Sarah Dipity's season average went up three pins to 180, and her season trend went down eight pins to +9. To see how profound the effect of this change was on her team, let's accept the change by clicking OK and then do another postseason analysis.

Bowling League Tuneup
Pin Pals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7
3-The Four Shots	181 (+3)*	220 (+5)*	236 (+0)*	234 (-11)-	871 (-3)	37.6	23.3	15.3	10.9	6.8	3.9	2.2
5-El Capitan	131 (+4)-	180 (+9)-	155 (-2)*	224 (+0)*	690 (+11)	27.6	23.5	17.7	13.7	9.1	5.6	2.8
6-Pinheads	231 (-1)*	131 (+8)-	134 (+5)*	187 (-5)*	683 (+7)	16.4	19.5	17.7	17.5	13.5	9.6	5.7
1-In The Gutter	235 (+2)*	143 (+8)*	155 (+2)-	137 (-5)-	670 (+7)	15.1	18.1	17.6	17.7	14.4	10.7	6.5
2-Heatwave	131 (+1)-	165 (+3)-	113 (+10)-	172 (-6)-	581 (+8)	6.1	11.0	13.1	18.0	18.8	19.3	13.7
7-Alley Oops	169 (-9)-	180 (+2)*	190 (+10)*	130 (-6)-	669 (-3)	5.0	9.1	11.6	16.8	18.4	21.4	17.7
4-Aches & Pains	162 (+0)*	132 (+0)-	162 (+3)*	137 (-8)*	593 (-5)	1.3	3.3	5.3	10.4	15.1	27.7	37.0
8-VACANCY												

Place Of Finish Probabilities

League Management: Load League, Define League, Save League, Enter Scores, Import Scores, View League

Week: 3 Games bowled per week, 1 Points earned per game win, 1 Points earned per weekly win

Season: 12 Total weeks, 2 Position weeks, Split season

Handicap: 90 % of 250, Hdcp, Hdcp+score, Neg handicaps

Vacancy Teams: Bowl against vacancy scores, Always best vacancy team, Win if not below 50 pins under team average, Win if not below percent of team average

Computations: Use trend values, Use volatility ratings, Use book average for weeks in handicap computations (leave blank to use all season)

Analysis: 7, Analyze League

By modifying only that one game, team 5's chances of a first-place finish went down by a whopping 14%. Perhaps the better way to say this is that by bowling a single game 100 pins below her average on the first week of the season, Sarah Dipity increased her team's chances of a first-place finish by 14%. And by doing a little addition, we can see that the team's chances of a top-three finish went up by about 13%.

Ever since the beginning of handicap league bowling, people have known of the evils of sandbagging. Now we can quantify the advantage gained and see that, indeed, sandbagging, even when done for just one game, can pay large dividends for a team.

It is at this point that our lawyers are reminding us not to convict Ms. Dipity without a trial. We cannot be certain that the first game of the season represents a flagrant case of sandbagging. It is possible she was a victim of large amounts of bad luck and early-season rustiness, and that she was really trying her hardest. Of course, only Ms. Dipity knows the truth.

So, what can a league manager do to discourage this form of cheating? The common solution employed by leagues is to use book averages for the first few weeks of a new season. This practice can boost the fairness of any league, whether or not sandbagging is a major concern, by delaying the use of current averages to set handicaps until league bowlers have established averages which more accurately represent their bowling skills. It also has the benefit of discouraging sandbagging, as it can be counterproductive to a team's chances in a league if bowlers sandbag (and therefore lose a lot of games) during the book-average period. By the time the league reverts to basing handicaps on current averages several weeks into the season, a sandbagging team may have dug itself a hole, in the form of a poor win-loss record, too big to crawl out of by the end of the season.

Shown below is Sarah Dipity's performance sheet if the league had used book averages for four weeks. We'll assume she has a book average of 181, which is the average she ultimately achieved for the season (if you don't count that suspicious first game).

Pin Pals.xlsx - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer Add-Ins Team

M1 fx

Bowling League Tuneup

Sarah Dipity

League: Pin Pals
 Team: 5-El Capitan
 Book: 181 (used for 4 weeks in handicap/trend computations)
 Date: (week 12 of 12)

Week	1	2	3	Total	Avg	High	Low	Season Avg*
1	80	138	177	395	131.6	177	80	131.6 (-49)°
2	126	149	155	430	143.3	155	126	137.5 (-43)°
3	180	183	231	594	198.0	231	180	157.6 (-23)°
4	163	182	185	530	176.6	185	163	162.4 (-18)°
5	168	201	122	491	163.6	201	122	162.6 (-14)°
6	199	210	243	652	217.3	243	199	171.7 (-2)°
7	179	204	148	531	177.0	204	148	172.5 (-1)°
8	181	177	161	519	173.0	181	161	172.5 (-1)°
9	221	207	177	605	201.6	221	177	175.8 (+2)°
10	144	188	167	499	166.3	188	144	174.8 (+1)°
11	155	244	205	604	201.3	244	155	177.2 (+3)°
12	181	199	174	554	184.6	199	174	177.8 (+3)°

Games	12	12	12	36	Effective†	177 (+3)°
Total	1977	2282	2145	6404		
Avg	164.7	190.1	178.7	533.6	177.8	202.4
High	221	244	243	652	217.3	244
Low	80	138	122	395	131.6	80

* Includes trend (average pins per game above or below the average that handicap is based upon) and volatility (variability of game scores: • low, - normal, or ° high)
 † Includes any undisplayed absence, substitute, and vacancy scores for this bowler

Season Average

Weekly Scores

Weekly vs. Season

Weekly vs. Handicap Basis

Dolores Reyes Michael Jefferson Jaime Quinn Sarah Dipity Morris Santos

Ready 100%

Using book averages has caused Sarah's trend to reenter the atmosphere, ending the season at a much more modest value of +3. In other words, the use of book averages would have been very effective in diminishing the advantage – and therefore the temptation – of sandbagging.

The other form of cheating is dumping. This occurs when a bowler (or entire team) chooses not to bowl well whenever the outcome of a game or series has already been pretty well determined. This practice keeps averages artificially low and handicaps artificially high without sacrificing victories.

Dumping is a more insidious form of cheating than sandbagging because it's tougher to spot and it's tougher to thwart. Since intentional bad bowling is not limited to the beginning of the season but is instead spread throughout the season, trend numbers won't be dramatically inflated. And the use of book averages will not reduce the effectiveness of this form of cheating.

Any suspicion of sandbagging or dumping will most likely need to be observed for more than one season to diagnose these practices with a high degree of confidence. A single season with a trend value that's off the charts (see Appendix E) may be a big tipoff to potential sandbagging, but having very high trends season after season would provide even more compelling evidence of it.

Detecting dumping is trickier, but it can be done. Basically, what you're looking for is a team with a pattern of league success that continually exceeds the expectations indicated in Bowling League Tuneup's postseason analyses.

For example, we previously saw that team 14, Bowlingheimers, won the Funseekers league despite a postseason analysis showing the team had just over a 5% chance of a first-place finish, with half the league's teams being given a greater chance of finishing first. This kind of thing happens when you're dealing with the laws of probability, so this result in itself should raise no eyebrows. But if the team continues to exceed expectations like this season after season – or if this behavior seems to follow one bowler who's on different teams over several seasons – that would be a red flag.

Once that red flag is raised, you might want to start looking at the weekly results for the team in question. A team which engages in dumping will usually show a pattern of winning games and/or weekly series by smaller margins (since the team wants to bowl only as well as is required to win a game or series) and losing them by larger margins (since the team purposely bowls poorly once defeat appears assured).

While Bowling League Tuneup can't prove beyond all doubt that a bowler or team is sandbagging or dumping, it can provide compelling mathematical evidence of these practices. That makes BLT a valuable tool in a league manager's arsenal in his or her efforts to detect possible cheating and prevent leagues from being undermined by those cheaters.

Using Bowling League Tuneup as a research tool

Ultimately, perhaps the best way to think of Bowling League Tuneup is as a very special-purpose calculator that can be used at any time – before, during, after, or independent of a bowling league season – to answer all kinds of bowling-related questions.

The idea is to use Bowling League Tuneup to model a situation and quantify results that would be extremely difficult to calculate using mathematics. We used it in that capacity earlier, when we answered the question of how often a 180-average bowler could expect to beat a 165-average

bowler in a nine-game scratch series. This is the kind of simple question that there's never been a way to answer before.

To answer that question, we simply created (in Bowling League Tuneup) a scratch league with two one-person teams bowling one game per week for nine weeks, as shown below.

The screenshot shows the 'Bowling League Tuneup' application window. The main area displays a table titled 'Bowler Averages' and 'Place Of Finish Probabilities'. The table has columns for Team, 1, 2, Total, 1, and 2. The data is as follows:

Team	1	2	Total	1	2
1-Team 1	180		180	85.9	14.1
2-Team 2	165		165	15.6	84.4

Below the table is a control panel with several sections:

- League Management:** Load League, Define League, Save League, Enter Scores, Import Scores, View League.
- Week:** Games bowled per week (1), Points earned per game win (1), Points earned per weekly win (0).
- Season:** Total weeks (9), Position weeks (0), Split season (checkbox).
- Handicap:** % of (0), Hdcp, Hdcp+score, Caps, Neg handicaps (checkbox).
- Vacancy Teams:** Bowl against vacancy scores (checked), Always best vacancy team (checkbox), Win if not below pins under team average (checkbox), Win if not below percent of team average (checkbox).
- Computations:** Use trend values (checkbox), Use volatility ratings (checkbox), Use book average for weeks in handicap computations (checkbox).
- Analysis:** Rigor slider (set to H), Analyze League button.

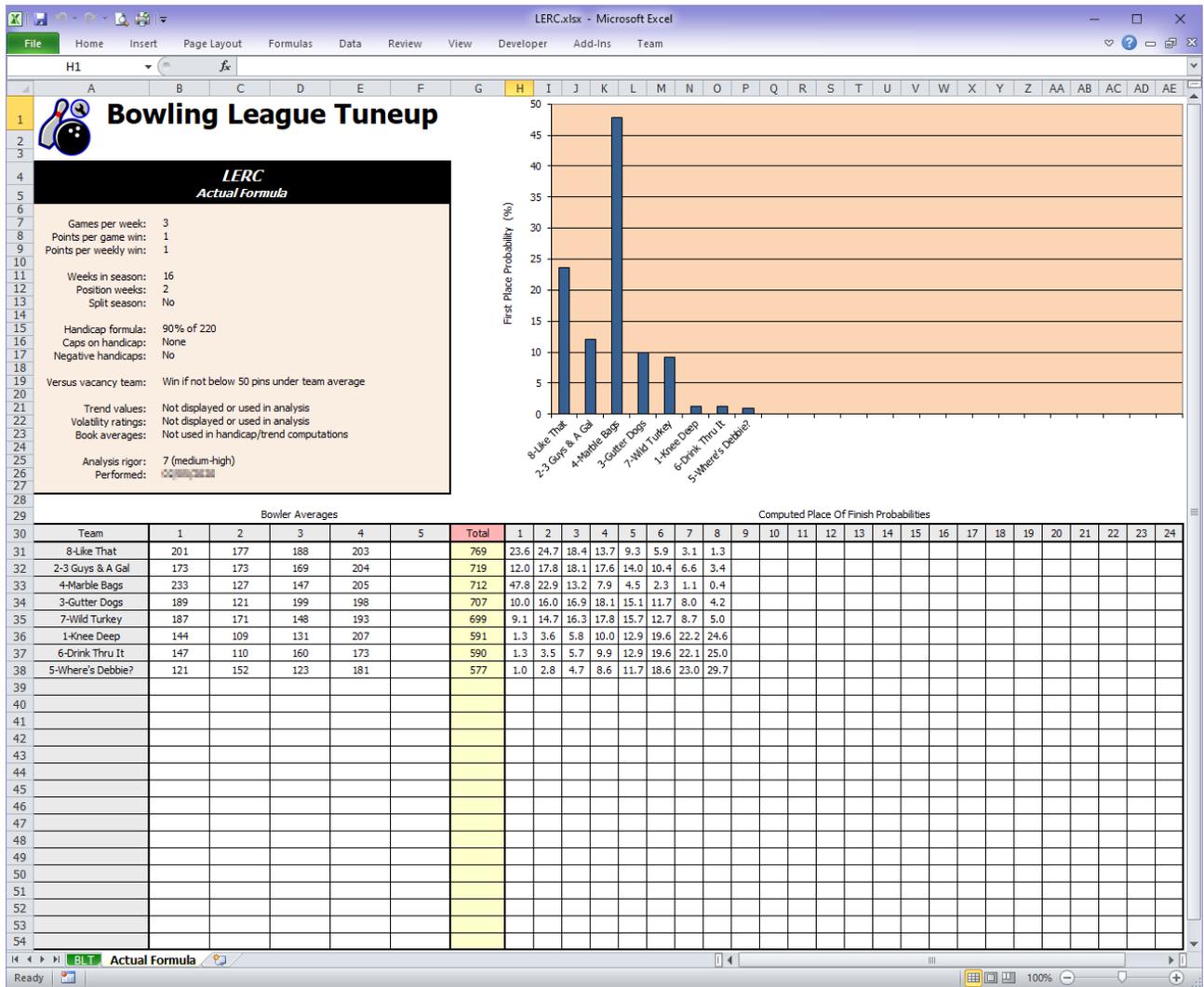
We set each win to be worth one point but did not assign points for a weekly win, so a nine-week "season" would be the equivalent of a nine-game head-to-head match. Note that we are not using volatility ratings, so the assumption is that each bowler has normal volatility. Setting high volatility for one or both bowlers would decrease the advantage of bowler 1 a bit, while setting low volatility would increase the advantage a bit.

Note that the same results could be obtained by setting up BLT to have the bowlers bowl three games per week for three weeks. Since games per week is limited to four and total weeks is limited to 50, this technique could be used to simulate head-to-head matches of up to 200 games.

This technique can also determine a bowler's chances of victory in one head-to-head scratch game. Just create a two-team scratch league with one bowler per team, enter the bowlers' averages, and set one game per week, one point per game win, and a one-week "season." When you analyze this "league" with high rigor, BLT will simulate a million matchups to give very accurate probabilities.

The use of BLT as a calculator isn't limited to hypothetical situations. For instance, what if you find that after a season is over, a bowler managed to attain an average above the league's handicap formula base number? By now you know that the poorly selected handicap base number gave this bowler an unfair advantage in the league. But how much of an advantage? Was it significant or not worth fretting over? Up until now, there's been no way to answer that question.

Now there is. We'll demonstrate how to do this by using another actual league as an example – a league the creator of Bowling League Tuneup was a member of.



A problem is immediately apparent in the LERC league. The teams are sorted in order of their averages, with trend and volatility data removed from consideration. So, with a 90% handicap percentage, we would expect to see the highest-average team with the best chance of finishing in first place and a steady decline of chances going down to the lowest-average team. Clearly, that's not what we're seeing.

Bowler 1 on team 4 achieved a season-ending average of 233, an admirable accomplishment. But the league's handicap base was only 220. As the league progressed, the creator of Bowling League Tuneup complained that team 4 had a tremendous and unfair advantage because of the improperly set handicap base. Unfortunately, most of the league actually believed that team 4 was at a *disadvantage* because bowler 1 was the only bowler in the league with no handicap to add to his scores. Attempts to explain the math to league members and the league secretary were futile – not that much could be done once the league was underway in any case.

It turned out that team 4 took first place that season by a very wide margin, despite their having only the third-highest average in the league. Before Bowling League Tuneup, there was no way to quantify the magnitude of the advantage team 4 gained from the improperly set base number. Comparing the analysis above to the one below, which uses a big-enough base number, that can now be done.

and then disbanded a few seasons after the one shown here, with bowlers on the poorer teams convinced (accurately) they would never have much of a chance to succeed in this league.

Using Bowling League Tuneup as a bowling league calculator can help league managers better understand expected outcomes in a variety of situations, both hypothetical and real. Armed with this knowledge, better decisions can be made when setting up bowling leagues – decisions that will make the leagues fun for all bowlers and contribute to the long-term health of those leagues.

CREATING LEAGUE LIBRARIES

Bowling League Tuneup workbook files contain information that is accessible from outside the Bowling League Tuneup application. This section discusses some of the ways you can use these workbook files to enhance Bowling League Tuneup's utility and collect the files to create a library of historical league records.

Congregating the data

One of the benefits of Bowling League Tuneup's use of Microsoft Excel to create league workbooks is that these workbooks can provide a convenient place to store league materials that aren't related to Bowling League Tuneup.

Up until now, you've been admonished not to modify Bowling League Tuneup's Excel workbook files. Now we'll make an exception. You are free to add your own worksheets, which we'll call custom worksheets, to a Bowling League Tuneup league workbook file as long as (a) the workbook is not currently in use by Bowling League Tuneup and (b) you add your worksheets *before* (that is, using tabs located to the left of) the BLT worksheet. Adding custom worksheets to a workbook does not affect your ability to use the workbook in Bowling League Tuneup.

The easiest way to add a custom worksheet to an existing league file is to open the file in Microsoft Excel, right-click on the BLT tab (or any tab to the left of it), click Insert, and select Worksheet. A new blank worksheet will be created before the tab that was clicked. You may add as many new worksheets as you want to the workbook, and you may give their tabs any names you like (as long as they don't conflict with existing tab names).

What you put in custom worksheets is entirely up to you. Excel worksheets can be used to store a wide variety of contents, from a spreadsheet of numbers (e.g., bowler weekly payment records) to rows of text (e.g., the official league rule sheet) to charts and graphs (e.g., season high scores) to graphics (e.g., scanned or copied images of league recap sheets and weekly league standings) to photos (e.g., team pictures).

Shown below is an example of a league that created a custom worksheet called Standings into which was pasted images of the league's standings from the end of each half of the league's split season, copied from the league's recap sheets.

Kings & Queens - Winter 2017.xlsx - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer Add-Ins Team

O61 fx

Kings and Queens Winter 2016/17 Page 1
 Tuesday 7:30 pm 11/29/2016 Week 15 of 31 Lanes 11 - 32
Pinz Bowling Center

Team Standings

Place	Lane	#	Team Name	Points	Points	Year-To-Date	Team	Pins +	Scratch	High Scratch		High HDCP		
				Won	Lost					WON	Ave	HDCP	Pins	10
1	22	8	Team 8	43	17	43	652	172	37342	29173	757	2163	938	2706
2	21	19	Insufficient Fun	40	20	40	746	89	38132	33425	847	2388	937	2657
3	18	3	Team 3	36½	23½	36½	648	178	37490	29819	786	2257	942	2716
4	15	10	Dictionary Sales	34	26	34	780	52	37433	34922	903	2465	958	2630
5	23	7	Slick Wood <3	34	26	34	670	151	37286	30143	799	2266	951	2761
6	28	17	King Pinz	34	26	34	622	194	36736	27814	721	2049	920	2577
7	30	16	Alley Oops!	34	26	34	564	246	36599	25691	742	2112	936	2694
8	24	4	Stiff Competitor	33	27	33	682	140	36994	30288	779	2143	928	2590
9	12	1	Pincasso	32	28	32	665	155	37034	28821	762	2131	943	2673
10	27	22	WDGAF	30	30	30	568	244	36621	25752	683	1879	916	2580
11	14	9	Sonic Pinz	29	31	29	622	195	36692	28135	801	2056	932	2538
12	26	14	Kylo Pinz	29	31	29	582	230	36687	26349	679	1936	900	2568
13	25	12	Fricken 10 Pin!	28	32	28	617	199	36760	27328	705	1964	915	2590
14	19	21	Eddie's Angels	28	32	28	510	294	36421	23245	604	1712	899	2620
15	31	20	WTF	27½	32½	27½	584	228	36459	26616	710	1987	931	2566
16	11	18	Team 18	26	34	26	662	159	37197	29370	786	2174	958	2672
17	16	5	Rollin' With The Homies	25	35	25	567	245	36876	25503	662	1830	930	2568
18	17	15	The Bubble Chops	25	35	25	568	243	33805	23565	637	1781	883	2532
19	20	2	Bowlistics	24	36	24	683	140	36764	30141	795	2294	954	2741
20	29	6	RELAMPAGO	24	36	24	554	256	36488	25172	654	1765	911	2529
21	13	11	The Fab SHOR	23	37	23	686	137	36735	30684	801	2252	937	2660
22	32	13	Blow Our Pinz	21	39	21	689	134	36336	30042	791	2200	928	2653

Kings and Queens Winter 2016/17 Page 1
 Tuesday 7:30 pm 03/28/2017 Week 30 of 31 Lanes 11 - 32
Pinz Bowling Center
***** Have FUN! No points awarded this week! *****

Team Standings

Place	Lane	#	Team Name	Points	Points	Year-To-Date	Team	Pins +	Scratch	High Scratch		High HDCP		
				Won	Lost					WON	Ave	HDCP	Pins	10
1	15	5	Rollin' With The Homies	48	12	73	605	209	75678	54069	806	2086	1032	2741
2	13	3	Team 3	42½	17½	79	621	195	74513	58229	786	2257	942	2716
3	23	13	Blow Our Pinz	40½	19½	61½	705	120	74150	61997	855	2245	979	2653
4	19	9	Sonic Pinz	38	22	67	637	180	74252	57601	801	2110	941	2695
5	28	18	Team 18	33	27	59	670	151	74625	59820	786	2195	958	2672
6	14	4	Stiff Competitor	32	28	65	680	143	74028	60884	834	2270	982	2714
7	12	2	Bowlistics	31	29	55	671	150	73102	59937	795	2294	954	2741
8	22	12	Fricken 10 Pin!	31	29	59	616	200	73658	55703	771	2075	947	2608
9	18	8	Team 8 RD1	30½	29½	73½	673	153	74511	59358	791	2189	946	2706
10	27	17	King Pinz	30	30	64	621	195	73342	55681	737	2049	932	2577
11	17	7	Slick Wood <3	29	31	63	670	151	74309	60494	834	2266	987	2761
12	20	10	Dictionary Sales	28	32	62	777	55	74637	69588	941	2505	997	2673
13	29	19	Insufficient Fun	28	32	68	741	86	75273	66465	858	2498	947	2762
14	24	14	Kylo Pinz	28	32	57	573	239	72991	51970	679	1936	900	2568
15	11	1	Pincasso	27	33	59	664	155	73547	58362	812	2131	965	2673
16	31	21	Eddie's Angels	27	33	55	514	291	72947	46694	615	1748	907	2620
17	25	15	The Bubble Chops	26	34	51	571	240	65443	45816	642	1809	883	2535
18	32	22	WDGAF	24	36	54	620	196	73627	53527	746	2065	948	2671
19	21	11	The Fab SHOR	23	37	46	687	136	73479	61446	801	2252	937	2660
20	16	6	RELAMPAGO	21½	38½	45½	582	231	72748	50758	658	1839	911	2535
21	26	16	Alley Oops!	21	39	55	572	240	73424	51794	742	2112	936	2694
22	30	20	WTF	20	40	47½	584	229	73128	53256	710	1987	931	2566

Standings BLT Drew Lyons Suzanne Beck Lee Long Camerdi

Ready 100%

This Standings worksheet preserves the official league results in the Bowling League Tuneup file itself, where it can be easily accessed in order to compare analysis results with actual results. The league could have chosen to include images of the standings from all weeks of the season, and it could have chosen to paste them all into one large worksheet or to create one new worksheet to store each week's standings. There are no restrictions on what is stored or how it is organized in the workbook – as long as all tabs are inserted before the BLT tab.

