

EXCEL

Working with Tables

In this chapter, you will explore the table tools available in Excel as you discover the advantages of creating and using tables. You will also create formulas that use structured references and insert sparklines for quick and simple data trend analysis.

LEARNING OBJECTIVES

- Manage data using a table
- Create a custom filter
- Name a table
- Use structured references in a formula
- Create sparklines

CHAPTER TIMING

- Concepts/Develop Your Skills: 1 hr 10 mins
- Self-Assessment: 20 mins
- Apply Your Skills: 30 mins
- Total: 2 hrs 00 mins

PROJECT: ANALYZING EXAM PERFORMANCE

You are an instructor at LearnFast College. Your business students completed their final exams recently, and you are reviewing the grades. To help you assess individual exam grades and find the class average, you are going to create a table and use the table tools. For further analysis, you will create a series of formulas that use structured references to the table data and insert sparklines to show trends in the exam grades.

Working with Tables

Tables can be a valuable feature in Excel if they are used properly. An Excel table is comprised of a group of related data within a defined range. Formatting the data as a table enables the use of the table features.

Tables are useful, not only for managing and organizing data, but also when it comes to creating advanced formulas and analyzing data. In addition, table features allow you to manage the data in the table rows and columns independently from the data in other rows and columns on the worksheet. You can create a table by converting existing data into a table, or you can start by creating a blank table and then fill in the information later. You can even create multiple tables on the same worksheet.

| Last Name ▼ | First Name ▼ | State ▼ | Q1 ▼ | Q2 ▼ | Q3 ▼ | Q4 ▼ |
|-------------|--------------|---------|-----------|-----------|-----------|-----------|
| McGee | Olivia | MA | 317,000 | 513,000 | 709,000 | 905,000 |
| Fernandez | Maria | MA | 228,000 | 216,000 | 204,000 | 192,000 |
| Hasan | Taz | CA | 446,000 | 120,000 | 206,000 | 132,000 |
| Krebb | Lin | IL | 234,000 | 560,000 | 886,000 | 1,212,000 |
| Stafford | Dan | CO | 162,000 | 151,000 | 140,000 | 129,000 |
| Williams | Shaun | CO | 210,000 | 340,000 | 470,000 | 600,000 |
| Martinez | Carlos | FL | 450,000 | 450,000 | 450,000 | 450,000 |
| Mathis | Gerhardt | CA | 156,000 | 160,000 | 164,000 | 168,000 |
| Total | | | 2,203,000 | 2,510,000 | 3,229,000 | 3,788,000 |

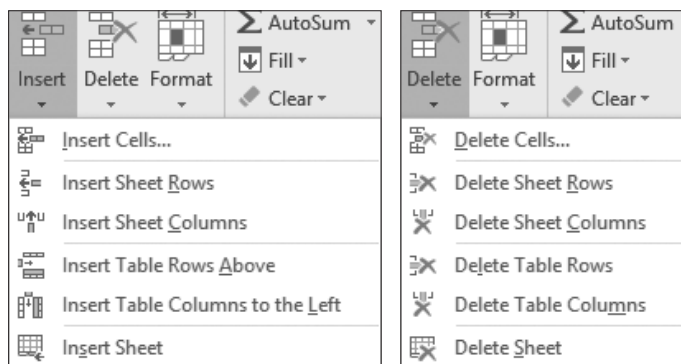
This table of sales data displays the header row, banded rows (alternating colors), and a total row.

Insert and Delete Table Rows and Columns

Generally, working with a table is not very different from working with a regular data range. You can add rows or columns into the middle of a table just as you would with a normal range—by selecting a cell below the desired location of the new row, or to the right of the location of the new column, and using the Insert command. To delete a row or column, you use the Delete command.

The simplest way to add rows, however, is to add them at the bottom of the table, as entering new data in the row directly below a table will automatically expand the table to include the new row. Likewise, if you add new data in the column to the right, it will be included in the table

as well. Table formatting will also be automatically applied to any new rows or columns to stay consistent with the rest of the table.



When a table is selected, the Insert and Delete menus have the additional table options to Insert/Delete Table Rows or Columns.

The difference between inserting a table row/column or a sheet row/column is that the Table commands do not affect the rest of the worksheet. For example, inserting a table row will insert the row into the table only, but inserting a sheet row will insert the row for the table and the entire worksheet.

TIP! If the table includes a total row, you can insert a new row at the bottom but above the total row by selecting the bottom-right table cell and pressing **Tab**.