Creating custom worksheets can allow you to congregate virtually all items associated with a bowling league into one workbook. In this way, a single Excel file can contain a full historical record of the league. That entire record can be accessed by simply opening the workbook file in Excel, where you can peruse Bowling League Tuneup's alphabetized list of league bowlers, the charts and graphs containing the season's performances of all league bowlers, all saved league analyses, and all league information you've saved in custom worksheets within the workbook.

By gathering your collection of league workbook files into a logically organized folder structure, you can create a bowling league history library whose full contents you can access using nothing more than Microsoft Excel.

Searching the data

When you have a library of league workbook files, you sometimes may not know which files contain the information you're looking for. In these instances, you'll want to search the library. For instance, if you want to find a bowler's past history at the bowling center but don't know which leagues the bowler has been in, it may be necessary to search the contents of all the files in your library. Windows Explorer/File Explorer makes this easy to do.

In order to search the contents of a group of files, those files should be stored together – either all in one folder or in separate folders contained within a parent folder. In the latter configuration, you may choose to create a folder called Leagues to store all Bowling League Tuneup league workbook files. Within that folder you may create one folder for each league run by your bowling center. Within each league folder you may store one league workbook for each season you've recorded in Bowling League Tuneup, being sure to include the season date in each file name.

Once you've created a library of Bowling League Tuneup workbook files, you can use Windows to search the library. The method used to do the search depends on the version of Windows you're using. In older versions of Windows, you can right-click on the parent folder and then click Search to specify a search string. In later versions of Windows, you can navigate to the parent folder, then type a search string in Explorer's search field. Either way, the result of the search will be a list of all files in the parent folder and all its subfolders in which the search string was found. All worksheets in a league workbook file will be searched.

If the search string contains spaces, Windows will search for occurrences of *any* of the words in the search string. To search for a string that contains spaces (e.g., a first and last name), enclose the string in double-quotes. Note that due to Windows limitations, some special (non-alphabetic, non-numeric) characters may not work properly in searches.

While it's most common to search for bowler names and team names, you may search for any string that will help you find the files you're interested in. All that's required to make it easy to find files is a good organizational scheme combined with a good file-naming scheme.

Mining the data

While it's nice to be able to view bowler performance sheets and league analysis sheets from past seasons, probably the biggest benefit from keeping league files is to be able to "mine" that collection of historical data to extract hidden nuggets of information.

To illustrate this, let's consider the process discussed earlier of creating what-if scenarios designed to determine a league's fairness. This will often involve setting hypothetical bowler averages and trends to determine what values might be required to bring a team into contention. But what kinds of numbers can bowlers be reasonably expected to achieve? The best way to find out is to mine your Bowling League Tuneup library.

Looking up historical data can uncover, for instance, the variability in a bowler's averages from season to season. With this information, the likelihood of the bowler improving his or her average by, say, five pins next season can be grasped better.

Trends, in particular, are not a very intuitive concept. Having a library of past leagues allows a league manager to peruse actual historical performances to look for the typical range of trend values that have been achieved by bowlers and teams in similar leagues of about the same length. This information, along with the tables in Appendix E, can give a league manager a good feel for the range of trends that can be expected of bowlers and teams, and this knowledge can be put to good use during the league tuneup process.

There are, of course, other, more punitive, uses for historical data. Specifically, if a bowler or team is suspected of sandbagging, the best way to confirm this suspicion is to show a historical pattern of this behavior. For instance, any bowler can have a bad week to start the season. But if the same bowler averages significantly below his or her final season average on the first week of almost every league season, that begins to look more like cheating than random chance. The only way to make this discovery is to have access to bowler records going back multiple seasons.

Perhaps a simpler approach to identifying sandbagging is to simply look at the season-ending trend values for a bowler or team going back many seasons. A bowler or team engaging in this practice will consistently end each season with a large positive trend, indicating general improvement throughout the season. When this happens predictably, especially if Appendix E indicates the trend values found would normally occur quite rarely, it becomes more and more difficult to attribute this to luck. Again, a Bowling League Tuneup library makes it possible to review historical trend values in the search for sandbaggers.

Using book averages at the beginning of the season is usually a successful antidote to sandbagging, greatly reducing the need to detect it. But this doesn't solve the problem of dumping, where throughout the season a bowler or team stops trying to bowl well whenever it is not necessary to do so. Since this practice has no easy antidote, it is especially important that it be detected.

We know from our earlier discussion that the way to spot teams that don't try their hardest when victory or defeat appear assured is to find teams that consistently do better than a Bowling League Tuneup postseason analysis predicts based on season-ending averages and trends. And the only way to make this discovery is to be able to review many seasons of historical records.

Sharing the data

Because Bowling League Tuneup stores files as standard Excel workbook files, league files can be shared with people and bowling centers who don't have access to the Bowling League Tuneup application. The workbook file, containing bowler performance sheets, analysis sheets, and custom sheets, can be viewed and printed on any computer that has Microsoft Excel installed.

Of course, you'll have to have your own copy of the Bowling League Tuneup app in order to run analyses on these files – or to create your own league workbook files.

APPLICATION INFORMATION

This section delves into some of the inner workings of Bowling League Tuneup. This is optional reading. It is here primarily for the curious and the skeptical.

Monte Carlo simulations

A common question about Bowling League Tuneup is a simple one: How does it work?

Most people assume it's just doing math to figure out all the probabilities. The problem is, the math would be prohibitively complex. With all the attributes of potentially dozens of bowlers and all the possible league settings, there are just too many variables to account for.

So BLT uses something called Monte Carlo simulations. The idea is to create an accurate model of the thing being evaluated – in this case, a bowling league – and then run a huge number of simulations of a process being applied to that model – in this case, a bowling season. The more simulations that are run, the closer the results will be to the mathematically correct answer – in this case, teams' place-of-finish probabilities.

This process is perhaps best illustrated by a simple example. Let's use a Monte Carlo simulation to try to estimate the odds of rolling any total with two dice.

This is a very easy simulation to create. All we need to do is generate a random number between 1 and 6, simulating the rolling of one die, then do it again to simulate the rolling of the second die. Then add those two results together, record the total, and repeat this process, oh, a million times. After this has been done, just divide the number of times a specific total was rolled by a million to get the percentage of the time that total was rolled. The results we get will be very close to the mathematically correct answers – without doing the math.

To get an even more accurate result, we can repeat the process 10 million times. The more times the process is repeated, the closer the results will be to the mathematically correct answer.

The nice thing about this example is that it is actually easy to calculate the mathematically correct answer, so we can see if our simulation is working properly. Let's look at the odds of getting one specific total on the two dice – say, 6. We know that there are five ways to roll a 6: 1-5, 2-4, 3-3, 4-2, and 5-1. And we know there are 36 different possible results of rolling the two dice (1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 2-1, 2-2, 2-3, . . . , 6-4, 6-5, and 6-6). So there should be a $5/36$ chance of rolling a 6 – which, rounding off to four decimal places, comes out to 13.8889%.

Let's have our Monte Carlo simulation program perform a million dice rolls, and let's run that simulation five different times to compare the results. The five results we get are as follows:

13.8649%
13.9059%
13.8988%
13.8725%
13.9032%

We can see that all of these results are very close to the mathematically correct answer.

Now let's have our simulation program perform 10 million dice rolls. Running that simulation five different times yields the following five results:

13.8899%
13.8906%
13.8901%
13.8885%
13.8895%

We can see how, with more dice rolls, the simulation is zeroing in on an extremely accurate answer. And all without doing any of the math to figure out the exact answer.

Because we could do the math, we didn't need to run a Monte Carlo simulation to determine the odds of rolling various totals with two dice. But we can't do the math for a bowling league, so Monte Carlo simulations are all we have. Fortunately, as we can see, as long as the model is constructed accurately, this technique can produce very accurate results, even when the math would be hopelessly complex.

Application architecture

In order to produce mathematically valid results, Bowling League Tuneup must be able to generate a mathematically valid set of scores for each league bowler. While the algorithm to do this is not as simple as the one to mimic a series of dice rolls, it can nevertheless be done via relatively straightforward mathematical techniques, using bowlers' averages and volatilities to characterize their scoring patterns.

Bowling League Tuneup must then duplicate every variable factor in a bowling league. As suggested by all the options on the main screen, BLT scrupulously mimics all bowling league attributes as it simulates an entire season of bowling. For each simulated week of the season, it pairs up teams according to a standard bowling league schedule, with each team meeting each other team once before the cycle starts over again. The exception is for position weeks, when teams are paired up according to the current (simulated) league standings.

In each simulated week, scratch scores are generated for each bowler, as described above, and then handicaps are then applied to all scores, using either current or book averages as appropriate – but only after those handicaps have been adjusted, based on bowler trend values, to mimic mathematically the bowler's overall season improvement or degradation. Then game and series results are totaled, and points are awarded to the winning teams. This process is repeated for the total number of weeks in the league season, at which point the final standings are determined. (For

split seasons, the higher place of finish out of the two halves of the season is recorded for each team.)

This simulation of a full bowling season is repeated anywhere from approximately a thousand times (low rigor) to a million times (high rigor). At the end of each simulated season, each team's place of finish is recorded. At the end of the full simulation, the final tally of each team's places of finish is used to compute the probabilities that are displayed.

Great pains have been taken in the architecture of Bowling League Tuneup to accurately mimic all factors which affect the outcomes in a bowling league. We believe the results produced by BLT are extremely accurate assessments of teams' actual probabilities of success in a league.

Mathematical challenges

Bowling League Tuneup is the result of several years of research, coding, and testing. During that time, several mathematical challenges were faced. We'll discuss some of them here.

Let's start with a problem that reared its ugly head throughout the coding process: round-off issues. In league bowling, decimal places are shunned. Bowler averages and handicaps are always forced to be integers – not by rounding, but by simply ignoring the decimal part of the number. An average of 144.98 is recorded as an average of 144.

Originally, Bowling League Tuneup mimicked this rule exactly. But difficult-to-explain anomalies kept popping up. The problem was caused by the truncation of handicaps, and it can best be seen with a simple example. In a 90% of 240 league, a bowler with a 148 average would have a handicap one pin greater than a bowler with a 149 average. But a bowler with a 149 average would have the exact same handicap as a bowler with a 150 average. This is because the 149-average bowler's untruncated handicap is 81.9 and the 150-average bowler's is 81.0.

In a handicap league, a bowler who raises his or her average by one pin will usually have his or her handicap lowered correspondingly, but there are certain magic averages, like 150 in the league just described, where a raised average is not accompanied by a lowered handicap. This gives a subtle advantage to bowlers who can achieve those magic averages.

In a league situation, this slight advantage is barely worthy of mention. But when millions of games are being generated to approximate exact probabilities, that slight advantage can be magnified to produce seemingly inexplicable results. In the league above, a 149-average bowler would correctly show a slight advantage over a 148-average bowler, but a 150-average bowler would show a much larger advantage over a 149-average bowler. This is not what anyone expects or wants to see.

How should Bowling League Tuneup deal with this? By doing an exact simulation of a league situation, BLT will properly show seemingly bizarre inconsistencies in its results. By truncating values *after* calculations are performed, BLT will produce results which better conform with expectations and produce mathematically defensible outcomes, even if the crude math of bowling leagues doesn't live up to that standard.

After considerable consideration of this issue, we opted to take the latter route, i.e., doing better math than a bowling league does. Doing a perfect simulation of league methods would occasionally produce results that would cause the accuracy of the program to come into question. And who

knows? Maybe there really are leagues out there that do the math properly. We wouldn't want to present mathematically inaccurate results due to the dumbing-down of the application.

The same reasoning went into another decision, namely how to treat similar mathematical issues resulting from the use of vacancy scores. Vacancy scores are added in with all the simulated bowler scores when determining team wins and losses. But, unlike bowler scores (simulated or actual), vacancy scores never change. And that lack of change can cause the same kinds of round-off problems we just described.

Mathematical biases are introduced whenever results are rounded off to integers. But with a large amount of data, those biases tend to cancel themselves out, with some results rounding one way, other results rounding the other way. But this cancellation process doesn't happen if the exact same number (i.e., the vacancy score) is processed each time. Instead, rounding biases are magnified, as previously described. The result is that, for instance, a 150-average bowler may not (depending on the handicap formula) compete equally with a vacancy score of 150.

Again, we chose not to faithfully simulate inadvertently created biases in the real system. We've taken steps to cancel biases in vacancy scores so that, again, the integrity of the Bowling League Tuneup program does not come into question and so that actual results sync with expected results whenever possible.

Not all mathematical issues involve round-off errors. Obvious biases are built into any league in which every team doesn't bowl against every other team an equal number of times. Some teams will end up bowling a poorer opponent more than other teams will, while some teams must bowl a tougher opponent more than other teams will. (We'll exclude position weeks from this discussion, as the biases those weeks create are intended.)

To merely simulate a full season with a standard league schedule presumes that the league is using the exact same schedule of team pairings that Bowling League Tuneup is using, which may not be the case. Worse, the league analysis (not to mention actual league results) could be altered by merely reordering the teams. We deem that to be completely unacceptable.

So, once again, we've opted to, shall we say, improve upon reality. If the number of weeks in the season does not come out as an even multiple of the number of team pairings, BLT uses an interpolation technique to remove the effects of an unequal number of team pairings.

This is the most blatant example of Bowling League Tuneup failing to exactly reproduce league attributes. But it is done for a very good reason. Given that there is no way to assure the simulated team pairing schedule matches the actual league schedule, it is really the only reasonable decision. The end result is that BLT simulates a slightly fairer environment than exists in reality. How much fairer is unclear, but any league manager who configures a league to allow teams to bowl against some teams more times than other teams is implicitly stating that the unbalanced schedule is essentially irrelevant in influencing league outcomes. BLT must make this same assumption.

Mathematical skepticism

Using an early version of Bowling League Tuneup to convince his bowling league that the league had not been set up fairly, the creator of BLT found himself dealing with a good amount of skepticism over whether there was any merit in his efforts. Some questioned the correctness of the

algorithms used, while others questioned whether it was even possible or meaningful to compute teams' probabilities of success.

The latter form of skepticism came directly from the league secretary, who said, "I understand what you're saying, but I think you're ignoring the human factor."

When pressed to elaborate, she said she believed that probability assessments are essentially meaningless because a bowler's performance in any given week is unpredictable. Bowling League Tuneup simply can't know whether a bowler or team will have a breakout performance one week, thus invalidating its carefully calculated odds. So, since a poorer team can have a great week and vanquish the toughest of opponents, there is no reason why that team couldn't do that consistently throughout the season.

The problem with this explanation is that it ignores reality. This is like saying that when a career .275 hitter in the major leagues averages .400 in the month of April, it is reasonable to believe he has a good shot at maintaining that pace and ending the season with a .400 batting average. In real life, this never actually happens. Over time, hitters tend toward their historical batting averages. Likewise, bowlers' historical performances provide insight into their future performances.

It is certainly true that in any given week, a bowler's performance is unpredictable – in the same way that the result from a single roll of a pair of dice is unpredictable. But over the course of a season, the summarized set of scores rolled by a bowler with a given average and volatility is actually fairly predictable, in the same way that the summarized list of rolls from a pair of dice in an all-night craps game is fairly predictable. (The fact that dice-rolling results are predictable is what keeps casinos in business.)

Those who accept the premise that probabilities of success can indeed be computed often question Bowling League Tuneup's actual assessments because they don't jibe with their intuitive feel for what the probabilities "should" be. Interestingly, more people accept BLT's assessments of scratch leagues than of handicap leagues.

This dichotomy is understandable, since we expect that the best teams will almost always win in scratch leagues – which Bowling League Tuneup will show to be the case – but we've been led to believe that similarly large differences in chances of team success should not be seen in handicap leagues. Furthermore, we can see that handicaps usually bring the poorest bowlers' handicap averages to within just a few pins of the best bowlers' handicap averages, so it appears that handicaps are doing exactly what they are intended to do, namely bring teams of widely varying abilities into relative parity.

Perhaps the best way to illustrate why perception may differ from reality is via an example. Consider a scratch league with just two teams and four bowlers on each team. The league bowls three games a week for 20 weeks. If all the bowlers on team 1 end the season with a 180 average and all the bowlers on team 2 end up with a 175 average, what do you suppose team 1's chances of a first-place finish are?

Most people expect that team 1 will come in first place either always or almost always. After all, every bowler on that team did better than every bowler on the other team, and scratch leagues are supposed to reward the teams that bowl best.

Modeling this scenario in Bowling League Tuneup, we see that, indeed, team 1 can be expected to come in first place almost 97% of the time in this league. This result jibes with most people's expectations.

Now let's change our league from scratch to a 90% handicap league. Team 1's bowlers still all end up averaging 180, but let's say team 2's bowlers all finish with a 130 average.

Because this is a handicap league, most people see this scenario as being fundamentally different from the scratch-league example. They expect that the large difference in averages between the bowlers on the two teams will be largely compensated for by the handicap. Sure enough, the handicap makes up for all but five pins of the 50-pin difference in the bowlers' averages – seemingly an almost insignificant advantage for the higher-average bowlers. After all, how many games are decided by five pins or fewer? So most people expect that team 2 will still have a good chance of success in this league.

As you may have suspected, this handicap league is mathematically identical to the scratch league. In both leagues, each team 1 bowler has a five-pin advantage over each team 2 bowler. Modeling the handicap league in Bowling League Tuneup, we see the results are identical to the scratch league's. Again, team 1 has an almost 97% chance of finishing in first place. The problem is, this is a handicap league, whose purpose is to level the playing field for all participants. But it doesn't appear that this handicap formula did a very good job of leveling.

The point of this exercise is to show that setting up handicap leagues is usually far from an intuitive endeavor. While handicaps may bring poorer bowlers' results to within just a few pins of better bowlers' results, that seemingly small advantage for the better bowlers can become quite significant when applied to every game over a full season of bowling. We expect this to be the case in scratch leagues, but most people find the results surprising in handicap leagues.

In the scratch league, all the team 2 bowlers have to do is improve their averages by a few pins to get into contention. But with a 50-pin difference in the bowlers' averages in the handicap league, the bowlers on team 2 have little hope of improving enough to have a shot at beating team 1. Only with astonishing trend values would team 2 ever have a decent chance of success in this league. And since real leagues have many more teams than this, team 2 would have to defeat many more teams than just team 1. The bottom line is that with team average disparities this large, a 90% handicap does not appear to be appropriate.

The hope is that anyone willing and able to work through examples like this one will understand the computational similarity of scratch and handicap leagues, and will understand the power that just a few pins of advantage has over the course of a full season in both scratch and handicap leagues.

With luck, this kind of explanation is all it will take to convince skeptics that Bowling League Tuneup really is taking the "human factor" into account in its mathematics, and that handicap leagues can be just as biased as scratch leagues. If this doesn't do the trick, perhaps the long-term accuracy of Bowling League Tuneup's analyses will.

Official research

Before embarking on the project to create Bowling League Tuneup, its creator did countless Internet searches to find a tool which would compute teams' chances in a bowling league. He came up empty, which provided the spark to initiate the BLT project.

Published research on the mathematics of bowling leagues was disappointingly sparse as well. The U.S. Bowling Congress site (www.bowl.com) contains documents such as Playing Rules, in which the USBC recommends the use of 100% handicaps. They base this recommendation on their contention, documented in the Mythbusters document located at that site, that handicap leagues are not fully leveled until the handicap percentage greatly exceeds 100%.

As we've discussed, the findings of the U.S. Bowling Congress make no mathematical sense, and we disagree that a 100% handicap percentage is a proper choice for most leagues.

In December 2012, Donal O'Neill and Sarah Keogh published a research paper entitled, "A Statistical Analysis of the Fairness of Alternative Handicapping Systems in Ten-Pin Bowling." In this paper, the authors used data from approximately 1240 games of bowling and concluded that a 90% handicap percentage did not sufficiently level the playing field. They also concluded that a 100% handicap percentage "goes too far" and does not provide bowlers with an incentive to improve. They propose the use of a compromise 95% handicap percentage.

We concur with the authors' assessments that the standard 90% handicap formula is too low a value for many leagues, and that 100% is inappropriate for most leagues. But we disagree with their assumption that they can or should make a blanket characterization of all bowling leagues to arrive at a one-size-fits-all conclusion without considering the specific characteristics of different leagues. We have shown that different leagues require different handicap percentages in order to tune them optimally.

Way back in 1964, J.L. Martin and J. Keogh performed a study of bowling results from 320 college students and published the results in "Bowling Norms for College Students in Elective Physical Education Classes." They classified results by bowler experience and by gender. While the scoring statistics are not particularly useful for BLT's purposes, Martin and Keogh did include standard deviations of the scores among the various groups. Standard deviations relate directly to bowler volatilities, with higher values meaning higher volatility, lower values meaning lower volatility.

In their study, standard deviations ranged from a low of 14.6 to a high of 30.7, with the values of most groups being in the high teens and low twenties. These values were generally a bit lower than we found for most league bowlers. The normal range of standard deviations for BLT was chosen to be 20-30. By setting slightly higher values than those suggested by this one study, we are taking the conservative route, erring on the side of greater variability and therefore less-definitive conclusions from the program.

Finally, Curtis N. Cooper and Robert E. Kennedy wrote a fascinating paper, "A Generating Function for the Distribution of the Scores of all Possible Bowling Games," in October 1990. This paper describes a mathematical technique for determining how many different score sheets (recording the results of both the first ball and the second ball in each frame) can arrive at each possible bowling score, 0 through 300. While this paper has no direct applicability to our task of evaluating teams' chances of success, it does support the notion that there are so many ways to arrive at each possible game score that the bias for specific scores is likely to be insignificant or nonexistent, thus bolstering the validity of the techniques we use for mimicking bowling scores.

Reference Guide

The following is a reference guide for the use of Bowling League Tuneup. Keyboard use, BLT windows, and Excel workbook contents are all described in detail here.

KEYBOARD USE

As with most Windows applications, Bowling League Tuneup can be used most efficiently with a mouse alongside the keyboard. But BLT was designed with keyboard shortcuts for all activities, so a mouse is never required. The following are the rules for keyboard-only operation:

- All command buttons (except OK and Cancel) can be “clicked” by holding the Alt button down while tapping the underlined letter in the button.
- OK and Cancel buttons can be “clicked” by pressing Enter or Escape, respectively.
- All input fields, except for those within grids, can be navigated to via the Tab key, with the cursor indicating the current field (including on checkboxes).
- When it is the current field, a checkbox can be toggled off and on via the space bar.
- This help file can be accessed by pressing the F1 function key from anywhere in BLT.
- Main screen grid features that can be accessed by function keys:
 - F2: Cycle through the sort fields via repeated key presses
 - F3: Open the Edit Bowler window for the first bowler (then pressing Enter in the Edit Bowler window cycles through the bowlers)
 - F4: Open the Team Entry Mode window for the first team (then pressing Enter in the Team Entry Mode window cycles through the teams)
 - Shift-F5: Clear analysis results without prompting if results are being displayed, clear team definitions without prompting if no results are being displayed (which is the same as double-clicking the Bowling League Tuneup logo)
- Edit Bowler grid features that can be accessed by function keys:
 - F2: Cycle through the number of weeks to highlight in the grid header
 - F3: Open the Score Entry Mode window for the week following the last week containing scores (then pressing Enter in the Score Entry Mode window cycles through the grid to allow a series of scores to be entered)
 - F4: Open the Row Edit Mode window
- Bowler Score Entry and Bowler Score Import grid features that can be accessed by function keys:
 - F2: Cycle through the number of weeks to highlight in the grid header
 - F3: Open the Score Entry Mode window for the first bowler (then pressing Enter in the Score Entry Mode window cycles through the grid to allow a series of scores to be entered)
- Bowler Score Extraction window features that can be accessed by function keys:
 - F4: Open the Reorder Mode window to reorder the team list (then the Up, Down, Left, and Right arrow keys can be used in lieu of the Move Up, Move Down, Prev, and Next buttons, respectively)
- Standard Windows keys may be used to resize (Windows Logo + Up Arrow), minimize (Windows Logo + Down Arrow), and close (Alt+F4) the main screen.

MAIN SCREEN

Bowling League Tuneup's main screen is the one that comes up when the application is started. Shown below is the main screen annotated with explanations of each element of the screen.

Bowling League Tuneup
Party Animals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13
4-Kingpins	132 (+1)	172 (+9)*	161 (-3)*	166 (+2)-	631 (+9)	39.5	23.1	14.7	8.8	5.5	3.4	2.2	1.3	0.7	0.4	0.2		
8-Beast	147 (+2)*	106 (+6)*	150 (+2)-	186 (+1)*	589 (+11)	24.6	22.1	17.2	12.5	8.4	5.9	3.9	2.5	1.4	0.8	0.4	0.2	
11-Hot Dog BBQ	187 (-2)-	105 (+2)-	146 (+4)+	200 (+0)-	638 (+4)	21.6	21.3	17.4	13.2	9.3	6.4	4.4	2.8	1.9	1.0	0.5	0.2	
5-Don't Touch	121 (-2)*	147 (+1)-	169 (+4)+	161 (-2)-	598 (+1)	5.6	10.0	11.6	13.5	13.1	11.8	10.2	8.4	6.4	4.4	2.9	1.6	0.7
2-Clam Schells	166 (+4)-	106 (-2)*	160 (-3)-	186 (-1)-	618 (-2)	4.5	8.3	10.9	12.7	12.7	10.3	9.3	6.9	5.3	3.5	2.0	0.9	
3-Lucky Strokes	161 (-5)*	157 (+0)*	165 (-5)*	195 (+0)-	678 (-10)	3.6	7.0	9.2	11.9	11.7	12.6	11.1	10.0	8.3	6.2	4.5	2.7	1.2
1-14 Dollar Salad	112 (+0)*	107 (+0)*	178 (+3)+	169 (-2)*	566 (+1)	2.5	5.3	7.3	10.5	11.1	12.7	11.3	11.2	9.3	8.0	5.4	3.6	1.8
13-Only 2 Left	113 (-2)*	99 (-3)-	167 (+6)-	171 (-2)-	550 (-1)	1.1	2.6	4.3	6.8	8.3	10.6	10.9	12.3	11.6	11.5	9.3	6.8	3.9
12-Pincasso	98 (+0)*	133 (+0)*	152 (+1)-	150 (-1)-	533 (+0)	0.7	2.0	3.4	5.6	7.0	9.3	10.4	12.4	12.5	12.3	10.9	8.4	5.2
7-A Team	181 (-5)-	134 (-2)*	171 (-5)-	191 (-6)-	677 (-18)	0.4	1.4	2.4	4.2	5.4	8.0	9.1	11.4	12.5	13.9	12.9	10.9	7.5
14-A1A Carwash	135 (+0)-	124 (-5)*	125 (+2)*	131 (+0)-	515 (-3)	0.2	0.6	1.2	2.4	3.2	5.2	6.5	9.4	11.0	14.5	15.6	16.4	13.7
9-4 Looney Pinz	149 (-2)*	105 (+0)-	114 (+0)*	121 (-3)*	489 (-5)	0.1	0.3	0.7	1.1	2.1	3.1	5.1	6.5	10.8	14.4	22.5	33.3	
10-The Fantastic Fo	152 (+0)*	119 (-7)*	134 (-4)-	144 (+0)-	549 (-11)	0.2	0.3	0.9	1.5	2.6	3.6	5.6	7.9	11.8	15.4	22.5	27.6	
6-VACANCY																		

League Management

- 13 Load League
- 14 Define League
- 15 Save League
- 16 Enter Scores
- 17 Import Scores
- 18 View League

Week

- 319 Games bowled per week
- 120 Points earned per game win
- 121 Points earned per weekly win

Season

- 28 Total Weeks
- 23 Position Weeks
- 24 Split season

Handicap

- 90 % of 220
- 25 % of
- 26 Hdcp
- 27 Hdcp-score
- 27 Neg handicaps

Vacancy Teams

- 28 Bowl against vacancy scores
- 29 Always beat vacancy team
- 30 Win if not below pins under team average
- 31 Win if not below percent of team average

Computations

- 32 Use trend values
- 33 Use volatility ratings
- 34 Use book average for weeks in handicap computations (leave blank to use all season)

Analysis

- 5 Analyze League
- 35 Rigor
- 36 Analyze League

Bowling League Tuneup
Party Animals

Bowler Averages

Team	1	2	3	4	Total	1	2	3	4	5	6	7	8	9	10	11	12	13
4-Kingpins	132 (+1)	172 (+9)*	161 (-3)*	166 (+2)-	631 (+9)	39.5	23.1	14.7	8.8	5.5	3.4	2.2	1.3	0.7	0.4	0.2		
8-Beast	147 (+2)*	106 (+6)*	150 (+2)-	186 (+1)*	589 (+11)	24.6	22.1	17.2	12.5	8.4	5.9	3.9	2.5	1.4	0.8	0.4	0.2	
11-Hot Dog BBQ	187 (-2)-	105 (+2)-	146 (+4)+	200 (+0)-	638 (+4)	21.6	21.3	17.4	13.2	9.3	6.4	4.4	2.8	1.9	1.0	0.5	0.2	
5-Don't Touch	121 (-2)*	147 (+1)-	169 (+4)+	161 (-2)-	598 (+1)	5.6	10.0	11.6	13.5	13.1	11.8	10.2	8.4	6.4	4.4	2.9	1.6	0.7
2-Clam Schells	166 (+4)-	106 (-2)*	160 (-3)-	186 (-1)-	618 (-2)	4.5	8.3	10.9	12.7	12.7	10.3	9.3	6.9	5.3	3.5	2.0	0.9	
3-Lucky Strokes	161 (-5)*	157 (+0)*	165 (-5)*	195 (+0)-	678 (-10)	3.6	7.0	9.2	11.9	11.7	12.6	11.1	10.0	8.3	6.2	4.5	2.7	1.2
1-14 Dollar Salad	112 (+0)*	107 (+0)*	178 (+3)+	169 (-2)*	566 (+1)	2.5	5.3	7.3	10.5	11.1	12.7	11.3	11.2	9.3	8.0	5.4	3.6	1.8
13-Only 2 Left	113 (-2)*	99 (-3)-	167 (+6)-	171 (-2)-	550 (-1)	1.1	2.6	4.3	6.8	8.3	10.6	10.9	12.3	11.6	11.5	9.3	6.8	3.9
12-Pincasso	98 (+0)*	133 (+0)*	152 (+1)-	150 (-1)-	533 (+0)	0.7	2.0	3.4	5.6	7.0	9.3	10.4	12.4	12.5	12.3	10.9	8.4	5.2
7-A Team	181 (-5)-	134 (-2)*	171 (-5)-	191 (-6)-	677 (-18)	0.4	1.4	2.4	4.2	5.4	8.0	9.1	11.4	12.5	13.9	12.9	10.9	7.5
14-A1A Carwash	135 (+0)-	124 (-5)*	125 (+2)*	131 (+0)-	515 (-3)	0.2	0.6	1.2	2.4	3.2	5.2	6.5	9.4	11.0	14.5	15.6	16.4	13.7
9-4 Looney Pinz	149 (-2)*	105 (+0)-	114 (+0)*	121 (-3)*	489 (-5)	0.1	0.3	0.7	1.1	2.1	3.1	5.1	6.5	10.8	14.4	22.5	33.3	
10-The Fantastic Fo	152 (+0)*	119 (-7)*	134 (-4)-	144 (+0)-	549 (-11)	0.2	0.3	0.9	1.5	2.6	3.6	5.6	7.9	11.8	15.4	22.5	27.6	
6-VACANCY																		

Team Entry Mode

- 38 Team name: 5-Don't Touch
- 39 Move Up
- 40 Move Down
- 41 Reorder bowlers
- 42 A change or move will discard analysis results
- 43 OK
- 44 Cancel

Week

- 3 Games bowled per week
- 1 Points earned per game win
- 1 Points earned per weekly win

Season

- 28 Total Weeks
- 2 Position Weeks
- Split season

Handicap

- 90 % of 220
- % of
- Hdcp
- Hdcp-score
- Neg handicaps

Vacancy Teams

- 28 Bowl against vacancy scores
- 29 Always beat vacancy team
- 30 Win if not below pins under team average
- 31 Win if not below percent of team average

Computations

- 32 Use trend values
- 33 Use volatility ratings
- 34 Use book average for weeks in handicap computations (leave blank to use all season)

Analysis

- 5 Analyze League
- 35 Rigor
- 36 Analyze League

1 Title bar

The Windows title bar includes the name of the league file (Excel file) that is currently loaded, if any. This is the file that will be opened via the View League button, and this is the file that will be updated via the Save League button when saving to the open workbook.

2 BLT icon

With analysis results displayed, double-clicking the icon clears the results without prompting. With no analysis results displayed, double-clicking the icon clears all loaded or defined league data without prompting, bringing Bowling League Tuneup back to its start-up state as a convenient alternative to exiting BLT and restarting it. Shift-F5 duplicates this functionality.

3 Resize button

The Magnify icon can be used to toggle Bowling League Analyzer between its two form sizes. The larger form is appropriate for larger, higher-resolution displays; the smaller form may need to be used so it fits on smaller, lower-resolution displays. Maximize/restore on the Windows title bar duplicates this functionality.

4 Help

Clicking the Help icon brings up the Bowling League Tuneup user manual (i.e., this file) and Quick Start. Help can also be accessed from anywhere in Bowling League Tuneup via the F1 key.

5 League name

This field displays the name of the currently loaded league. When a league has been loaded or defined, the league name can be entered or changed by clicking in (or tabbing to) the field and typing the desired name. If this field is blank when the league is saved, the league name is set to the name of the file being saved to. League name is limited to 40 characters.

6 Bowler name

Right-clicking on a bowler average cell will display that bowler's name for two seconds in this position.

7 Analysis results warning

The warning "(Escape to restore analysis)" appears in this position whenever displayed analysis results are removed due to a change to league settings. Pressing Escape or clicking on the warning message will undo the change that was made and redisplay analysis results. Making a second change to the league settings without restoring the analysis removes the warning message and prevents analysis results from being retrieved.

8 Column header

In addition to labeling team names, team bowlers, team totals, and analysis results, the column header can be used to sort grid data. Clicking on the Team header, the Total header, or the place-of-finish headers will sort grid data by that column and change the color of the header to red to indicate that column is being used to sort data. If trends are displayed, the Total header may be clicked a second time to sort grid data by trends, changing the header color to green. The F2 key can also be used to change the sort by each column sequentially. Clicking a highlighted column header to remove the sort reverts the grid to the unsorted team order.

9 Team names

Clicking in a team name field (or pressing F4) brings up the Team Entry Mode window, which allows the entry or modification of team names, the resorting of the unsorted team list, and/or the resorting of a team's bowlers. If Shift was pressed while clicking in a team name field to enter team entry mode, the editing process is limited to just that one team; if Shift was not pressed, a series of team names can be entered or modified.

10 Bowler averages

This portion of the grid displays all bowler information that will be used in an analysis. (Although each grid cell is said to represent a "bowler," it actually represents a bowler position on a team, since a cell may include scores [i.e., absence, substitute, and vacancy scores] that were not bowled by that bowler. It is necessary to do this since all values for this bowler position will influence the team's chances of success in the league.) Each cell will contain the bowler's average, and it may also contain the bowler's trend value (in parentheses) and/or the bowler's volatility rating (• = low, - = normal, ° = high), according to the trend and volatility checkbox values on this screen. (Trends will not be displayed for bowlers without defined trends, even when that option is selected. An undefined trend is treated as a trend value of zero in computations.) Values will be displayed in black if values have been supplied or blue if these values have been computed from bowler scores. Vacancy bowler averages will be displayed in red. Clicking on a bowler average cell (or pressing F3) brings up the Edit Bowler window, which allows editing of bowler data. If Shift was pressed while clicking on a bowler average cell, the editing process is limited to just that one bowler; if Shift was not pressed, a series of bowlers can be edited. Right-clicking on a bowler average cell displays that bowler's name for two seconds above the Team header.

11 Team totals

This column contains the total team averages and, if trends are displayed, trends. Both values are obtained by simply summing the averages and trends of each team's bowlers. (No attempt is made to determine or display team volatility.)

12 Analysis results

This portion of the grid contains the results of a Bowling League Tuneup analysis. Displayed values represent the computed percent chances of each team having each possible place of finish. Values under one-tenth of one percent are represented by a blank cell. Percentages across each row will total 100% (although round-off issues may mean the total isn't exact), but percentages down the columns will not in general because when teams finish a season in a tie, both teams are given credit for the same (higher) place of finish. Also, when results are for a split season, displayed values represent the chances of each team's higher place of finish between the two halves of the season, so columns will total much greater than 100% for high places of finish and much lower than 100% for low places of finish.

13 Load league button

This button opens a Windows Open File dialog box which allows navigation to the folder that stores the league file to load into Bowling League Tuneup and selection of that file by clicking Open. League files are stored as Microsoft Excel workbook (.xlsx) files.

14 Define league button

This button opens the Define League window, which is used to create a new league or modify the current league definition.

15 Save league button

This button opens the Save League window, which is used to save league and bowler data and league analyses to a Microsoft Excel workbook (.xlsx) file. This file can be opened later in Bowling League Tuneup via the Load League button, and it can also be shared with Excel users who don't have access to BLT to allow them to view bowler performance sheets, league analyses, and any custom worksheets that have been stored in the league workbook file.

16 Enter scores button

This button opens the Bowler Score Entry window, which is used to enter one week of league scores at a time into Bowling League Tuneup.

17 Import scores button

This button opens the Bowler Score Extraction window, which is used to import one week of league scores from text that is copied and pasted from an electronic league recap sheet. Scores can be extracted from this text in order to populate the Bowler Score Import window, which looks and works exactly like the Bowler Score Entry window, to enter one week of league scores into Bowling League Tuneup.

18 View league button

Click this button to view the contents of the currently open league workbook file in a separate window using Microsoft Excel. The workbook should only be viewed, not modified, in Excel, and the window should be closed before returning to operate on the league in Bowling League Tuneup. Failure to do this may cause subsequent BLT save attempts to fail, requiring you to restart BLT in order to clear the problem. When attempting to close Excel, you may be asked whether workbook changes should be saved – even when you made no changes. Always select Don't Save if this happens.

19 Games bowled per week

The number of games bowled by each pair of teams against each other each week. Valid values are 1 through 4.

20 Points earned per game win

The number of points earned for each game won by a team against its opponent. If a game ends in a tie, points are distributed equally to each team (even if half points must be given). Points are summed over the season for each team, then the totals are used to determine team position in the league standings. Valid values are 0 through 6. The size of this value in relation to points earned per weekly win establishes their relative importance in determining league standings.

21 Points earned per weekly win

The number of points earned by the team in each pairing which has the highest pin total (handicap totals if it's a handicap league) for the week's games. If the two teams tie for total pins, these points are distributed equally to each team (even if half points must be given). Points are summed over the season for each team, then the totals are used to determine team position in the league standings. Valid values are 0 through 6. The size of this value in relation to points earned per game win establishes their relative importance in determining league standings.

22 Total weeks

The number of weeks of bowling in the bowling season, not counting a final sweepers week or a week for split-season playoffs. If a split season is being used, this is the total length of the season (i.e., the number of weeks in both halves combined). The minimum league length is dependent on the number of teams in the league and whether the season is split. The maximum league length is 50 weeks.

23 Position weeks

The number of weeks scheduled in the season for teams to be matched up not by a standard league schedule, but by teams' positions in the standings. In a position week, the first-place team bowls against the second-place team, the third-place team against the fourth-place team, and so on. Position weeks are spaced evenly throughout the season, with the last week of the season always being a position week when position weeks are used. There must be an even number of position weeks in split seasons. The maximum number of position weeks is dependent on the number of weeks in the season.