Calculated Columns

Table columns can contain text values, numerical values, or formulas. When you enter a formula into a table cell, it will automatically become a calculated column, which instantly copies the formula to all cells in the column. In the same fashion, editing a formula in one cell will update the formula for the entire column. This eliminates the need to use the fill handle to copy your formula, making the task quick and easy.

Apply a Sort or Filter

Another advantage of tables is the ability to quickly sort and filter the information contained in them. A sort will arrange all the information in the table according to your preference, and a filter allows you to decide which data to display and which to hide. Sorts and filters can be performed on both a normal range or a table, but a table automatically displays a filter button at the top of each column. Depending on the actions taken in that column, the filter button may show the down-arrow, the filter symbol, a sort arrow, or some combination of these.

| Last Name ▼ | First Name ▼ | State ▼ | Q1 ▼ | Q2 ▼ | Q3 ▼ | Q4 ▼ |
|-------------|--------------|---------|---------|---------|---------|---------|
| McGee | Olivia | MA | 317,000 | 513,000 | 709,000 | 905,000 |
| Fernandez | Maria | MA | 228,000 | 216,000 | 204,000 | 192,000 |



≡ Insert→Tables→Table

≡ Home→Cells→Insert or Delete

DEVELOP YOUR SKILLS: E11-D1

In this exercise, you will create a table from existing data (the exam grades) and then edit and sort the students' exam data.

Before You Begin: Download the student exercise files from the Student Resource Center (labyrinthelab.com/office19) and determine your file storage location before beginning this exercise.

1. Start Excel, open **E11-D1-Exam** from your **Excel Chapter 11** folder, and save it as: **E11-D1-ExamRevised**
2. Select **cell A5** and choose **Insert**→**Tables**→**Table** .
The Create Table dialog box suggested range is A5:J17 (as an absolute reference), which is correct. The My Table Has Headers box has a checkmark to indicate there are headers.
3. Click **OK** to create the table.
The table is created. Notice the filter buttons beside each heading and the formatting changes. The Table Tools Design tab is activated on the Ribbon.
4. Select **cell D5** and choose **Home**→**Cells**→**Insert**  menu button ▼→**Insert Table Columns to the Left**.
Notice the inserted column does not affect the data in the range A20:D22.
5. Type **Date** to replace **Column1** in **cell D5**.
6. In **cell D6**, enter **=A\$3** to copy the date from **cell A3** using an absolute reference.
After you complete the formula entry in cell D6, the formula is automatically added to all other cells in the table column. The results display only the #### symbols because the column needs to be resized.
7. Select the **range D6:D17**, change the number format to **Short Date**, and then autofit the width of **column D**.
8. Set the width of **column I** to: 6
9. Select **cell K17** and tap **Tab**.
A new row is added to the bottom of the table in row 18.
10. Enter the information for another student in the new table row:

| | First | Last | Program | Date | Pt. 1 | Pt. 2 | Pt. 3 | Pt. 4 | Pt. 5 | Total |
|----|--------|---------|---------|-----------|-------|-------|-------|-------|-------|-------|
| 18 | Justin | Patrick | Honors | 7/18/2020 | 20 | 38 | 19 | 12 | 28 | 89 |

Notice that the Date and Total column formulas for Justin are automatically added for you.

11. Use the **Total filter** button ▼ to sort the students by their total mark, **Smallest to Largest**.
12. Sort the students by program, from **A to Z**.
Because you already sorted by the totals first, the students are still arranged lowest to highest within the Applied group and Honors group.
13. Save the file.

NOTE! Always leave your file open at the end of an exercise unless instructed to close it.

Special Table Features

The special features of a table include the ability to rename the table for quick reference to its data, the header row (used to label columns of information), and the total row (summarizes table data). You can also quickly adjust the formatting of a table by applying a table style, and you can modify table styles by adding or removing options such as banded rows, banded columns, or special first/last column formatting. For other formatting changes, you can select a table row or column with one click without selecting the rest of the worksheet.

NOTE! The Table Tools tab is a contextual Ribbon tab; you must have a cell within the table selected to prompt it.

Table Name

The default name for the first table in a workbook is *Table1*, the second is *Table2*, and so on. Although you can keep the default names, more descriptive names can be useful, especially if the table data will be used in formulas. You can change a table name by editing the name directly in the Table Tools Properties menu. As with defining names for a cell or range, table names cannot contain spaces but may include underscores.



Header Row

Most tables will contain categories of information in columns, so including a header row at the top of the table provides a label for each column. It's good practice to limit each column to one piece of information, such as having two separate columns for first name and last name, to enable full sorting and filtering. Each column heading in a table should be unique.