24 Split season

When checked, this indicates that the season will be split in half. A first-half winner is determined at the end of the first half of the season, then standings are reset (leaving all bowler statistics untouched) prior to continuing to bowl the second half of the season. The winners of the first and second halves of the season can meet one more time after the season to determine the overall season winner. It is at the league's discretion how prizes are to be awarded in a split season. For instance, each team's highest place of finish can be recognized or separate recognition can be given for each half of the season. Splitting seasons can keep bowler interest up since every team gets a second chance in mid-season, and it gives poorer teams a better chance by (a) doubling the opportunities for a good finish and (b) creating shorter seasons, which produce less-predictable outcomes.

25 Handicap formula

The top boxes contain the handicap formula (percentage and base) used by the league. For split-season and dual-handicap leagues, the top boxes contain the handicap used during the first half of the season and the bottom boxes contain the handicap used during the second half of the season. The percentage can range from 0 (indicating a scratch league, in which case the base number need not be filled in) to 125. The base can range from 100 to 300.

26 Caps on handicap

When a league limits the maximum handicap any bowler may attain and/or the maximum handicap score (scratch score plus handicap) any bowler can bowl in a game, these fields contain those values. If both values are given, the cap on a bowler handicap is applied before it is added to the scratch score for comparison with the handicap score cap. The cap on a bowler's handicap can range from 10 to 200. The cap on a bowler's handicap score can range from 300 to 500. These fields are included for leagues that impose such caps, but caps will always reduce a league's fairness and their use is therefore never recommended.

27 Negative handicaps

When checked, bowler handicaps will be allowed to go below zero on those occasions when a bowler's average is greater than the handicap base. A negative handicap will *subtract* from a bowler's scratch scores. Using negative handicaps prevents giving an unfair advantage to a bowler who achieves a scratch average above the handicap base, while allowing the handicap base to stay small enough that handicap scores can still look like uninflated bowling scores.

28 Bowl against vacancy scores

When checked, determination of a team's wins and losses against a vacancy team will be based on comparing the team's scores with the vacancy scores of the bowlers on the vacancy team. In a sub-100% handicap league, this option favors higher-average teams, which will have an easier time beating the vacancy scores than lower-average teams will. In a 100% handicap league, all teams will have equal chances of success against a vacancy team.

29 Always beat vacancy team

When checked, a team will be credited with victories for all games against a vacancy team. This is rarely a good choice since it gives an unfair advantage to teams which bowl more weeks against a vacancy team than other teams do, and since a team can unethically use such an opportunity to boost its handicap by bowling poorly while still getting credit for automatic wins.

30 Beat vacancy team if within pin threshold

When checked, a team will be credited with a victory against a vacancy team if it bowls no worse than the specified number of pins below its established average. Mathematically, this does almost as good a job as the percent threshold option does of giving all teams an equal shot of winning against a vacancy team, and it's easier to determine wins and losses than that option. The pin threshold can range from 0 to 200 pins under the team's established average.

31 Beat vacancy team if within percent threshold

When checked, a team will be credited with a victory against a vacancy team if it bowls at least the specified percentage of its established average. Mathematically, this gives all teams an equal shot of winning against a vacancy team. The percent threshold can range from 50 to 100 percent of the team's established average.

32 Use trend values

When checked, bowlers' trend values (if they exist) will be displayed and used in analyses.

33 Use volatility ratings

When checked, bowlers' volatility ratings will be displayed and used in analyses. Volatility ratings are represented by symbols: • = low, - = normal, ° = high.

34 Use book average

When checked, bowlers' book averages (as recorded in the Edit Bowler window) will be used for determining their handicaps for the specified number of weeks of bowling. More precisely, a bowler's book average will be used through the week that the bowler bowls as many games as the specified number of weeks times the number of games per week in the league. In other words, absences will stretch the period that book averages are used. If the number of weeks is left blank, book averages will be used for the entire season. During the weeks when book averages should be used, bowlers without book averages will use handicaps that are set *after* each week's games are bowled, so that each week's handicap will be computed retroactively to include that week's games.

35 Analysis rigor

This value, which can be typed in directly (0-9 or "H" for 10) or set via the accompanying slider, determines the length of the Monte Carlo simulation that is performed during a league analysis. The lowest value of 0 will simulate approximately a thousand league seasons; each successive value doubles the number of simulated seasons, with the highest value of "H" simulating approximately a million seasons. Lower rigor values will produce less-accurate results quickly; higher rigor values will produce more-accurate results but could take several minutes or even hours to produce, depending on the size and length of the league.

36 Analysis progress bar

This is displayed during an analysis to indicate the progress of the analysis. Clicking on the progress bar (or pressing Escape) allows you to cancel the analysis.

37 Analyze league button

Clicking this button initiates a league analysis. If any fields have invalid values, an error message will be shown and the analysis will not be performed.

38 Team name

This field is used to specify a team name. Names are often started with a team number, allowing teams to be sorted by their numbers rather than alphabetically by their names. Team name is limited to 20 characters.

39 Move up button

This button moves the current team up one position in the unsorted list of teams. This button can be used to assure that teams leaving the league are at the bottom of the list for subsequent removal via the Define League window. A move is not undone by clicking Cancel.

40 Move down button

This button moves the current team down one position in the unsorted list of teams. This button can be used to assure that teams leaving the league are at the bottom of the list for subsequent removal via the Define League window. A move is not undone by clicking Cancel.

41 Reorder bowlers

These fields are used to change the order of the bowlers on a team. The first position should be filled with the current bowler number that should be moved to the number one position; the second position should be filled with the current bowler number that should be moved to the number two position; etc. This option allows bowlers to be put in the order in which they bowl and/or the order in which they appear on the recap sheet, easing importing of scores.

42 Name change or move warning

This warning appears when analysis results are displayed to warn you that clicking OK or changing the unsorted team list order will clear out those results. Clicking Cancel (or pressing Escape) will leave the results intact.

43 OK button

This button accepts the potentially modified team name and the potentially reordered bowler list, then proceeds to display the next team name for modification. However, if Shift was pressed while clicking on a team name to enter this mode, the editing session is limited to only that one team. Pressing Enter is the same as clicking this button.

44 Cancel button

Cancels any changes that have been made to the team name or bowler order (but does not undo any team ordering changes that may have been made) and exits team entry mode. Pressing Escape is the same as clicking this button.

EDIT BOWLER WINDOW

The Edit Bowler window is displayed when a bowler's cell is clicked on the main screen or when the F3 key is pressed to enter bowler edit mode. Shown below is the Edit Bowler window annotated with explanations of each element of the window.

The image shows three annotated screenshots of the 'Edit Bowler' window for 'Jose Bowler'. The annotations are as follows:

- 1** Jose Bowler (Bowler name)
- 2** Use Supplied Bowler Data (checkbox)
- 3** Average: 186
- 4** Trend: -3
- 5** Vacancy score (checkbox)
- 6** Volatility: Low (checkbox)
- 7** Volatility: Normal (checkbox)
- 8** Use Computed Bowler Data (checkbox)
- 9** Book average: 197 (used for 2 weeks)
- 10** Week 1
- 11** 177
- 12** 227
- 13** 141
- 14** 156 (173)
- 15** 169 (173)
- 16** 204 (173)
- 17** OK
- 18** Cancel
- 19** Score Entry Mode
- 20** Score: 20
- 21** sent bowler; set score
- 22** OK
- 23** Cancel
- 24** Delete Row
- 25** Prev
- 26** Next
- 27** Insert Row
- 28** Cancel

1 Bowler name

The bowler's name. This field defaults to a team number and bowler number, but it can be replaced by the bowler's actual name. The name can be typed in as Lastname, Firstname. It will still display as Firstname Lastname when the cursor leaves this field, but putting last name first and following it with a comma will show bowlers sorted by last name on the first sheet of the saved league workbook. Bowler name is limited to 30 characters.

2 Use supplied bowler data

When checked, bowler average, trend, and volatility represent manually entered values. Typing into any fields in the Use Supplied Bowler Data frame will automatically check this checkbox and uncheck the Use Computed Bowler Data frame's checkbox.

3 Bowler average

The bowler's scratch average. This value must be between 50 and 250. An attempt to manually enter a value outside this range will cause an error. Any computed values below 50 will display as 50 and any computed values above 250 will display as 250 (with an accompanying warning message).

4 Bowler trend

The bowler's trend, which is the average of the differences between the bowler's scores and the average upon which his/her handicap was being based when each game was bowled. If a trend is unknown, this field can be left blank; computationally, this is equivalent to a trend of zero. This value must be between -50 and 50. Any computed values below -50 will display as -50 and any computed values above 50 will display as 50 (with an accompanying warning message).

5 Vacancy score

When checked, this indicates that this is a missing bowler and the average given is the league's default score which is to be credited to the missing bowler's team each game. A negative trend would indicate that teams in this league are penalized for missing a bowler (which is not usually done).

6 Average/trend warning message

When a warning message appears here, it means this bowler's computed average and/or trend have fallen outside allowable limits and therefore have been set to those limits. Average cannot go below 50 or above 250. Trend cannot go below -50 or above 50.

7 Bowler volatility

The bowler's volatility. Low volatility indicates a high degree of consistency from game to game; a high volatility indicates a low degree of consistency.

8 Use computed bowler data

When checked, the bowler average, trend, and volatility shown in the Use Supplied Bowler Data section represent values that have been automatically calculated by Bowling League Tuneup from the scores (and potentially the given book average) within this frame. Clicking in the grid to enter score entry mode will automatically check this checkbox and uncheck the Use Supplied Bowler Data checkbox.

9 Bowler book average

The bowler's established book average coming into this league. The label beside this box indicates whether book averages are being used in this league (based on the value on the main screen) and, if so, how many weeks the league uses the book average. If this box is left blank, that indicates this bowler has no established book average. If this field is completed while this bowler is categorized as a vacancy bowler, the displayed vacancy score will be replaced by this field's value as a supplied (but not vacancy) average. This provides a quick way to perform a preseason analysis for a new league using bowlers' book averages.

10 Column header

The highlighted column numbers indicate the columns to be used during score entry. By default, the highlighted column numbers will match the number of games per week in the league, if that has been defined on the main screen. But scores can always be entered anywhere in the grid, including under unhighlighted column numbers. To change the columns which are used during score entry, click on the column number you wish to make the last column to use before score entry takes you back to column 1. Alternatively, pressing F2 will sequentially progress through all four settings.

11 Row header

Clicking on any week number will initiate row edit mode, which allows you to insert and delete rows of scores, establishing the clicked row as the current row to edit. Alternatively, pressing F4 will initiate row edit mode for the middle row in the grid.

12 Bowler scores

This portion of the grid contains all the scores that have been recorded for this bowler. Each non-blank cell contains either (a) the bowler's score for the indicated week and game, (b) a substitute bowler's score, followed in parentheses by the average the substitute's handicap is based on, (c) the vacancy score to use for a missing bowler, followed in parentheses by the average the vacancy score's handicap is based on, or (d) "Abs" to indicate the bowler's absence, followed by the number of pins under the bowler's current average (or book average) to score for the absent game. Bowlers' actual scores are displayed in black; all other entries are displayed in red. The computed average, trend, and volatility are based on all four types of entries for this bowler position on the team. Clicking on a bowler score cell (or pressing F3) brings up the Score Entry mode window, which allows editing of bowler data. Any scores entered after an empty row are ignored in computed values and are deleted upon exiting score entry mode.

13 Clear all scores button

Click this button to remove all entries from the grid. If computed bowler data was being used, the current values for average, trend, and volatility are preserved as supplied data.

14 Clear red scores button

Click this button to remove all red entries from the grid, i.e., entries that represent absence, substitute, or vacancy scores. This button will also remove any newly created or already existing empty rows within the bowler's scores. Use of this option sets the bowler to use computed bowler data and the displayed values for average, trend, and volatility will immediately be updated.

15 Convert to substitute button

Click this button to change all entries in the grid to substitute bowler entries that will preserve the bowler's computed average, trend, and volatility values. This option is typically used when a bowler is replaced by a new bowler on a team, allowing any previously bowled games to be treated as substitute bowler scores for the new bowler. By using this option, the new bowler's performance sheet will not include games bowled by the previous bowler(s), but league analyses will be based on the full historical scoring record for this bowler position. Use of this option sets the bowler to use computed bowler data.

16 Analysis results warning

This warning appears when analysis results are displayed to warn that clicking OK will clear out those results. Clicking Cancel will leave the results intact.

17 OK button

Accepts any bowler changes made, displays potentially modified bowler values on the main screen, then proceeds to display the next bowler for editing or viewing. However, if Shift was pressed while clicking on a bowler cell to enter this mode, the editing session is limited to only that one bowler. Pressing Enter is the same as clicking this button.

18 Cancel button

Cancels any changes that may have been made to this bowler and exits the Edit Bowler window. Pressing Escape is the same as clicking this button.

19 Score

When entering score entry mode, this field contains the score in the highlighted grid cell. A new score can be entered to replace the value in the cell, or an existing score can be deleted to delete the value in the cell. For a substitute or vacancy bowler, the score entered should be the substitute's score or the league's standard vacancy score, respectively. For an absent bowler, this field is automatically filled in with the value "Abs."

20 Sub/vacancy bowler

When checked, the Score field contains the score bowled by a substitute bowler or the league's standard vacancy score. The associated field contains the average upon which the substitute's or vacancy bowler's handicap will be based. If the Score field is empty when this checkbox is checked, the score and associated field are automatically filled in with the league's default vacancy score and associated average. If the Score field contains a score when this checkbox is checked, the associated field is automatically filled in with that same default associated average or with the last average that was typed into the field (to speed data entry).

21 Absent bowler

When checked, the Score field is automatically filled in with the value "Abs" to indicate this is a game the bowler missed. When this happens, the bowler's score will be set as his/her league average or book average (depending on which is being used to base the bowler's handicap on), minus the number of pins specified in the associated field, which defaults to the standard absence penalty for the league.

22 OK button

Accepts the potentially modified score for the highlighted grid cell, then proceeds to display the next game in sequence. However, if Shift was pressed while clicking on the game cell to enter this mode, the editing session is limited to just that one game. Pressing Enter is the same as clicking this button.

23 Cancel button

Cancels any changes that may have been made to this game and exits score entry mode. Pressing Escape is the same as clicking this button.

24 Delete row button

Deletes the highlighted row, bringing all rows below it up one row.

25 Prev button

Changes the highlighted row to the previous row, allowing editing of different rows without having to leave and reenter row edit mode.

26 Next button

Changes the highlighted row to the next row, allowing editing of different rows without having to leave and reenter row edit mode.

27 Insert row button

Inserts a row above the currently highlighted row, pushing all rows below it down one row.

28 Cancel button

Leaves row edit mode. Note that row-editing changes made in row edit mode cannot be undone, although all changes made to this bowler in the Edit Bowler window can of course still be canceled in that window. Pressing Enter or Escape is the same as clicking this button.

DEFINE LEAGUE WINDOW

The Define League window is displayed when the Define League button is clicked on the main screen to set or change the attributes of a league. Shown below is the Define League window annotated with explanations of each element of the window.

The screenshot shows the 'Define League' window with the following sections and annotated elements:

- League Settings**
 - 1: Number of teams (input field: 16)
 - 2: Bowlers per team (input field: 4)
 - 3: Default vacancy score (input field: 150) with handicap based on a (input field: 150) average
 - 4: Default absence score (input field: 10) pins under average
 - 5: Fill in league attributes with stored default values
- New Bowler Template**
 - 6: Average (input field: 150)
 - 8: Vacancy score
 - 7: Trend (input field)
 - 9: Volatility (radio buttons: Low, Normal, High)
- Mass Change Options**
 - 10: Change all bowlers with scores to computed data
 - 11: Change all bowlers to supplied data
 - 12: Set supplied averages to book averages if given
 - 13: Apply new bowler trend to supplied data
 - 14: Apply new bowler volatility to supplied data
- 15: Clicking OK will discard analysis results (text)
- 16: OK button
- 17: Cancel button

1 Number of teams

The number of teams in this league. If there are currently fewer teams than this (as will be the case when defining a new league), the appropriate number of teams (populated by bowlers whose attributes are defined in the New Bowler Template frame) will be added after the existing teams. If there are currently more teams than this, the teams at the end of the unsorted team list will be removed from the league.

2 Bowlers per team

The number of bowlers on each team in this league. If there are currently fewer bowlers than this (as will be the case when defining a new league), the appropriate number of bowlers (whose attributes are defined in the New Bowler Template frame) will be added to each team. If there are currently more bowlers than this, the excess bowlers will be removed from each team.

3 Default vacancy score

The default vacancy score for this league and the average that should be used when setting a handicap for that vacancy score. Leagues typically do not impose a penalty for a team that is missing a bowler, so the average upon which a handicap is based is usually the same as the league's default vacancy score. When entering bowler scores in the Score Entry Mode window, if the score field is empty when the Sub/Vacancy checkbox is checked, the default vacancy score will automatically be filled into the score field and the default "based on" average will automatically be filled into the associated field.

4 Default absence score

The default absence score penalty that will automatically be filled in when the Absent Bowler checkbox is checked while entering bowler scores in the Score Entry Mode window.

5 Fill in input fields with stored default values

When checked, the fields underneath the grid on the main Bowling League Tuneup screen will be filled in or overwritten with the standard default values that were previously saved by this user of BLT via the Save League window, in order to save some typing. Any of these default values may subsequently be changed as desired.

6 New bowler average

The average to assign to new bowlers when they are created by expanding the number of teams or bowlers per team in the league. This value will be replaced whenever an actual bowler is subsequently defined, but a properly chosen value can reduce typing by eliminating the need to overwrite bowlers (e.g., vacancy bowlers) who will use this default value.

7 New bowler trend

The trend to assign to new bowlers when they are created by expanding the number of teams or bowlers per team in the league. Typically, newly defined bowlers would have no trend defined, in which case this field would be left blank.

8 New bowler vacancy score

When checked, new bowlers will be created as vacancy bowlers. In this case, the new bowler average and trend would typically represent the league's vacancy bowler values, eliminating the need to subsequently edit vacancy positions. When unchecked, new bowlers will be created as actual bowlers who all have the average, trend, and volatility indicated in those three fields.

9 New bowler volatility

The volatility to assign to new bowlers when they are created by expanding the number of teams or bowlers per team in the league. If new bowlers are created as vacancy bowlers, this value will not be used until the new bowler is subsequently redefined as an actual bowler, since volatility has no meaning for vacancy bowlers.

10 Change all bowlers with scores to computed data

All bowlers using supplied data who have any actual scores recorded for them will be changed to use averages, trends, and volatilities computed from those scores. This option would typically be used to undo the effects of a mass change of all bowlers to use supplied data.

11 Change all bowlers to supplied data

All bowlers using computed data will be changed to supplied data, preserving the bowlers' averages, trends, and volatilities, along with their recorded scores. This option would typically be used along with one or more of the next three mass change options, which manipulate bowlers' averages, trends, and/or volatilities in order to perform what-if analyses. This change, if selected, is performed prior to those three mass change options, allowing the change to supplied data and the resetting of supplied data to be performed via a single request.

12 Set supplied averages to book averages if given

All bowlers with supplied data will have their averages changed to match their book averages. If no book average is given for a bowler, the bowler's supplied average will remain unchanged. This option provides a quick way to change bowlers to their book averages prior to performing what-if analyses.

13 Apply new bowler trend to supplied data

All bowlers with supplied data will have their trends set to the value specified in the New Bowler Template frame. This option provides a quick way to set all bowlers to the same trend value (or to a blank trend, which is computationally equivalent to a trend value of zero), usually in order to subsequently set specific bowlers' trends prior to performing what-if analyses.

14 Apply new bowler volatility to supplied data

All bowlers with supplied data will have their volatilities set to the value specified in the New Bowler Template frame. This option provides a quick way to set all bowlers to the same volatility, usually in order to subsequently set specific bowlers' volatilities prior to performing what-if analyses.

15 Analysis results warning

This warning appears when analysis results are displayed to warn you that clicking OK will clear out those results. Clicking Cancel will leave the results intact.

16 OK button

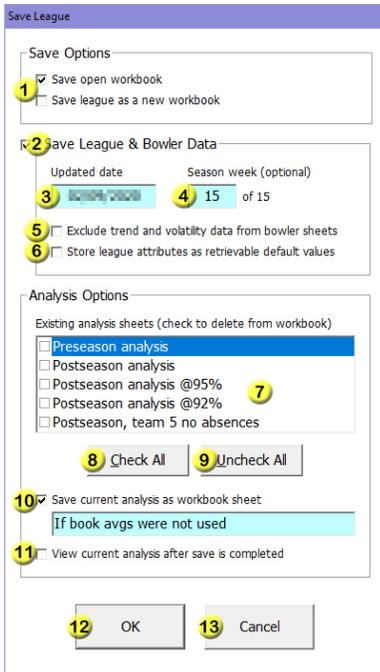
Click this button to make any changes specified to league settings or the new bowler template, and/or to run the specified mass change options.

17 Cancel button

Exits this window without making any league changes.

SAVE LEAGUE WINDOW

The Save League window is displayed when the Save League button is clicked on the main screen to save a league's attributes, bowler data, and analyses. Shown below is the Save League window annotated with explanations of each element of the window.



1 Save workbook options

The checkbox that is checked determines whether to save the league to the currently open Excel workbook file or to save it to a file you specify. If this is a newly defined league that has not yet been saved, the Save Open Workbook option will be disabled. If saving as a new workbook, a Windows Save As dialog box will let you specify the name and location for the league file.

2 Save league & bowler data

When checked, all changes that have been made to league attributes and bowler data will be saved when OK is clicked. You may want to uncheck this box if your only intent is to save a what-if analysis, whose hypothetical league and bowler changes you do not want to preserve.

3 Bowler sheet updated date

This is the date that will appear on bowler performance sheets. The field defaults to the current date, but you might want to change it to another date, like the previous or next week of league bowling, for instance.

4 Bowler sheet season week

This is the current week number of the bowling season, which, if it is given, will be displayed (along with the total number of weeks in the season) following the date on bowler performance sheets. If left blank, the week number will not be included on bowler sheets.

5 Exclude trend and volatility data from bowler sheets

If checked, the Season Avg column on bowler performance sheets will show *only* the bowler's season average, i.e., it will exclude the trend and volatility data normally included in that column, and it will exclude the Weekly vs. Handicap Basis chart as well. This option is provided if a league decides it would be inappropriate or too confusing to disseminate trend and volatility information to league bowlers.

6 Store inputs as retrievable defaults

When checked, the contents of the fields underneath the grid on the main Bowling League Tuneup screen, as well as the extract format definitions on the Bowler Score Extraction window, will be saved as standard default values for this user of BLT. Those values can later be retrieved via the Fill In Input Fields With Stored Default Values option on the Define League window, saving the time to type them in for each newly defined league. Whenever this option is used, all this user's previously stored default values are overwritten.

7 Analysis sheet list

This list contains one entry for each saved analysis in the league workbook, shown in the order the analyses were created. An analysis can be deleted from the league workbook by checking the box next to its name before saving. A current analysis can't be saved using any of these names unless that name is marked for deletion. If you have not yet checked the option to save the current analysis, marking an analysis name for deletion will fill that name in as the default name for the current analysis, saving typing in situations where a new analysis is replacing an existing one.

8 Check all button

A quick way to mark all existing analysis sheets for deletion.

9 Uncheck all button

A quick way to unmark all existing analysis sheets for deletion.

10 Save current analysis as workbook sheet

When checked, the current analysis will be saved in the league workbook with the name specified in the associated field. The analysis name cannot match any of the names listed in the analysis sheet list (unless that entry is checked), any bowler names, "BLT" (the name of the first workbook sheet), or the name of any custom worksheets in the workbook. Analysis name is limited to 30 characters.

11 View current analysis after save completed

When checked, the analysis sheet being saved will be automatically displayed in Excel after the save operation has completed.

12 OK button

Click this button to begin the save operation. If a league is being saved to the currently opened workbook, the save begins immediately; if being saved as a new workbook, the Windows Save As dialog box will come up to allow the specification of the name and folder location for the workbook before the save begins. Saves can take up to several minutes to perform, so a progress bar is displayed during the save process.

13 Cancel button

Exits this window without performing a save operation.

BOWLER SCORE EXTRACTION WINDOW

The Bowler Score Extraction window is displayed when the Import Scores button is clicked on the main screen to import one week's worth of scores for the entire league from an electronic document, such as a league recap sheet.

Bowler Score Extraction

1 - Stupid Ball Lane 24 HDCP=288 Avg=575
 Corey Barrett 107 107 2910 27 132 360 241 684 108 100 101 309 627
 Guadalupe Wise 170 47 3575 21 257 593 307 743 161 162 150 473 608
 Alberta Rivera 125 90 2251 18 195 447 284 714 a115 a115 a115 345 615
 Ray Mann 173 44 5192 30 257 578 304 719 157 164 257 578 719
 2 - Enterprise Lane 18 HDCP=264 Avg=600
 Tammy Chandler 127 88 3054 24 175 413 267 689 159 114 118 391 658
 Chad McGee 139 76 3353 24 181 503 263 749 122 154 133 409 637
 Oscar Sherman 194 24 5834 30 259 696 296 807 194 151 199 544 613
 Vernon French 140 76 2114 15 174 449 243 680 a130 a130 a130 390 618
 3 - Bowling 4 Oscars Lane 20 HDCP=163 Avg=706
 Ramiro Higgins 152 64 4570 30 193 528 268 729 116 178 161 455 647
 Jeremy Sims 170 47 3584 21 232 595 282 745 137 148 189 474 609
 Joanne Barnett 179 38 5395 30 248 658 282 760 202 147 198 547 661
 Bradley Hall 205 14 6178 30 246 664 260 712 210 212 208 630 672
 4 - OMG Give Me A Break Lane 25 HDCP=268 Avg=596
 Wendell Montgomery 154 62 4627 30 213 570 279 768 155 202 213 570 768
 Wesley Ferguson 142 74 4278 30 180 476 258 697 115 169 134 418 640
 VACANT 150 66 0 0 0 0 v150 v150 v150 450 648
 Wilfred Matthews 150 66 3169 21 179 485 246 691 143 179 163 485 686
 5 - Where's Jim? Lane 16 HDCP=232 Avg=634
 Peggy Roberts 120 95 3620 30 160 468 258 762 109 121 120 350 632
 Stewart Lloyd 150 66 4505 30 189 500 255 702 147 177 168 492 696
 Duane Burton 158 58 4289 27 193 521 255 707 178 151 145 474 648

108	100	101	161	162	150	a	a	a	157	164	257
159	114	118	122	154	133	194	151	199	a	a	a
116	178	161	137	148	189	202	147	198	210	212	208
155	202	213	115	169	134	v150	v150	v150	143	179	163
109	121	120	147	177	168	178	151	145	215	258	194
158	163	151	a	a	a	131	136	150	123	158	131
170	148	154	166	142	137	235	190	176	203	164	153
213	194	158	126	165	136	140	122	133	154	221	166
208	178	185	164	151	168	138	137	189	225	225	199
152	181	189	a	a	a	123	125	171	183	180	150
84	121	123	160	165	137	153	180	168	159	203	153
67	84	98	133	105	152	136	139	97	v150	v150	v150
a	a	a	76	91	104	588	s104	s103	235	231	235
v150	v150	v150	132	145	153	146	144	178	v150	v150	v150
143	131	152	128	123	159	167	192	109	v150	v150	v150
v150	v150	v150	151	131	111	106	118	108	180	170	183
118	147	211	146	235	182	186	198	177	v150	v150	v150

STEP 1 - EXTRACT scores from league sheet

- Define the format of extracted league sheet data below. (Definitions will be remembered for this league.)
- Copy (Ctrl+C) the bowlers' weekly results section from an online league sheet and then paste (Ctrl+V) into the box above, examining results, editing, and/or repeating as desired to conform to the format definitions.
- Click Extract to extract bowler scores to the box at the right, repeating as desired until results are acceptable.

Extract Format Definitions (Save changes)

Numeric fields per bowler: 13 (Maximum), 8 (Minimum)

Score field numbers: 5 (Game 1), 4 (Game 2), 3 (Game 3), 3 (Game 4)

Prefixes used: Prefixes used, Suffixes used

Prefix chars: a, s, v (Absence Substitute Vacancy)

Chars to treat as spaces: bki

Each row contains exactly one team

Each row contains at most one bowler

Bowlers do not span multiple rows

Row boundaries should be ignored

Scan rows and number fields left-to-right

Scan rows and number fields right-to-left

STEP 2 - POPULATE the import form

- Examine extracted text above and go back to Step 1 if necessary to correct problems. Or skip Step 1 and type scores here directly, one team per row, as described in item 3 below.
- If the rows above are not in the team order at the left, click on a team name or press F4, then use arrow keys or the pop-up form to reorder the teams to match the rows of scores.
- Edit extracted text as necessary to correct any problems found. Assume there is one team per row, matched to the team names at the left, that commas separate the bowlers on a team, and that spaces or prefix characters separate each bowler's scores. (Prefixes are always used here, not suffixes, and are the same characters as those defined in Step 1.)
- Click Populate to populate the Import form with the above scores for final inspection and editing of this new week of league scores. (You will be able to enter substitutes' averages on the Import form.)

13 Completing the import process will discard analysis results

14 Populate 15 Cancel

Bowler Score Extraction

1 - Stupid Ball Lane 24 HDCP=288 Avg=575
 Corey Barrett 107 107 2910 27 132 360 241 684 108 100 101 309 627
 Guadalupe Wise 170 47 3575 21 257 593 307 743 161 162 150 473 608
 Alberta Rivera 125 90 2251 18 195 447 284 714 a115 a115 a115 345 615
 Ray Mann 173 44 5192 30 257 578 304 719 157 164 257 578 719
 2 - Enterprise Lane 18 HDCP=264 Avg=600
 Tammy Chandler 127 88 3054 24 175 413 267 689 159 114 118 391 658
 Chad McGee 139 76 3353 24 181 503 263 749 122 154 133 409 637
 Oscar Sherman 194 24 5834 30 259 696 296 807 194 151 199 544 613
 Vernon French 140 76 2114 15 174 449 243 680 a130 a130 a130 390 618
 3 - Bowling 4 Oscars Lane 20 HDCP=163 Avg=706
 Ramiro Higgins 152 64 4570 30 193 528 268 729 116 178 161 455 647
 Jeremy Sims 170 47 3584 21 232 595 282 745 137 148 189 474 609
 Joanne Barnett 179 38 5395 30 248 658 282 760 202 147 198 547 661
 Bradley Hall 205 14 6178 30 246 664 260 712 210 212 208 630 672
 4 - OMG Give Me A Break Lane 25 HDCP=268 Avg=596
 Wendell Montgomery 154 62 4627 30 213 570 279 768 155 202 213 570 768
 Wesley Ferguson 142 74 4278 30 180 476 258 697 115 169 134 418 640
 VACANT 150 66 0 0 0 0 v150 v150 v150 450 648
 Wilfred Matthews 150 66 3169 21 179 485 246 691 143 179 163 485 686
 5 - Where's Jim? Lane 16 HDCP=232 Avg=634
 Peggy Roberts 120 95 3620 30 160 468 258 762 109 121 120 350 632
 Stewart Lloyd 150 66 4505 30 189 500 255 702 147 177 168 492 696
 Duane Burton 158 58 4289 27 193 521 255 707 178 151 145 474 648

108	100	101	161	162	150	a	a	a	157	164	257
159	114	118	122	154	133	194	151	199	a	a	a
116	178	161	137	148	189	202	147	198	210	212	208
155	202	213	115	169	134	v150	v150	v150	143	179	163
109	121	120	147	177	168	178	151	145	215	258	194
158	163	151	a	a	a	131	136	150	123	158	131
170	148	154	166	142	137	235	190	176	203	164	153
213	194	158	126	165	136	140	122	133	154	221	166
208	178	185	164	151	168	138	137	189	225	225	199
152	181	189	a	a	a	123	125	171	183	180	150
84	121	123	160	165	137	153	180	168	159	203	153
67	84	98	133	105	152	136	139	97	v150	v150	v150
a	a	a	76	91	104	588	s104	s103	235	231	235
v150	v150	v150	132	145	153	146	144	178	v150	v150	v150
143	131	152	128	123	159	167	192	109	v150	v150	v150
v150	v150	v150	151	131	111	106	118	108	180	170	183
118	147	211	146	235	182	186	198	177	v150	v150	v150

STEP 1 - EXTRACT scores from league sheet

- Define the format of extracted league sheet data below. (Definitions will be remembered for this league.)
- Copy (Ctrl+C) the bowlers' weekly results section from an online league sheet and then paste (Ctrl+V) into the box above, examining results, editing, and/or repeating as desired to conform to the format definitions.
- Click Extract to extract bowler scores to the box at the right, repeating as desired until results are acceptable.

Extract Format Definitions (Save changes)

Numeric fields per bowler: 13 (Maximum), 8 (Minimum)

Score field numbers: 5 (Game 1), 4 (Game 2), 3 (Game 3), 3 (Game 4)

Prefixes used: Prefixes used, Suffixes used

Prefix chars: a, s, v (Absence Substitute Vacancy)

Chars to treat as spaces: bki

Each row contains exactly one team

Each row contains at most one bowler

Bowlers do not span multiple rows

Row boundaries should be ignored

Scan rows and number fields left-to-right

Scan rows and number fields right-to-left

STEP 2 - POPULATE the import form

- Examine extracted text above and go back to Step 1 if necessary to correct problems. Or skip Step 1 and type scores here directly, one team per row, as described in item 3 below.
- If the rows above are not in the team order at the left, click on a team name or press F4, then use arrow keys or the pop-up form to reorder the teams to match the rows of scores.
- Edit extracted text as necessary to correct any problems found. Assume there is one team per row, matched to the team names at the left, that commas separate the bowlers on a team, and that spaces or prefix characters separate each bowler's scores. (Prefixes are always used here, not suffixes, and are the same characters as those defined in Step 1.)
- Click Populate to populate the Import form with the above scores for final inspection and editing of this new week of league scores. (You will be able to enter substitutes' averages on the Import form.)

16 Move Up 17 Prev 18 Next 19 Move Down 20 Cancel

Completing the import process will discard analysis results

Populate Cancel

1 Imported text box

The box into which text containing a week's worth of league bowler scores (likely intermingled with other text) is pasted (by typing Ctrl+V) after having been highlighted and copied (by typing Ctrl+C) from a recap sheet, a spreadsheet, or some other digital source. The extract format definitions below this box define how to identify the scores within the pasted text. This box may contain tab characters, which may be entered by typing Ctrl+Tab. The most recent change to the box's contents may be undone by typing Ctrl+Z.

2 Team list

The list of teams in the league. Each row of the extracted text box to the right of the team list contains the scores for the corresponding team in the team list. Sometimes it may be necessary to reorder the teams in this list to match the rows in the extracted text box to the correct team. Clicking on a team name or pressing F4 brings up the Reorder Mode window to change the order of the teams.

3 Extracted text box

The box that contains bowler scores extracted from the imported text box, using the rules specified by the extract format definitions, after the Extract button is clicked. In this box, each row contains all the scores from the team in the corresponding row in the team list. Commas separate the bowlers on a team and spaces or prefix characters separate each bowler's scores. This box may be edited manually to correct extraction problems or to bypass the extraction process entirely.

4 Extract button

Clicking this button extracts scores from the left-hand box, using the given extract format definitions, and places the results in the right-hand box, completely replacing its contents if it wasn't empty.

5 Save changes

If this checkbox is checked, any changes made to extract format definitions will be remembered and saved when the league is saved, even if the Extract button was never clicked. Unchecking this checkbox allows experimentation with different definitions without remembering or saving definition changes (i.e., the previous definition values will be recalled the next time the Bowler Score Extraction window is loaded). The value of this checkbox is always remembered and saved when the league is saved.

6 Numeric fields per bowler

The minimum and maximum number of consecutive numbers (separated by spaces and/or prefix or suffix characters) that constitute a single bowler entry in the imported text. During the extraction process, text is scanned (either left-to-right or right-to-left) in a search for consecutive numbers. A bowler entry is identified when the specified minimum number of consecutive numeric fields is found; scanning continues until either a non-number is found or the specified maximum number of numeric fields is reached.

7 Score field numbers

These fields define the positions of the first, second, third, and fourth game scores within a bowler entry. If the scan direction is left-to-right, the score field numbers identify the scores within the bowler's entry when counted from left to right; if the scan direction is right-to-left, the score field numbers identify the scores within the bowler's entry when counted from right to left.

8 Prefixes/suffixes used

These checkboxes define whether prefix or suffix characters are used to identify absence, substitute, and vacancy scores in the imported text. Prefix characters must appear as the first character of a bowler score, with no spaces between the character and the score. Suffix characters must appear as the last character of a bowler score, with no spaces between the character and the score. Absence and vacancy characters may appear by themselves, i.e., with no score attached to the prefix or suffix character.

9 Prefix/suffix characters

The characters which identify a score as an absence score, a substitute score, or a vacancy score in the imported text. Prefix and suffix characters define the beginning or end of a bowler score, respectively, so no spaces are required to separate them from the previous or subsequent score. But two consecutive prefix or suffix characters must always be separated by at least one space in the imported text. These characters are also used (always as prefixes) to identify absence, substitute, and vacancy scores in the extracted text box.

10 Characters to treat as spaces

All the characters listed in this field will be treated as spaces when imported text is scanned in a search for consecutive numbers. This allows specified non-prefix/suffix characters to appear within a bowler's entry. For instance, a league recap sheet may denote a book average within a bowler's entry by accompanying the average with the letters "bk." Typing these two letters into this field assures that the inclusion of a book average will not prevent the bowler's full entry from being used for extraction.

11 Row boundary meaning

These four options define the meaning of line breaks in the imported text. The first box should be checked if imported text contains exactly one row for each team's scores. The second box should be checked if a single row never contains more than one bowler's entry (although some rows may contain no bowler entry). The last two checkboxes indicate that the full contents of the imported text box should be treated as one long string of text, read either from beginning to end or from end to beginning. The first of these boxes should be checked if a single bowler's entries cannot span multiple rows; the second of these boxes should be checked if row boundaries are to be ignored completely.

12 Scan direction

These checkboxes indicate whether import box rows (or the full contents of the import box, depending on the Row Boundary option selected) should be scanned from left to right or from right to left during the extraction process. Scanning right-to-left may be necessary when bowler entries can't be numbered reliably from left to right due to possible variations (e.g., missing values) in the format of bowler entries. When scanning right-to-left, score field numbers are also numbered from right to left (i.e., the rightmost number would be field 1).

13 Analysis results warning

This warning appears when analysis results are displayed to warn you that completing the import process will clear out those results. Clicking Cancel will leave the results intact.

14 Populate button

Clicking this button brings up the Bowler Score Import window, fully populated with the bowler scores listed in the extracted text box. Scores may be edited there before they are imported into bowler records.

15 Cancel button

Exits this window without performing an import operation.

16 Move up button

This button moves the current team up one position in the team list. The Up Arrow key duplicates this functionality and is generally more efficient to use.

17 Prev button

This button changes the highlighted row the previous row without changing the order of the team list. The Left Arrow key duplicates this functionality and is generally more efficient to use.

18 Next button

This button changes the highlighted row to the next row without changing the order of the team list. The Right Arrow key duplicates this functionality and is generally more efficient to use.

19 Move down button

This button moves the current team down one position in the team list. The Down Arrow key duplicates this functionality and is generally more efficient to use.

20 Cancel button

Exits this window without performing an import operation. The Escape key duplicates this functionality.

BOWLER SCORE ENTRY/IMPORT WINDOWS

The Bowler Score Entry window is displayed when the Enter Scores button is clicked on the main screen to allow entry of one week's worth of scores for the entire league. The Bowler Score Import window, shown below, does the same thing and operates the same way as the Bowler Score Entry window, but it is accessed during the score import process when Populate is clicked on the Bowler Score Extraction window, and it can come up already populated with imported bowler scores. The Bowler Score Import window, which includes instructions for completing the score import process, will be used to document the operation of both windows.

Bowler Score Import

Team / Bowler	1	2	3	4
1-Stupid Ball / Monique Derry	108	100	101	
1-Stupid Ball / Nick Harrison	161	162	150	
1-Stupid Ball / Tawmi Bentkowski	Abs (-10)	Abs (-10)	Abs (-10)	
1-Stupid Ball / Tracy Tufts	157	164	257	
2-Enterprise / Bill Greenberg	159	114	118	
2-Enterprise / Shin Takei	122	154	133	
2-Enterprise / Steven Knox	194	151	199	
2-Enterprise / Arthur Lambrose	Abs (-10)	Abs (-10)	Abs (-10)	
3-Bowling 4 Oscars / Daniel Rodriguez	116	178	161	
3-Bowling 4 Oscars / Richard Martinez	137	148	189	
3-Bowling 4 Oscars / Jared Karp	202	147	198	
3-Bowling 4 Oscars / Brinton Smith	210	212	208	
4-Give Me A Break / Peter Berger	155	202	213	
4-Give Me A Break / Melissa Ryan	115	169	134	
4-Give Me A Break / Team 4 Bowler 3	150 (150)	150 (150)	150 (150)	
4-Give Me A Break / Bob Brownstein	143	179	163	
5-Where's Jim? / Lori Lapkin	109	121	120	
5-Where's Jim? / Jim Spleen	147	177	168	
5-Where's Jim? / Russ Wolkoff	178	151	145	
5-Where's Jim? / Andre Duguay	215	258	194	
6-Panther Spice / Riley Riley	158	163	151	
6-Panther Spice / Michael Kvamme	Abs (-10)	Abs (-10)	Abs (-10)	
6-Panther Spice / Jordan Dunn	131	136	150	
6-Panther Spice / Mark Lester	123	158	131	
7-Don't Give A Split / Kenn Wynn	170	148	154	

STEP 3 - IMPORT scores into Bowling League Tuneup

1. Examine scores above that were populated from the previous screen and make any required changes.
2. Edit substitute scores (shown in blue) to assure handicaps are correctly based on the substitute's average.
3. Click OK to post all scores above as a new week of league scores.