WARNING! Avoid the characters @, #, [], and ' in column headings because they have special meanings in formulas.

When scrolling through a large table, a table's header row will remain visible across the top of the worksheet, eliminating the need to freeze the top row. The headings replace the normal worksheet column headings A, B, C, etc.

| | Last Name | First Name | Region | State | Q1 | Q2 |
|----|-----------|------------|---------|-------|---------|---------|
| 13 | Krebb | Lin | Central | IL | 234,000 | 560,000 |
| 14 | Stafford | Dan | Central | CO | 162,000 | 151,000 |
| 15 | Williams | Shaun | Central | CO | 210,000 | 340,000 |
| 16 | Martinez | Carlos | Eastern | FL | 450,000 | 450,000 |
| 17 | Mathis | Gerhardt | Western | CA | 156,000 | 160,000 |

You can drag the table resize handle to add and remove columns and rows.

Table Style Options

You can add and remove table formatting using the Table Style Options checkboxes. These options can help make the information easier to read by differentiating certain rows and columns. Clear the Filter Button checkbox to hide the filter buttons in the header row.

| | | |
|---|--|---|
| <input checked="" type="checkbox"/> Header Row | <input checked="" type="checkbox"/> First Column | <input checked="" type="checkbox"/> Filter Button |
| <input checked="" type="checkbox"/> Total Row | <input checked="" type="checkbox"/> Last Column | |
| <input checked="" type="checkbox"/> Banded Rows | <input checked="" type="checkbox"/> Banded Columns | |
| Table Style Options | | |

Total Row

Checking the Total Row option in the Table Style Options group will automatically add a row to the bottom of your table with the text *Total* in the left column and a sum in the far-right column. Although a total row is often used to sum the values in a column, there are other summary functions that can be used as well. The total row is formatted to match the style of the rest of the table but may be a different shade to stand out from the other data.

| | | | | | |
|----------|----------|---------|----|---------|-----------|
| Williams | Shaun | Central | CO | 210,000 | 340,000 |
| Martinez | Carlos | Eastern | FL | 450,000 | 450,000 |
| Mathis | Gerhardt | Western | CA | 156,000 | 160,000 |
| Total | | | | | 4,252,000 |

This total row adds a sum in the last column on the right, but if the last column contained text or dates, it would simply count the populated cells.

Selecting a cell in the total row will display a menu button ▼ that shows a list of the available summary formulas. For example, rather than a sum, you may wish to display the average of the column data.

| | | | | | |
|----------|----------|---------|----|---------|---------------|
| Williams | Shaun | Central | CO | 210,000 | 340,000 |
| Martinez | Carlos | Eastern | FL | 450,000 | 450,000 |
| Mathis | Gerhardt | Western | CA | 156,000 | 160,000 |
| Total | | | | | 327,077 ▼ |
| | | | | | None |
| | | | | | Average |
| | | | | | Count |
| | | | | | Count Numbers |
| | | | | | Max |
| | | | | | Min |
| | | | | | Sum |

☰ Table Tools→Design→Properties

☰ Table Tools→Design→Table Style Options

DEVELOP YOUR SKILLS: E11-D2

In this exercise, you will rename the table and add a total row to calculate the average exam grades for the students.

1. Save your file as: **E11-D2-ExamRevised**
2. Go to **Table Tools→Design→Properties** and click in the **Table Name** box to select the existing name, type **Exams** to replace that, and tap **Enter**.
The new table name is now saved as part of the table properties.
3. Scroll down on the worksheet so **row 6** is the first visible row. (You may need to use the up/down arrows on the scroll bar to move up/down one row at a time to get the worksheet to display precisely this way.)
The table headers now replace the worksheet column headers.

| | First | Last | Program | Date | Pt. 1 | Pt. 2 | Pt. 3 | Pt. 4 | Pt. 5 | Total |
|---|--------|---------|---------|-----------|-------|-------|-------|-------|-------|-------|
| 6 | John | Aikens | Applied | 7/18/2020 | 15 | 22 | 18 | 14 | 16 | 69 |
| 7 | Ashley | Ronayne | Applied | 7/18/2020 | 18 | 29 | 17 | 12 | 24 | 76 |

| | First | Last |
|---|--------|---------|
| 6 | John | Aikens |
| 7 | Ashley | Ronayne |
| 8 | Pamela | Clark |

4. Point to the **First** table header, which changes your pointer to the table column selector arrow.

| | First | Last |
|---|--------|---------|
| 6 | John | Aikens |
| 7 | Ashley | Ronayne |
| 8 | Pamela | Clark |

5. Drag one column to the right, to the **Last** table header, to select both table columns.
Notice that the selection does not include the cells below the table.
6. Apply **Bold** formatting to the selection.
7. Add a total row by going to **Table Tools→Design→Table Style Options** and clicking the **Total Row** checkbox.
The total row is added to the bottom of the table. The number 0 appears in the bottom-right cell because there is no data in the % column yet (the sum for that column is zero).