4 Clicking OK will discard analysis results

5 OK 6 Cancel

Bowler Score Import

Team / Bowler	1	2	3	4
12-What R The Odds? / Team 12 Bowler 4	150 (150)	150 (150)	150 (150)	
13-No Expectations / Francis Rivera	Abs (-10)	Abs (-10)	Abs (-10)	
13-No Expectations / Hannah Wolfe	76	91	104	
13-No Expectations / Alfred Mullins	88	104	103	
13-No Expectations / Don Duncan	235	231	235	
14-Eddie's Angels / Tracy Ford	150 (150)	150 (150)	150 (150)	
14-Eddie's Angels / Floyd Ortega	132	145	153	
14-Eddie's Angels / Josh Wise	146	144	178	
14-Eddie's Angels / Team 14 Bowler 4	150 (150)	150 (150)	150 (150)	
15-Team 15 / Bruce Padilla	143	131	152	
15-Team 15 / Freddie Patton	128	123	159	
15-Team 15 / Betty Jennings	167	192	109	
15-Team 15 / Team 15 Bowler 4	150 (150)	150 (150)	150 (150)	
16-Bowl 4 Fun / Team 16 Bowler 1	150 (150)	150 (150)	150 (150)	
16-Bowl 4 Fun / Clark Ball	151	131	111	
16-Bowl 4 Fun / Wilson Buchanan	106	118	108	
16-Bowl 4 Fun / Rita McLaughlin	180	170	183	
17-Team 17 / Tanya Daniel	118	147	211	
17-Team 17 / Harry Frank	146	235	182	
17-Team 17 / Chelsea Harrington	186	198	177	
17-Team 17 / Team 17 Bowler 4	150 (150)	150 (150)	150 (150)	
18-VACANCY / Team 18 Bowler 1				
18-VACANCY / Team 18 Bowler 2				
18-VACANCY / Team 18 Bowler 3				
18-VACANCY / Team 18 Bowler 4				

STEP 3 - IMPORT scores into Bowling League Tuneup

1. Examine scores above that were populated from the previous screen and make any required changes.
2. Edit substitute scores (shown in blue) to assure handicaps are correctly based on the substitute's average.
3. Click OK to post all scores above as a new week of league scores.

Score Entry Mode

Score b/vacancy bowler; hdcap based on avg

sent bowler; set score pins under avg

10 OK 11 Cancel

1 Team/bowler list

The list of all bowlers in the league, with the teams they are on, displayed in team and bowler order.

2 Column header

The highlighted column numbers indicate the columns to be used during score entry. By default, the highlighted column numbers will match the number of games per week in the league, if that has been defined on the main screen. But scores can always be entered anywhere in the grid, including under unhighlighted column numbers. To change the columns which are used during score entry, click on the column number you wish to make the last column to use before score entry takes you back to column 1. Alternatively, pressing F2 will sequentially progress through all four settings.

3 Bowler scores

This portion of the grid contains scores to be added as a new week of scores for league bowlers. Entries have the same meanings as on the Edit Bowler screen. As on that screen, clicking on a bowler score cell (or pressing F3) brings up the Score Entry mode window, which allows editing of bowler data. On the Bowler Score Entry window, all scores must be typed in manually; on the Bowler Score Import window, scores may be automatically populated via the Populate button on the Bowler Score Extraction window. Automatically populated scores are still fully editable here. Automatically populated substitute scores display in blue as a reminder that those entries must be edited in order to supply a substitute bowler average.

4 Analysis results warning

This warning appears when analysis results are displayed to warn you that completing the score entry or score import process will clear out those results. Clicking Cancel will leave the results intact.

5 OK button

Click this button to post (add) all scores in the grid as a new week of scores for each bowler. When this process is complete, the main screen is returned to and a pop-up window displays how many bowlers had scores posted to their records.

6 Cancel button

Cancels any changes that may have been made to the listed scores and exits this window, going back to the Bowler Score Extraction window (from Bowler Score Import) or the main screen (from Bowler Score Entry). Pressing Escape is the same as clicking this button.

7 Score

When entering score entry mode, this field contains the score in the highlighted grid cell. A new score can be entered to replace the value in the cell, or an existing score can be deleted to delete the value in the cell. For a substitute or vacancy bowler, the score entered should be the substitute's score or the league's standard vacancy score, respectively. For an absent bowler, this field is automatically filled in with the value "Abs."

8 Sub/vacancy bowler

When checked, the Score field contains the score bowled by a substitute bowler or the league's standard vacancy score. The associated field contains the average upon which the substitute's or vacancy bowler's handicap will be based. If the Score field is empty when this checkbox is checked, the score and associated field are automatically filled in with the league's default vacancy score and associated average. If the Score field contains a score when this checkbox is checked, the associated field is automatically filled in with that same default associated average or with the last average that was typed into the field (to speed data entry).

9 Absent bowler

When checked, the Score field is automatically filled in with the value "Abs" to indicate this is a game the bowler missed. When this happens, the bowler's score will be set as his/her league average or book average (depending on which is being used to base the bowler's handicap on), minus the number of pins specified in the associated field, which defaults to the standard absence penalty for the league.

10 OK button

Accepts the potentially modified score for the highlighted grid cell, then proceeds to display the next game in sequence. However, if Shift was pressed while clicking on the game cell to enter this mode, the editing session is limited to just that one game. Pressing Enter is the same as clicking this button.

11 Cancel button

Cancels any changes that may have been made to this game and exits score entry mode. Pressing Escape is the same as clicking this button.

EXCEL WORKBOOKS

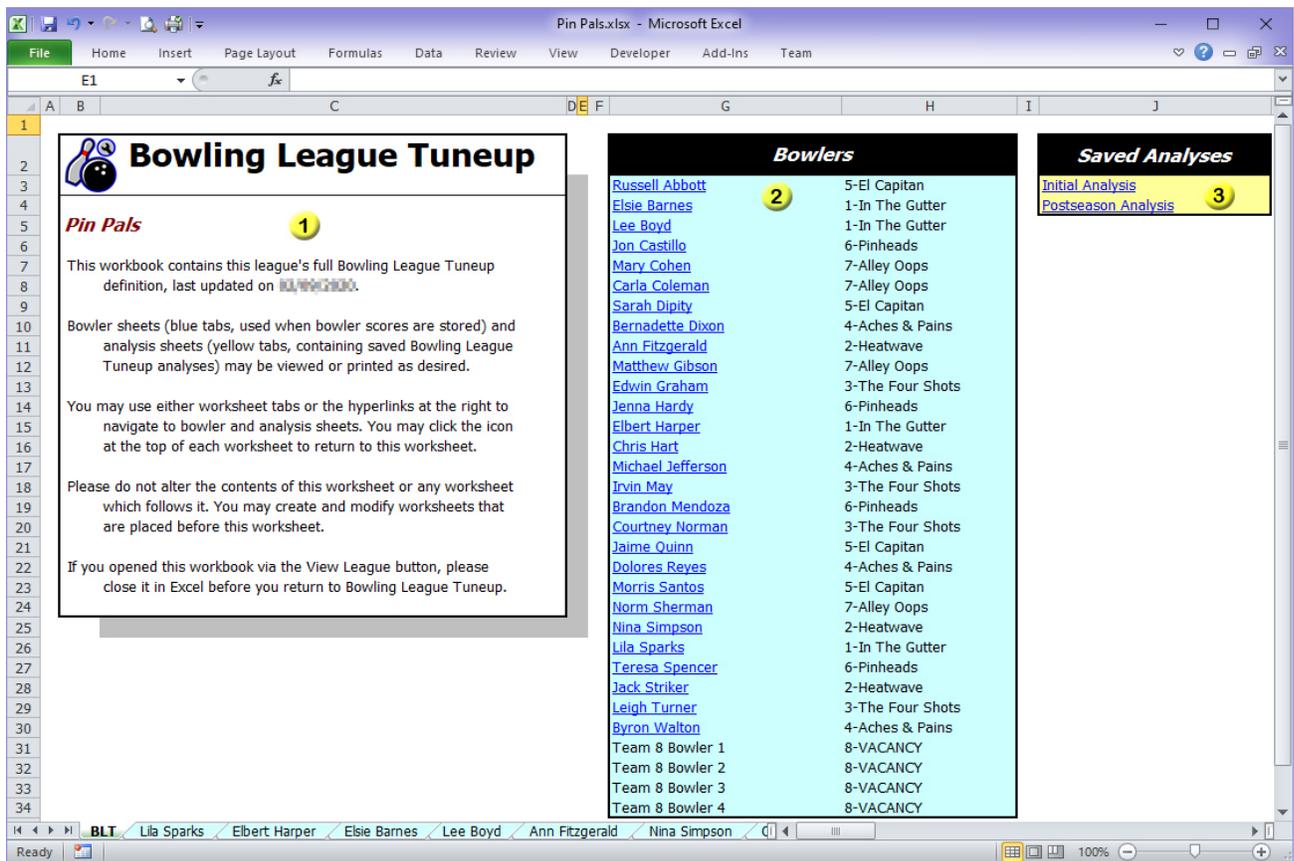
All data stored by Bowling League Tuneup is saved in Microsoft Excel workbooks. While this scheme requires the separate purchase and installation of Excel, it allows the use of a familiar tool for the display and storage of BLT analyses and bowler performance sheets, and it allows league data and analyses to be shared with any Microsoft Excel user – even with people who do not use Bowling League Tuneup.

Each league defined in Bowling League Tuneup is stored in its own Excel workbook file. Minimally, this workbook contains the full league definition, i.e., the specifications of all league attributes, bowlers, and teams. The workbook may also contain separate worksheets (spreadsheets) to store league analyses (one worksheet per saved analysis) and bowler performance sheets (one worksheet per bowler).

Microsoft Excel workbooks are not designed to be opened for modification by multiple users simultaneously. When you open an Excel workbook via Bowling League Tuneup's View League button, you and BLT both have access to the workbook. It is important, therefore, that after you are done viewing the workbook, you close it before returning to use BLT. Failure to do so may cause subsequent BLT save attempts to fail. If this happens, you will have to restart BLT, potentially losing any league changes you made since the last save.

When you try to close a Bowling League Tuneup workbook you're viewing, Excel may annoyingly ask if you want to save the workbook first, even though you've made no changes to it. Always select Don't Save when this happens.

Shown below are the formats of the three types of worksheets Bowling League Tuneup creates within an Excel workbook: the cover sheet (always named BLT), a bowler performance sheet, and a league analysis sheet.



1 League information box

This box contains basic information about use of the workbook, and it includes the name of the league and when the league definition was last updated (i.e., the date the league was last saved with the Save League & Bowler Data option checked).

2 Bowlers

An alphabetized list of league bowlers and their teams. Any bowler with recorded scores will have a bowler performance sheet which can be accessed by clicking the bowler's hyperlinked entry as an alternative to clicking on the sheet's Excel tab.

3 Saved analyses

A list of each saved analysis sheet. Sheets can be accessed by clicking the analysis name or by clicking on the sheet's Excel tab.

Pin Pals.xlsx - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer Add-Ins Team

M1 fx

A B C D E F G H I J KLNN O

Bowling League Tuneup

Jack Striker

League: Pin Pals
 Team: 2-Heatwave
 Book: 170 (not used in handicap/trend computations)
 Date: (week 12 of 12)

Week	1	2	3	Total	Avg	High	Low	Season Avg*
1	150	185	207	542	180.6	207	150	180.6 (+0)-
2	179	210	184	573	191.0	210	179	185.8 (+5)•
3	133	212	203	548	182.6	212	133	184.7 (+3)-
4	157	152	170	479	159.6	170	152	178.5 (-3)-
5	143	173	197	513	171.0	197	143	177.0 (-4)-
6	161	122	189	472	157.3	189	122	173.7 (-6)-
7	177	147	172	496	165.3	177	147	172.5 (-7)-
8	115	228	178	521	173.6	228	115	172.6 (-5)-
9		177	221	398	199.0	221	177	174.6 (-3)-
10	158	105	158	421	140.3	158	105	171.1 (-6)°

Games	9	10	10	29	Effective†
Total	1373	1711	1879	4963	172 (-6)-
Avg	152.5	171.1	187.9	513.4	171.1
High	179	228	221	573	199.0
Low	115	105	158	421	140.3

* Includes trend (average pins per game above or below the average that handicap is based upon) and volatility (variability of game scores: • low, - normal, or ° high)
 † Includes any undisplayed absence, substitute, and vacancy scores for this bowler

Season Average

Weekly Scores

Weekly vs. Season

Weekly vs. Handicap Basis

Lee Boyd Ann Fitzgerald Nina Simpson Chris Hart Jack Striker Irvin May

Ready 100%

1 BLT icon

Can be clicked as a fast way to return to the cover sheet.

2 Bowler information box

Displays the bowler's name, league, team name, and book average. Also included is the date for which the sheet was created and, optionally, the league's week number.

3 Bowler scores

A list of all scores recorded by this bowler. Any missed games (i.e., absence, substitute, and vacancy scores) are shown as empty cells; any missed weeks are omitted from this list.

4 Weekly statistics

A week-by-week summary containing the bowler's total pins, average, and high and low games for the week. The last column shows cumulative season average after each week, and may optionally include the bowler's cumulative season trend and volatility values as well (only if the option to exclude trend and volatility data from bowler sheets was not selected when the league was saved). Weekly and season averages are shown with one decimal place to show how close the bowler is to the next-higher average.

5 Effective statistics

Effective season statistics include all games bowled in this bowler's position on his/her team, meaning that absence, substitute, and vacancy scores, although not displayed on this sheet, are all included. The effective statistics are what Bowling League Tuneup displays for this bowler position on the main screen and what it uses in its league analyses. The difference between a bowler's final Season Avg column entry and this entry indicates the overall effect the bowler's absences had on the team. Effective season average is shown without any decimal places (the same as all averages used in BLT computations) and will be displayed with effective season trend and volatility values if trend and volatility values are displayed in the bowler's weekly statistics.

6 Game statistics

A game-by-game summary containing the bowler's total games bowled, and the total pins, average, and high and low games for each game number over the course of the season.

7 Summary statistics

A full-season summary of totals, averages, highs, and lows. The six farthest-right numbers indicate the average high and low games each week, the high score of the season (where high and high intersect), the low score of the season (low-low), the best low score for any week (high-low), and the worst high score for any week (low-high). Note that the low total series and low average series values exclude weeks in which the full number of games was not bowled, as it wouldn't be fair to base those values on a week in which games were missed.

8 Season average graph

A graph of the bowler's cumulative week-by-week season average. This is a graph of the last column of the weekly statistics. An upward slope indicates overall improvement as the season progresses, while a downward slope indicates performance degradation over the season.

9 Weekly scores graph

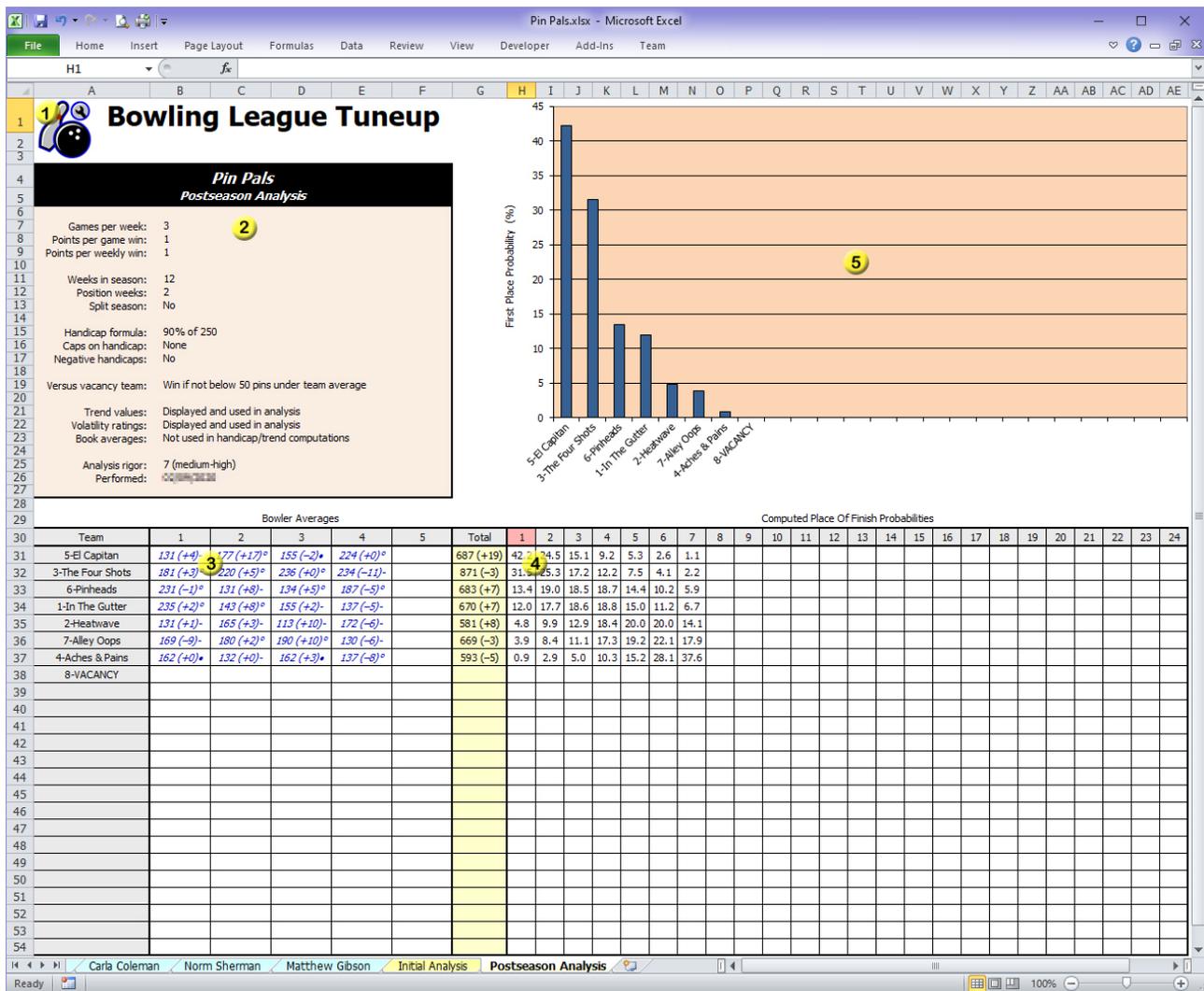
A graph of the bowler's weekly scores. Each vertical bar represents the range of scores bowled that week, with a dot at the position of the average score for that week. This graph shows a bowler's volatility. Longer vertical bars and less-consistent positions of the bars are signs of higher volatility; shorter bars in more consistent positions indicate lower volatility.

10 Weekly versus season graph

A graph that compares each week's results (black line) with cumulative season results (blue line). When the black line rises above the blue line, the bowler has exceeded his/her season performance to date, causing the blue line to rise; when it dips below the blue line, the bowler has bowled below his/her average, causing the blue line to fall.

11 Weekly versus handicap basis graph

A graph that shows each week's results along with the bowler's handicap basis. The line indicates the average being used to set the bowler's handicap each week. A dot that falls above the line, in the light blue area, means the bowler exceeded the average upon which his/her handicap was being based, resulting in a positive trend for the week. A dot that falls below the line, in the dark blue area, means the bowler failed to reach that average, resulting in a negative trend for the week. By observing the number and positions of dots above and below the line, the bowler's season trend value may be approximated. The more dots above the line and the higher they are above the line, the higher the bowler's trend will be. Here, the predominance of dots below the line indicates the bowler's negative trend value. In leagues that use book averages, the handicap basis line will remain at the bowler's book average for as many weeks as a book average is used (or perhaps longer if games were missed in the weeks that were bowled during this period). In leagues that don't use book averages (like this one), the handicap basis line will be the same for the first two weeks since the handicap basis is established in the first week of bowling and used in both weeks one and two. This graph will not appear if the option to exclude trend and volatility data from bowler sheets was selected when the league was saved.



1 BLT icon

Can be clicked as a fast way to return to the cover sheet.

2 League information box

Displays the league name and analysis name, followed by all relevant attributes of the league. The rigor of the analysis and date it was performed are shown at the bottom of the box.

3 Bowler averages

This is the same information shown on the main screen. The sort order is what was set at the time the analysis was saved. Because the sheet may be printed in black-and-white, computed (blue) entries are shown italicized, and vacancy (red) entries are underlined.

4 Analysis results

This is the same information shown on the main screen.

5 Analysis graph

A graph of the first-place finish probabilities (column 1 of the analysis results).

Appendices

A. SYSTEM REQUIREMENTS

Bowling League Tuneup will run on any computer which meets these minimum requirements:

- Runs Microsoft Windows (Windows 7 or later)
- Has Microsoft Excel installed (genuine Microsoft Excel 2010 or later)
- Has a screen resolution of 1280 x 720 or greater (16:9 screen ratio) or 1024 x 768 or greater (4:3 screen ratio)

B. INSTALLATION INSTRUCTIONS

Bowling League Tuneup may be downloaded at the Bowling League Tuneup website (www.bl tuneup.com).

You may be required to install Bowling League Tuneup using administrator privileges due to enhanced security mechanisms on newer versions of Windows. If you are prevented from running the installer directly from the website, you should save the downloaded installer program file, allowing an administrator on the computer to run the program by right-clicking the program file name in Windows Explorer/File Explorer and selecting the Run As Administrator option.

If you are installing a new version of Bowling League Tuneup on a computer that already has a previous version installed, you should begin by uninstalling the previous version using the Windows uninstall option. This can be found in older versions of Windows via Control Panel (under Programs and Features or Add and Remove Programs) and in newer versions of Windows via Windows Settings (under Apps). Install steps are as follows:

- Click Yes, you want to allow the program to make changes to this computer.
- Make sure you have no running apps, then click OK.
- Accept the default installation folder (e.g., C:\Program Files(x86)\Bowling League Tuneup) or change to one of your preference, then click the computer icon to begin the installation.
- Accept the default program group or change to one of your preference, then click Continue.
- If you get a Version Conflict window, which tells you that your system has a newer version of a file than BLT does, click Yes to keep the version of the file that is already on your computer. Repeat this as many times as the Version Conflict window comes up.
- Click OK after being told the setup has completed successfully.

The installation folder contains a subfolder named Samples, which contains sample files that can help you learn to use Bowling League Tuneup. To use the sample files, you should copy the Samples folder from the installation location to a location of your choice – for instance, to the same folder structure you'll use to store your own BLT league files. Using the files in this new location will assure you have full access to the sample files and will preserve the original sample files should you ever want to revert your sample file copies back to their original contents. The file named Sample File List.pdf in the Samples folder describes the sample files and how you might want to use them.

C. APPLICATION STARTUP

Depending on the version of Windows you are using, the installation program will either add a Bowling League Tuneup entry to your Start menu in the All Programs/All Apps list or a live tile. Clicking the entry or live tile will start BLT.

Some people find it easier to start BLT from an icon on the taskbar or desktop. You can use standard Windows techniques to create these icons. To create a taskbar icon, right-click on the start menu entry or live tile for BLT and then click Pin To Taskbar. To create a desktop icon, right-click on the start menu entry or live tile, click Open File Location, right-click on the Bowling League Tuneup file, click Copy, then right-click on the desktop and click Paste Shortcut. Either of these shortcut icons can then be used to start BLT.

It may be convenient to load a league automatically upon starting BLT. Taskbar and desktop icons can be configured to do this, allowing you to create a set of BLT icons, each one loading a different league upon startup. To create an icon which automatically loads a league, do the following:

- Right-click on a taskbar or desktop icon and click on the Properties option.
- On the Shortcut tab, move to the end of the Target field, which contains the reference to start the BLT program, type a space, then type the full name (including folder names) of the Excel file which contains the league you want to load automatically. You should enclose the full name in double-quotes if there are any spaces in the name.
- Set the Start In field to have the full path of the folder which contains the Excel file. Again, enclose the path name in double-quotes if there are any spaces in it.
- On the General tab, you'll probably want to change the name of the shortcut to include the name of the league this icon will load. (This can also be done by renaming the icon later.)
- Click OK to accept the changes.

D. EXCEL CONFIGURATION

Genuine Microsoft Excel 2010 or later must be installed on the computer that runs Bowling League Tuneup. A normal Excel installation creates a Windows association between Excel and the .xlsx file extension. The existence of this association can be tested by going into Windows Explorer/File Explorer and double-clicking a file with a .xlsx extension. This should cause Excel to be launched and the file to be automatically opened in Excel. If you find this is not happening, do the following:

- Make sure Excel is not currently running on the computer.
- Right-click on a .xlsx file in Windows Explorer/File Explorer and select Open With. (With older versions of Windows, select Choose Program at this point.)
- Find Microsoft Excel in the displayed list or by browsing and navigating to the installed program, then select it.
- Make sure the checkbox is checked to indicate you always want to use the selected program to open this kind of file.
- Click OK.

If Excel then starts and opens the selected .xlsx file without displaying any questions, messages, warnings, or errors that require you to remove a window from your screen before you can use Excel, it is configured properly for your computer. If not, you must correct your problems with Excel before BLT will work properly.

Microsoft Excel does not require any specific configuration settings to work properly with BLT. However, Excel's error-checking of formulas can put annoying marks, meant to indicate a potential problem with a sheet's formulas, in the corners of some cells. To assure these marks do not show up, you can tell Excel to ignore the conditions which cause these marks to be displayed:

- Go to Excel's Options window by clicking File, then Options, then Formulas.
- In the error-checking rules section, make sure these options are *not* checked:
 - Numbers stored (or formatted) as text
 - Formulas referring to empty cells

E. TREND PROBABILITY TABLES

A common experiment performed in what-if analyses is to determine how changes to bowlers' assumed performances will affect league outcome probabilities. League settings can be altered until desirable results are achieved.

It's easy to set reasonable hypothetical values for bowler or team averages or bowler volatilities since those values can be intuitively understood. But that is probably not the case for trends, whose likely values are greatly influenced by the length of the season and the number of bowlers a trend value represents. For instance, it wouldn't be highly unusual for a four-bowler team to achieve a trend greater than +10 in a 15-week league, but it would be quite rare for that team to achieve such a trend in a 40-week league. This means that it would not be proper to set up a league in such a way that a four-bowler team would have to have a trend greater than +10 in order to have a realistic chance of success in a 40-week league.

The following trend probability tables can be used to determine the likelihood of a bowler or team achieving specific trend values in a league. The tables assume a league in which three games are bowled by each team per week and book averages are not used. They also assume bowlers have normal volatilities. Fewer games per week and higher volatilities will spread out the probabilities slightly away from a trend of zero, while more games per week and lower volatilities will concentrate the probabilities a little closer to a trend of zero. The use of book averages can invalidate these tables when the book averages do not accurately reflect bowlers' current abilities. The more weeks book averages are used, the more inaccurate the tables' values are likely to be. Note that bowler average is not a factor in determining trend probabilities, so these tables are valid for bowlers of all averages.

To use the tables, find the set of columns for the number of weeks in the season (use the closest match), then find the column for the number of bowlers on a team (using column 1 if you are looking up trend probabilities for a single bowler). The selected column shows the probabilities of that bowler or team ending the season with specific trend values.

Each column adds up to a probability of 100%. To determine the probability of a range of trends, just add the numbers in that range. For instance, a single bowler of normal volatility bowling three games per week in a 25-week league has a 1% chance of achieving a trend of +7 or greater (0.6% + 0.3% + 0.1%). That same bowler has an 8% chance of doing this in a 10-week league and would never be expected to have this result in a 50-week league.

These tables were created using the same Monte Carlo simulation techniques Bowling League Tuneup uses in performing its analyses. The resulting probabilities are valid for any bowler who was "stable" during the season, i.e., did not rapidly improve due to intensive training or recovery

from an injury, did not have a significant decline in scoring due to a mid-season injury, and did not cheat (sandbag) to try to raise his or her handicap.

This last caveat points out a second use for these tables, namely as a way of detecting potential instances of sandbagging. If a bowler or team achieves high trend values that these tables indicate are highly unlikely to occur in a normal series of games, especially if this is done on a repeated basis over multiple seasons, that is a very strong indication of a willful attempt to bowl low scores early in the season and higher scores as the season progresses. This form of cheating undermines the fairness of handicap bowling leagues, which makes its detection and prevention vital to a league's integrity.

Weeks Bowlers	10					15					20				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
>+20		0.1	0.5	1.3	2.3			0.1	0.3	0.6				0.1	0.2
+20		0.1	0.2	0.4	0.6			0.1	0.1	0.2					0.1
+19		0.1	0.3	0.5	0.7			0.1	0.2	0.3				0.1	0.1
+18		0.2	0.4	0.6	0.8			0.1	0.3	0.4				0.1	0.2
+17		0.2	0.5	0.8	1.0			0.2	0.4	0.6				0.1	0.3
+16		0.3	0.7	1.0	1.1		0.1	0.3	0.5	0.7			0.1	0.2	0.4
+15	0.1	0.4	0.8	1.1	1.3		0.1	0.4	0.7	0.9			0.2	0.3	0.5
+14	0.1	0.6	1.0	1.3	1.5		0.2	0.5	0.8	1.1		0.1	0.3	0.5	0.7
+13	0.2	0.8	1.3	1.6	1.7		0.3	0.7	1.1	1.3		0.1	0.4	0.7	0.9
+12	0.3	1.1	1.5	1.8	1.9	0.1	0.5	1.0	1.3	1.6		0.2	0.6	0.9	1.2
+11	0.6	1.4	1.9	2.1	2.2	0.2	0.8	1.3	1.6	1.9		0.4	0.9	1.2	1.5
+10	0.9	1.8	2.2	2.4	2.4	0.3	1.1	1.7	2.0	2.3	0.1	0.7	1.2	1.7	1.9
+9	1.3	2.3	2.6	2.6	2.6	0.6	1.6	2.2	2.4	2.7	0.3	1.0	1.7	2.1	2.4
+8	1.9	2.8	3.0	2.9	2.9	1.0	2.2	2.7	2.9	3.0	0.5	1.6	2.3	2.7	2.9
+7	2.6	3.3	3.3	3.2	3.1	1.7	2.9	3.3	3.4	3.3	1.1	2.4	3.0	3.3	3.4
+6	3.4	3.9	3.8	3.5	3.3	2.7	3.8	3.9	3.9	3.7	2.0	3.3	3.8	3.9	4.0
+5	4.3	4.5	4.1	3.8	3.5	3.9	4.7	4.6	4.4	4.1	3.3	4.5	4.7	4.6	4.5
+4	5.3	5.1	4.5	4.0	3.6	5.3	5.6	5.2	4.8	4.4	4.9	5.8	5.6	5.3	4.9
+3	6.3	5.5	4.7	4.2	3.7	6.8	6.5	5.7	5.1	4.6	6.9	7.1	6.5	5.9	5.4
+2	7.1	5.9	5.0	4.3	3.9	8.2	7.3	6.2	5.4	4.8	8.9	8.3	7.2	6.3	5.7
+1	7.6	6.2	5.1	4.4	3.9	9.3	7.8	6.4	5.6	5.0	10.5	9.1	7.6	6.6	5.8
0	16.0	6.8	5.2	4.4	4.0	19.8	9.0	6.6	5.6	5.0	23.0	10.8	7.8	6.8	6.0
-1	7.6	6.2	5.1	4.4	3.9	9.3	7.8	6.4	5.6	5.0	10.5	9.1	7.6	6.6	5.8
-2	7.1	5.9	5.0	4.3	3.9	8.2	7.3	6.2	5.4	4.8	8.9	8.3	7.2	6.3	5.7
-3	6.3	5.5	4.7	4.2	3.7	6.8	6.5	5.7	5.1	4.6	6.9	7.1	6.5	5.9	5.4
-4	5.3	5.1	4.5	4.0	3.6	5.3	5.6	5.2	4.8	4.4	4.9	5.8	5.6	5.3	4.9
-5	4.3	4.5	4.1	3.8	3.5	3.9	4.7	4.6	4.4	4.1	3.3	4.5	4.7	4.6	4.5
-6	3.4	3.9	3.8	3.5	3.3	2.7	3.8	3.9	3.9	3.7	2.0	3.3	3.8	3.9	4.0
-7	2.6	3.3	3.3	3.2	3.1	1.7	2.9	3.3	3.4	3.3	1.1	2.4	3.0	3.3	3.4
-8	1.9	2.8	3.0	2.9	2.9	1.0	2.2	2.7	2.9	3.0	0.5	1.6	2.3	2.7	2.9
-9	1.3	2.3	2.6	2.6	2.6	0.6	1.6	2.2	2.4	2.7	0.3	1.0	1.7	2.1	2.4
-10	0.9	1.8	2.2	2.4	2.4	0.3	1.1	1.7	2.0	2.3	0.1	0.7	1.2	1.7	1.9
-11	0.6	1.4	1.9	2.1	2.2	0.2	0.8	1.3	1.6	1.9		0.4	0.9	1.2	1.5
-12	0.3	1.1	1.5	1.8	1.9	0.1	0.5	1.0	1.3	1.6		0.2	0.6	0.9	1.2
-13	0.2	0.8	1.3	1.6	1.7		0.3	0.7	1.1	1.3		0.1	0.4	0.7	0.9
-14	0.1	0.6	1.0	1.3	1.5		0.2	0.5	0.8	1.1		0.1	0.3	0.5	0.7
-15	0.1	0.4	0.8	1.1	1.3		0.1	0.4	0.7	0.9			0.2	0.3	0.5
-16		0.3	0.7	1.0	1.1		0.1	0.3	0.5	0.7			0.1	0.2	0.4
-17		0.2	0.5	0.8	1.0			0.2	0.4	0.6				0.1	0.3
-18		0.2	0.4	0.6	0.8			0.1	0.3	0.4				0.1	0.2
-19		0.1	0.3	0.5	0.7			0.1	0.2	0.3				0.1	0.1
-20		0.1	0.2	0.4	0.6			0.1	0.1	0.2					0.1
<-20		0.1	0.5	1.3	2.3			0.1	0.3	0.6				0.1	0.2

Table 1 (Trend probabilities: 10, 15, 20 weeks per season)

Weeks Bowlers	25					30					35				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
>+20															
+20															
+19					0.1										
+18					0.1										
+17				0.1	0.1					0.1					
+16				0.1	0.2					0.1					
+15			0.1	0.2	0.3				0.1	0.2					0.1
+14			0.1	0.3	0.4				0.1	0.3				0.1	0.2
+13			0.2	0.4	0.6			0.1	0.2	0.4				0.1	0.3
+12		0.1	0.3	0.6	0.9			0.2	0.4	0.6			0.1	0.2	0.4
+11		0.2	0.5	0.9	1.2		0.1	0.3	0.6	0.9			0.2	0.4	0.7
+10		0.4	0.8	1.3	1.6		0.2	0.6	0.9	1.3		0.1	0.4	0.7	1.0
+9	0.1	0.7	1.3	1.7	2.1		0.4	0.9	1.4	1.8		0.3	0.7	1.1	1.5
+8	0.3	1.1	1.9	2.4	2.7	0.1	0.8	1.4	2.0	2.4	0.1	0.5	1.1	1.6	2.0
+7	0.6	1.8	2.6	3.1	3.3	0.4	1.4	2.2	2.7	3.1	0.2	1.0	1.8	2.4	2.8
+6	1.4	2.8	3.6	3.9	4.0	0.9	2.3	3.2	3.7	3.8	0.6	1.9	2.8	3.4	3.7
+5	2.6	4.1	4.6	4.7	4.7	2.0	3.7	4.4	4.7	4.7	1.6	3.2	4.2	4.6	4.7
+4	4.4	5.7	5.8	5.6	5.3	3.9	5.5	5.9	5.8	5.5	3.3	5.2	5.8	5.9	5.8
+3	6.8	7.5	7.0	6.4	5.9	6.5	7.6	7.3	7.0	6.4	6.1	7.6	7.5	7.2	6.8
+2	9.3	9.0	7.9	7.0	6.4	9.6	9.6	8.7	7.8	7.1	9.7	10.1	9.2	8.4	7.6
+1	11.6	10.3	8.7	7.5	6.7	12.4	11.3	9.6	8.3	7.5	13.1	12.3	10.5	9.1	8.2
0	25.8	12.6	9.2	7.6	6.8	28.4	14.2	10.4	8.6	7.6	30.6	15.6	11.4	9.6	8.4
-1	11.6	10.3	8.7	7.5	6.7	12.4	11.3	9.6	8.3	7.5	13.1	12.3	10.5	9.1	8.2
-2	9.3	9.0	7.9	7.0	6.4	9.6	9.6	8.7	7.8	7.1	9.7	10.1	9.2	8.4	7.6
-3	6.8	7.5	7.0	6.4	5.9	6.5	7.6	7.3	7.0	6.4	6.1	7.6	7.5	7.2	6.8
-4	4.4	5.7	5.8	5.6	5.3	3.9	5.5	5.9	5.8	5.5	3.3	5.2	5.8	5.9	5.8
-5	2.6	4.1	4.6	4.7	4.7	2.0	3.7	4.4	4.7	4.7	1.6	3.2	4.2	4.6	4.7
-6	1.4	2.8	3.6	3.9	4.0	0.9	2.3	3.2	3.7	3.8	0.6	1.9	2.8	3.4	3.7
-7	0.6	1.8	2.6	3.1	3.3	0.4	1.4	2.2	2.7	3.1	0.2	1.0	1.8	2.4	2.8
-8	0.3	1.1	1.9	2.4	2.7	0.1	0.8	1.4	2.0	2.4	0.1	0.5	1.1	1.6	2.0
-9	0.1	0.7	1.3	1.7	2.1		0.4	0.9	1.4	1.8		0.3	0.7	1.1	1.5
-10		0.4	0.8	1.3	1.6		0.2	0.6	0.9	1.3		0.1	0.4	0.7	1.0
-11		0.2	0.5	0.9	1.2		0.1	0.3	0.6	0.9			0.2	0.4	0.7
-12		0.1	0.3	0.6	0.9			0.2	0.4	0.6			0.1	0.2	0.4
-13			0.2	0.4	0.6			0.1	0.2	0.4				0.1	0.3
-14			0.1	0.3	0.4				0.1	0.3				0.1	0.2
-15			0.1	0.2	0.3				0.1	0.2					0.1
-16				0.1	0.2					0.1					
-17				0.1	0.1					0.1					
-18					0.1										
-19					0.1										
-20															
<-20															

Table 2 (Trend probabilities: 25, 30, 35 weeks per season)

Weeks Bowlers	40					45					50				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
>+20															
+20															
+19															
+18															
+17															
+16															
+15															
+14					0.1										
+13				0.1	0.2					0.1					0.1
+12			0.1	0.1	0.3				0.1	0.2				0.1	0.1
+11			0.1	0.3	0.5			0.1	0.2	0.3				0.1	0.2
+10		0.1	0.2	0.5	0.7			0.2	0.3	0.6			0.1	0.2	0.4
+9		0.1	0.5	0.8	1.2		0.1	0.3	0.6	0.9		0.1	0.2	0.5	0.7
+8		0.3	0.8	1.3	1.8		0.2	0.6	1.1	1.5		0.2	0.5	0.9	1.2
+7	0.1	0.8	1.5	2.1	2.5	0.1	0.6	1.2	1.8	2.3		0.4	1.0	1.5	2.0
+6	0.4	1.5	2.5	3.1	3.5	0.3	1.2	2.1	2.8	3.3	0.2	0.9	1.8	2.5	3.0
+5	1.2	2.8	3.8	4.4	4.6	0.9	2.4	3.5	4.2	4.6	0.7	2.1	3.2	3.9	4.4
+4	2.9	4.8	5.6	5.9	5.9	2.4	4.4	5.4	5.8	5.9	2.0	4.0	5.1	5.7	5.9
+3	5.7	7.4	7.7	7.5	7.1	5.3	7.3	7.7	7.6	7.3	4.9	7.0	7.6	7.7	7.6
+2	9.7	10.5	9.7	8.9	8.2	9.6	10.7	10.1	9.3	8.6	9.4	10.8	10.5	9.7	9.0
+1	13.7	13.1	11.3	9.9	8.9	14.1	13.8	12.1	10.6	9.5	14.6	14.5	12.8	11.2	10.1
0	32.6	17.2	12.4	10.2	9.0	34.6	18.6	13.4	11.2	9.8	36.4	20.0	14.4	12.0	10.6
-1	13.7	13.1	11.3	9.9	8.9	14.1	13.8	12.1	10.6	9.5	14.6	14.5	12.8	11.2	10.1
-2	9.7	10.5	9.7	8.9	8.2	9.6	10.7	10.1	9.3	8.6	9.4	10.8	10.5	9.7	9.0
-3	5.7	7.4	7.7	7.5	7.1	5.3	7.3	7.7	7.6	7.3	4.9	7.0	7.6	7.7	7.6
-4	2.9	4.8	5.6	5.9	5.9	2.4	4.4	5.4	5.8	5.9	2.0	4.0	5.1	5.7	5.9
-5	1.2	2.8	3.8	4.4	4.6	0.9	2.4	3.5	4.2	4.6	0.7	2.1	3.2	3.9	4.4
-6	0.4	1.5	2.5	3.1	3.5	0.3	1.2	2.1	2.8	3.3	0.2	0.9	1.8	2.5	3.0
-7	0.1	0.8	1.5	2.1	2.5	0.1	0.6	1.2	1.8	2.3		0.4	1.0	1.5	2.0
-8		0.3	0.8	1.3	1.8		0.2	0.6	1.1	1.5		0.2	0.5	0.9	1.2
-9		0.1	0.5	0.8	1.2		0.1	0.3	0.6	0.9		0.1	0.2	0.5	0.7
-10		0.1	0.2	0.5	0.7			0.2	0.3	0.6			0.1	0.2	0.4
-11			0.1	0.3	0.5			0.1	0.2	0.3				0.1	0.2
-12			0.1	0.1	0.3				0.1	0.2				0.1	0.1
-13				0.1	0.2					0.1					0.1
-14					0.1										
-15															
-16															
-17															
-18															
-19															
-20															
<-20															

Table 3 (Trend probabilities: 40, 45, 50 weeks per season)

F. GLOSSARY

Absence score – The score a bowler’s team receives when the bowler is unable to bowl a game. Typically, leagues use the missing bowler’s current average minus some number of penalty pins. If book averages are still being used to set the handicap for this bowler, the absence score would be the bowler’s book average minus that same number of penalty pins.