8. Select **cell A19** and replace the text *Total* with: **Average**
9. Select the cell that contains the zero in the total row, **cell K19**, under the % heading.

| | |
|----|---------|
| 97 | |
| | |
| | None |
| | Average |

10. Use the **menu** button ▼ to select **None** from the drop-down list, which removes the 0.
11. Move one cell to the left, to **cell J19** below the exam totals.

26 97

88.846

None

Average

Count

12. To find the average exam grade, click the **menu** button ▼ and select **Average** from the drop-down list.
13. Decrease the decimal places to show only one decimal.
14. Go to **Table Tools**→**Design** and in the Table Style Options group, click the **Last Column** checkbox and change the table style to **Blue, Table Style Medium 13**.
Only certain table styles have different last column shading, Medium 13 being one of them.
15. Save your work.

Structured References

A structured reference is created when you use a formula with cell/range references to data contained in a table. The advantage of structured references is that they adjust formula results automatically when new rows or columns are added to a table. They also make it easier to identify the data source because the reference name includes information such as the table name and header name. The reference name, once used in a formula, will also update automatically if you rename the table or column header.

The syntax for a structured reference varies depending on whether it is a reference to a cell, an entire column, or even an entire table.

| Last Name | First Name | Region | St | Q1 | Q2 | Q3 | Q4 | Q42 |
|-----------|------------|------------------|----|------------------|--------|--------|--------|----------------------------|
| Martinez | Carlos | Eastern | FL | 450000 | 450000 | 450000 | 450000 | =AVERAGE(Table1[@Q1]:[Q4]) |
| Mathis | Gerhardt | Western | CA | 156000 | 160000 | 164000 | 168000 | =AVERAGE(Table1[@Q1]:[Q4]) |
| | | | | | | | | |
| | | Highest Q1 Sales | | =MAX(Table1[Q1]) | | | | |

A formula with a structured reference to the column O1 in Table1

A formula with a structured reference to one row of data in the range from Q1:Q4 in Table1



View the video “Creating Formulas with Structured References.”

Formulas with Structured References

The best way to create structured references is to use the point-and-click method to select the table cell or column, which adds all the appropriate formatting/syntax based on the cell or range selected. Trying to type a structured reference manually is much more difficult and can lead to mistakes in your formula.

Compare the formulas in the following illustrations. The formula in the left figure was typed in, and the formula in the right figure was created by clicking on the cells in the Q1 and Q2 columns. In the formula on the right, it's easy to see that the information from Q1 and Q2 is being added together, whereas the formula on the left would require finding the cells H5 and I5 first to understand the meaning.

| | | | |
|---------|---------|-----------|--------|
| X | ✓ | fx | =H5+I5 |
| Q1 | Q2 | Total | |
| 340,000 | 700,000 | 1,040,000 | |

| | | | |
|---------|---------|-----------|--------------|
| X | ✓ | fx | =[@Q1]+[@Q2] |
| Q1 | Q2 | Total | |
| 340,000 | 700,000 | 1,040,000 | |

DEVELOP YOUR SKILLS: E11-D3

In this exercise, you will create formulas that use structured references to calculate the percentage grades, fix the total calculation, and insert summary calculations below the table.

1. Save your file as: **E11-D3-ExamRevised**

You will create a formula to find the percent each student scored by dividing the total mark by 150.

2. Select **cell K6** in the first row below the % table header.

3. Type = and use the mouse to select **cell J6**, one cell to the left, below the Total table header.

| | | |
|-------|----------------|---|
| Total | % | L |
| 69 | =[@Total/150]] | |

The cell reference is automatically inserted as a structured reference. Due to the dark fill color in the column (the image shows a lighter blue for visibility), you may not be able to see the text in the cell. If that's the case, check the Formula Bar.

4. Type **/150** and complete the formula entry.

The formula is calculated in cell K6, the result is 0.46, and the formula is automatically copied down to the rest of the column.

5. Point to the % column header, click to select the table column, and apply **Bold** and the **Percent Style** number format.