Average – The average scratch (non-handicap) score of a bowler in a league.

BLT – The unfortunate acronym of Bowling League Tuneup, which makes it sound like it’s a tasty sandwich.

Book average – The bowler’s sanctioned league average, as maintained by the U.S. Bowling Congress. A bowler establishes a separate book average in each sanctioned league he or she participates in. The book average may be selected from one of those leagues or from a *composite* average, which is the bowler’s overall average from multiple sanctioned leagues. Some leagues use the book average as the basis for a bowler’s handicap, usually for some period at the start of a new season, until enough games have been bowled for the bowler’s handicap to be based on the current season’s average.

Bowler performance sheet – A worksheet in a league workbook that contains a record of a bowler’s season performance, along with statistics and graphs of that performance.

Computed data – BLT terminology for averages, trends, and volatilities that have been calculated by BLT from actual bowler scores that have been entered into BLT.

Custom worksheet – Any worksheet added to a league workbook from outside the Bowling League Tuneup software. Custom worksheets may have any non-conflicting name and may contain anything that can be stored in an Excel worksheet, but they must be placed before (to the left of) the BLT worksheet tab and must be added only when Bowling League Tuneup is not using the league workbook.

Dual handicaps – BLT terminology for a league which uses two different handicap formulas, one for the first half of the season and another one for the second half. Dual handicaps may be used as part of a split season, with a different handicap being used in each of the two halves, or as part of a regular season, where the handicap changes halfway through the season without the standings being reset.

Dumping – The illegal practice in handicap leagues of bowling poorly on purpose at any time in a season when a good score is not likely to alter a game’s outcome. Like sandbagging, this practice lowers one’s average, and therefore boosts one’s handicap, in an attempt to win future games from an inflated handicap that does not properly represent the bowler’s actual abilities. BLT can be used to detect dumping, a practice which saps handicap leagues of their fairness and violates the requirement that bowlers try to bowl their best at all times.

Effective values – Effective averages, trends, and volatilities, as displayed in the “Effective” box on bowler performance sheets, include all games recorded for that bowler position on a team for the entire season, including absence, substitute, and vacancy scores. These effective values are the ones used by BLT when performing league analyses, since all these scores will influence a team’s chances in the league. But bowler performance sheet evaluations use only the scores actually bowled by that bowler.

Handicap – The number assigned to a league bowler which is added to his or her scratch score for each game bowled in a handicap league. Handicaps are added to all bowlers' scratch scores in a game between two opposing teams, then the teams' scores are summed to determine the game's winner and loser. Handicaps are usually recomputed for each bowler after each week of bowling and are determined by a formula which is designed to give lower handicaps to better bowlers and higher handicaps to poorer bowlers for the purpose of allowing good bowlers and not-so-good bowlers to compete on a relatively level playing field.

Handicap base – The number in the handicap formula from which a bowler's average is subtracted before being multiplied by the handicap percentage. If negative handicaps are not allowed, the handicap base must be larger than any average attained by any bowler in the league during the season. If it is not, bowlers able to exceed the handicap base will have a handicap of zero and will receive an unfair advantage in the league as a result.

Handicap basis – The average which is being used to determine (i.e., which serves as the *basis* for determining) a bowler's handicap. The handicap basis is usually the bowler's current league average, but in leagues which use book averages to set handicaps for some number of weeks, the bowler's book average, not the bowler's current league average, is the handicap basis during that period. (This term is unfortunately similar to the term "handicap base," as just described; we hope this doesn't cause too much confusion.)

Handicap formula – The formula, in the form of ($x\%$ of y), which is used to determine bowler handicaps in a league. To use the formula, a bowler's average is subtracted from the value y , then $x\%$ of that result becomes the bowler's handicap. Leagues remove the decimal portion of the result to assure the handicap is an integer. The handicap will be a negative number if a bowler's average is greater than y ; if negative handicaps are not allowed in the league, the bowler's handicap will be zero.

Handicap league – A bowling league which determines game wins and losses by adding bowlers' handicaps to their scratch scores before computing game totals.

Handicap percentage – The number in the handicap formula which is multiplied by the handicap base minus the bowler's average. A handicap percentage of 100% levels the playing field to the point that better bowlers have no advantage over poorer bowlers. A handicap percentage of zero gives all bowlers a handicap of zero, which means the league becomes a scratch league. Anything in between gives better bowlers some advantage over poorer bowlers.

Handicap score – A bowler's scratch game score plus his or her handicap.

League analysis sheet – A worksheet in a league workbook that contains the results of a Bowling League Tuneup league analysis that was saved at some point during the season. Each analysis shows league settings and team/bowler data along with analysis results in a table and in graphical form.

League manager – Sometimes called the league coordinator, this is the person responsible for setting up a bowling league, i.e., assembling the teams and setting the league's attributes. For a handicap league, the league manager's goal should be to create a properly tuned league that achieves the desired balance between rewarding high scores and good team performances, while assuring that all teams will have a reasonable chance of success in the league.

League workbook – A Microsoft Excel file saved by Bowling League Tuneup that contains a full league definition, including league attributes, team and bowler rosters, bowler performance sheets, league analysis sheets, plus any custom sheets that may have been added from outside of Bowling League Tuneup. League workbooks are loaded into Bowling League Tuneup in order to work on the league (enter bowler scores, perform league analyses, etc.). They may also be viewed outside of Bowling League Tuneup by opening them into Excel in order to view bowler performance sheets, league analysis sheets, and custom worksheets.

Mass changes – Changes made to bowler attributes for all league bowlers at once, usually in preparation for performing what-if analyses. Mass change options are accessed via the Define League window.

Negative handicaps – When a bowler's average goes higher than the handicap base, the resulting handicap will be negative, meaning that pins will be *subtracted from*, not added to, the bowler's scratch scores. Most leagues prohibit negative handicaps, instead setting the handicap to zero for any bowler whose average goes above the handicap base. Doing so gives such a bowler a disproportionately high handicap, preventing the handicap from properly leveling the playing field for the league.

Points – The values awarded to a team for winning games and/or attaining a higher pin total in the weekly series against an opponent. The number of points awarded for each game won and for each week won are specified in the Week section of the main BLT screen. In case of ties, the points are split between the two teams (even if fractions must be used). The teams' point totals for the season determine the league standings, from most points (first place) to least (last place). The specific numbers selected for game wins and weekly wins set their relative importance in determining league outcomes.

Position week – A week in the bowling season in which team pairings are determined not by the standard bowling league schedule, but instead by the current standings, where the first-place team bowls against the second-place team, third-place versus fourth-place, etc. When position weeks are used, they are scheduled to occur at approximately equally spaced weeks through the season, with the last week of the season always being a position week. The purpose of position weeks is to increase bowler fun by creating head-to-head matchups between teams that may be battling to get to a particular place in the standings.

Rigor – BLT terminology for the thoroughness of a Bowling League Tuneup analysis. The lowest level of rigor (0) simulates only about a thousand seasons, so results are usually just ballpark estimates, but they can be computed quickly. Each level of rigor approximately doubles the number of seasons simulated, with the highest level of rigor (10, which displays as "H") simulating about a million seasons, giving results which are highly consistent and accurate but which could take many minutes or even hours to produce, depending on the size and length of the league.

Sandbagging – The illegal practice in handicap leagues of bowling poorly on purpose early in the season in order to lower one's average, and therefore boost one's handicap, in an attempt to win future games from an inflated handicap that does not properly represent the bowler's actual abilities. Sandbagging is particularly effective when handicaps are based on bowler averages that are established in the first week of the season rather than being based on the bowlers' historical book averages at the beginning of the season. BLT can be used to detect sandbagging, a practice which saps handicap leagues of their fairness and violates the requirement that bowlers try to bowl their best at all times.

Scratch league – A bowling league which determines wins and losses solely from the totals of the scratch scores of the opposing teams, i.e., without adding handicaps to bowler scores.

Scratch score – A bowler's actual final score in a game, without a handicap being added to it.

Split season – A bowling season which is divided into two equal halves, with standings (but not bowler averages or handicaps) being reset before beginning the second half. This produces two league winners, one for each half of the season. A playoff series is usually bowled between each half's winners to determine the overall season winner. Splitting a season helps level a league's playing field, giving poorer teams a better chance of success, by (a) giving teams not one but two chances for success in the league and (b) shortening the season length, with two half-length seasons whose results are each less predictable than they would be with a single full-length season.

Substitute score – The score of a bowler who is temporarily replacing a team's permanent bowler when he or she is unable to bowl a game. Leagues may allow or disallow the use of substitute bowlers, and they may restrict who can act as a substitute bowler and at what times in the season a substitute may be used. In a handicap league, the substitute's handicap score is computed from his or her own established handicap, not from the handicap of the missing bowler.

Supplied data – BLT terminology for averages, trends, and volatilities which have been assigned to a bowler rather than being calculated by Bowling League Tuneup from actual scores. Supplied data may either be based on the bowler's actual past performances or entered as hypothetical values for what-if analyses.

Sweepers – The common name for a final postseason week in which league bowlers contribute to a pot to bowl for money, either individually, paired with other league bowlers, or as teams. Results are not counted in the final season standings. In handicap leagues, bowlers use the handicaps that were set during the just-completed season.

Trend – The measure of bowler performance which compares each of a bowler's scores with the average the bowler's handicap was being based on when each game was bowled. The trend is the average of these differences, measured over all games in the season. A positive trend means the bowler has overall outperformed his or her average; a negative trend indicates underperforming. Handicap leagues reward higher trend values.

Vacancy score – The standard score a league uses for an empty position on a bowling team when a full team could not be created. A vacancy score may also be required to be used if a bowler has been absent from a team for longer than the maximum number of weeks the league allows an absence score to be used. There is usually no penalty to a team for use of a vacancy score, i.e., the trend for vacancy scores is usually zero.

Vacancy team – A nonexistent team created to assure a league has an even number of teams. The Vacancy Teams section of the main BLT screen sets the rule for determining victories in weeks when a team is paired up to bowl against a vacancy team (meaning the bowlers bowl without an opponent).

Volatility – The measure of bowler performance which indicates the consistency of a bowler’s scores. In BLT, a bowler’s volatility is categorized as low, normal, or high. Low volatility reflects a high degree of consistency in scoring and more certainty in expected league results; high volatility reflects low consistency and less certainty.

What-if analysis – A BLT analysis that is based not on actual bowler data or league attributes, but on hypothetical changes to those values made as part of the process of tuning up a league – as in, “What if this bowler attains a 170 average?” or “What if the league handicap were changed to 95% of 240?”

G. FAQs

1. **Why won’t the View League button bring up Excel?**

The View League button should always bring up Excel successfully. If View League isn’t working, please refer to Appendix D to assure Excel is installed and configured correctly on your computer.

2. **Why do I get errors trying to load a league or run an analysis?**

If you can load some leagues but not a particular league, the league file may have been corrupted, which can happen if the file was improperly modified from outside of Bowling League Tuneup. Remember, the only changes you are allowed to make to a league file outside of BLT is to add custom worksheets before the BLT worksheet. When a file gets corrupted, your only recourse is to recover a backed-up version of the file (we strongly recommend running regular backups for this reason) or to recreate the league from scratch, perhaps aided by visual inspection of the corrupted file in Excel. If you can’t load any league files, this usually indicates a problem with the operation of Excel on your computer. Again, please refer to Appendix D to assure Excel is installed and configured correctly.

3. **Why do I keep getting errors trying to save the league?**

The message “Error saving league file” or some other error in the midst of saving the league is most often caused by accidentally leaving the league file open in Excel while using the league in BLT. Once you’re in this state, it doesn’t usually solve the problem to close Excel and then try saving again, nor does it usually work to try to save to a different file name or even to just reload the league. In these cases, there is no choice but to close BLT, losing any unsaved league changes, then restart BLT and reload the league.

4. **Why does Excel ask if I want to save changes made to the workbook?**

Excel has an annoying habit of thinking you’ve made workbook changes when all you’ve done is click View League, view various sheets in the Excel workbook, then try to close Excel and return to BLT. If Excel asks if you want to save the changes you made to the workbook after using the View League button, even when you’ve done as you should and made no changes, just answer Don’t Save. The only time you should save the league file in Excel is when you’ve opened it in Excel to add custom sheets to the workbook – something you should not do while BLT is using the same file.

5. **Can I use any other spreadsheet products besides Microsoft Excel?**

Our experience is that only genuine Microsoft Excel will work properly with Bowling League Tuneup, which uses Microsoft’s Excel object libraries to communicate with Excel. Unfortunately, these libraries don’t appear to work with many Excel imitators.

6. Can I delete a league workbook file while it is being used by BLT?

No, you can't. Bowling League Tuneup does not load the full contents of a league file into memory, so the file must exist even after the league has been opened in BLT. If you want to create a new league file and delete the old one, save the league into a new workbook first, and *then* you can delete the old league workbook file.

7. Can I resize BLT screens?

Bowling League Tuneup screens have only two sizes, small and large, which can be toggled via the magnify icon at the top-right of the main screen.

8. Why doesn't the BLT main screen fit on my monitor and/or why are parts of the grids are cut off?

If you have the minimum screen resolution required to run Bowling League Tuneup (1280x720 or 1024x768) and you are already using BLT's small screen size, you may have Windows set to magnify text to make it larger and easier to read. Unfortunately, doing this may make some BLT windows too big to fit on the screen and may make grids display improperly. The solution, at least when you're using BLT, would be to reset Windows to use 100% magnification (i.e., no magnification).

9. Why does clicking on a grid cell sometimes open the wrong cell for editing?

Same reason as the previous question. When text is magnified, the synchronization between the Windows cursor and the grid cell boundaries may not be accurate. Again, the solution would be to reset Windows to use 100% magnification.

10. Why do saves take so long?

Most of the time taken during league saves is to create or rewrite potentially dozens of bowler performance sheets in the league's Excel file. Unfortunately, we can't speed up Bowling League Tuneup's interface to Excel. But there is one time-saving feature you can take advantage of when you are performing and saving a series of what-if analyses. You generally do not want to save the hypothetical league and/or bowler changes made solely to create a what-if analysis. In these cases, be sure to uncheck the Save League & Bowler Data checkbox in the Save League window so only the analysis is saved and time is not pointlessly taken to update bowler worksheets in response to these changes.

11. Why aren't handicaps shown on bowler sheets?

Bowling League Tuneup is not a league management system. League management systems provide all the tools necessary to run a league, including creating league schedules, making weekly team lane assignments, tracking bowler payments records, determining season-best achievements for bowlers and teams, determining trophy distribution and monetary winnings, and producing weekly recap sheets of results and standings (which usually include the display of bowler averages and handicaps). BLT does none of these things. While we've had several requests for BLT to display handicaps on the bowler performance sheets, we feel that doing this would be a mistake, as handicaps have no absolute meaning (they only mean something when compared to other handicaps in the league). Plus, confusion would reign with leagues that use dual handicaps, i.e., a different handicap formula in each half of the season. So to keep BLT as simple as possible and to prevent misinterpretation and confusion, bowler handicaps are simply not displayed. We leave that job – and many others – to the league management system.

12. Why can't I put apostrophes in bowler's names?

Excel sheets can't have apostrophes in their names, so Bowling League Tuneup won't let you use them either. But you can use dashes, spaces, or even that backward apostrophe character at the upper-left corner of most keyboards.

13. How can I print all the bowler sheets at once?

Bowler sheets are always stored in adjacent tabs in the Excel workbook, so the easiest way to print them via a single print request is to click on the first sheet name, scroll to the last sheet, then shift-click on that sheet name. This highlights all the bowler sheets, allowing them to all be printed via a single Excel Print command.

14. Why is the Start In folder ignored at startup?

We showed in Appendix C how to create an icon that starts Bowling League Tuneup and loads a league automatically. The Start In field of the icon's properties is supposed to tell Windows what folder to use when the application loads and saves files. But some versions of Windows ignore this field and instead remember the last folder that was used by the program. This may work out fine if your league files are all stored under the same folder structure. If not, by using the fully qualified league file name (i.e., include the full folder path before the file name, as recommended in Appendix C) following the program name in the Target field, the league file should open regardless of the Start In field contents.

15. What if my league has more than 24 teams?

We had to make some compromises in the design of Bowling League Tuneup, and putting a limitation on the number of teams was one of them. Anything more than 24 teams would have required some significant complications to the user interface. The limit of 24 teams assures the interface is simple and easy to use. We know that there are larger leagues than this out there, but in the current release of Bowling League Tuneup, the largest league it is able to handle is 24 teams.

16. What do I do when my league has different vacancy scores for men and women?

Bowling League Tuneup only supports a single default vacancy score for the league. That score and the average it is based upon are filled in automatically if the Score field is empty when the Sub/Vacancy checkbox is checked. When a non-default vacancy score and the average it is based upon need to be entered, those values will have to be typed in to override the default value.

17. Is there any way to reorder the analysis sheet list on the cover page of a league workbook?

Analysis sheets are listed in the order they were created. Unfortunately, there is no mechanism in Bowling League Tuneup to reorder this list. Generally, the number of analysis sheets for a league will be small enough that resorting the list should usually be unnecessary.

18. Why do Place Of Finish Probabilities sometimes sort incorrectly?

Clicking a Place Of Finish Probabilities column header on the main screen occasionally results in an incorrect sorting of that column. This is a known issue that tends to occur when several teams share a tightly bunched set of probabilities. Unfortunately, this appears to be a bug in one of the tools used by Bowling League Tuneup, not in BLT itself, so it's a (hopefully rare) quirk that we've had to learn to live with.

19. Wouldn't bowlers with handicaps just below a cap on bowler handicaps still be affected whenever their handicaps rise above the cap during the season?

Good observation. Bowlers whose estimated or season averages give them handicaps at or just below a cap on bowler handicaps will still be penalized if their handicaps rise above that cap at some points during the season. While BLT accounts for in-season fluctuations in bowler averages that may cause their averages to occasionally rise above the handicap formula base number (thus giving an unfair advantage to those bowlers), it does not do the same for caps on handicaps. Remember, the only thing caps on handicaps do for a league is to punish low-average bowlers, which will always damage a league's fairness (as BLT will clearly show). So accounting for in-season handicap fluctuations is pointless, as no league should ever be imposing caps on handicaps in the first place, let alone be using BLT to fine-tune them for some misguided purpose.

20. Are there Mac-based, web-based, or smart-phone-based versions of BLT?

No, no, and no. Bowling League Tuneup runs only on Windows PCs. Apple computers have long had Windows emulation and dual-boot software available that will allow them to run Windows applications, so that would be a potential solution if you're a Mac user. Creation of native versions of BLT for other platforms is not currently being planned.

21. What if my league uses non-standard mechanisms, like counting head-to-head matchups between bowlers on opposing teams to compute wins and losses or basing handicaps on only the last x number of weeks of bowling?

Looking at bowling leagues around the country, we found some innovative ways that leagues have been set up – presumably all with the idea of making the leagues more fun, more fair, or both. Bowling League Tuneup implements the most commonly used scoring and handicapping mechanisms, but it cannot incorporate all of the novel approaches league managers have come up with. Future versions may add support for new mechanisms like the ones mentioned once they gain greater general acceptance among bowling leagues. (To comment on the given examples, it is unclear how counting head-to-head matchups might affect competitive balances, but it adds a whole new set of concerns for team captains who have to determine bowler pairings. Basing handicaps on a rolling number of weeks is surely done to try to thwart sandbaggers, but it can actually have the opposite effect, guiding cheaters on how to gradually improve throughout the season as the most effective way to unethically improve their chances in the league.)

22. Can bowling scores be imported into BLT directly from the bowling center's automated scoring system or from league management software?

Ideally, weekly bowler scores would be imported via a built-in interface between Bowling League Tuneup and one of these systems. Unfortunately, there are a lot of scoring systems and league management systems out there, and each would require its own unique interface that could only be designed with the cooperation of each of the companies that make these systems. We met with the industry leader in bowling league management software, but they politely declined to work with us to create an interface to BLT. The beauty of BLT's import mechanism is that it will work with any league management system that makes scores available electronically and doesn't need a different interface for each different system. We hope you find this import capability works easily and reliably with your league management system.

H. SUPPORT

We are deeply grateful for your interest in Bowling League Tuneup, and we want to do everything we can to assure that it works reliably and fully suits your needs.

We will be happy to work with you to resolve any problems you may have with the software and answer any questions you may have about its use. Please initiate any such communications via our website:

www.bltuneup.com

We would also love to hear about your experiences using Bowling League Tuneup and any suggestions you may have for improvements to future versions of the product. Again, please use our website to send us your feedback.