You may notice the marks seem unusually low, and you may have already noticed an error in the Total column, which you will fix now.

6. Select **cell J6**, the first cell below the Total header.

The sum formula finds the total for the range E6:H6, and the error indicates that there are adjacent cells omitted from the formula. Rather than edit the formula, you will reenter the SUM formula using AutoSum.

7. Choose **Home**→**Editing**→**AutoSum** Σ .

| | | | | | | | |
|-------|-------|-------|-------|-------|-----------------------------|---|---|
| Pt. 1 | Pt. 2 | Pt. 3 | Pt. 4 | Pt. 5 | Total | % | L |
| 15 | 22 | 18 | 14 | 16 | =SUM(Exams[@Pt. 1]:[Pt. 5]) | | |

The new formula calculates the SUM using a structured reference that includes the table name Exams and the table column headers in the range reference @[Pt. 1]:[Pt. 5].

8. Complete the formula entry, which again automatically updates all formulas in the column as well as the % grades in the next column.

9. Select **cell K19** in the total row below % and add the **Average** calculation for the % column.

Now you will enter some additional formulas outside of the table that use structured references to the table data.

10. Select **cell D21** in the box beside *Highest Exam Grade*.

To find the highest exam grade, you will use the MAX function referring to the % table column.

11. Type **=MAX (** and then use the mouse to select the **range K6:K18**. Complete the formula while keeping **cell D21** active.

The formula converts the range reference to Exams[%], and the formula bar displays =MAX(Exams[%]).

12. Apply the **Percent Style** number format.

13. In **cell D22**, enter the formula **=COUNTIF (Exams [Program] , "Honors")** and then use the mouse to select the program information (starting in **cell C6**, below the heading).

The result shows there are eight Honors students.

14. In **cell D23**, enter this formula using the mouse to select the table ranges, program information, and the marks for each criteria range: **=COUNTIFS (Exams [Program] , "Honors" , Exams [%] , ">80%")**

The result shows two Honors students scored higher than 80% on the exam. Notice the criteria ranges and corresponding criteria are easier to understand than a regular cell reference: The program must be Honors and the percentage score must be greater than 80%.

15. Save the file.

Creating Sparklines

In addition to creating charts and adding conditional formatting, Excel has another tool for visualizing data trends. A sparkline is a miniature chart inserted as an object into an individual cell. Sparklines are smaller, simpler versions of charts, and any changes made to the data are immediately updated in the sparklines, just as with a normal chart. Each sparkline can contain data for only one column or row at a time.


| Last Name ▼ | First Name ▼ | State ▼ | Q1 ▼ | Q2 ▼ | Q3 ▼ | Q4 ▼ | |
|-------------|--------------|---------|---------|---------|---------|-----------|--|
| Zain | Elizabeth | CA | 340,000 | 700,000 | 960,000 | 1,120,000 | |
| Alvizo | Alex | CA | 620,000 | 622,000 | 628,000 | 662,000 | |
| Clayton | Taneisha | IL | 230,000 | 120,000 | 180,000 | 100,000 | |
| Cray | Karen | WA | 123,000 | 130,000 | 127,000 | 144,000 | |
| Hill | Patricia | IL | 120,000 | 180,000 | 180,000 | 270,000 | |

Sparkline types include Line, Column, or Win/Loss, and you can change the type even after the sparkline has been created. Formatting changes can be made with the Sparkline tools. Changes made to one sparkline are applied to all of the sparklines in the same group automatically.

≡ Insert→Sparklines


DEVELOP YOUR SKILLS: E11-D4

In this exercise, you will insert sparklines to spot trends in the students' exam marks.

1. Save your file as: **E11-D4-ExamRevised**
2. Select the **range L6:L18** immediately to the right of the table.
3. Choose **Insert→Sparklines→Line**  to open the Create Sparklines dialog box.
4. Click in the **Data Range** box and then use the mouse to select the **range E6:I18**.

| Create Sparklines ? | |
|---|----------------|
| Choose the data that you want | |
| Data Range: | E6:I18 |
| Choose where you want the sparklines to be placed | |
| Location Range: | \$L\$6:\$L\$18 |

Because you already selected the desired range, the Location Range is already entered.

5. Click **OK** to insert the sparklines.
The sparklines are displayed in column L and show a comparison for each student, displaying the trends for the marks across the five different parts of the exam.
6. Go to **Sparkline Tools→Design→Show** and check the **Markers** option to display the markers on the sparklines.
7. Select **cell K20** and choose **Insert→Sparklines→Column** .
8. Select the **range K6:K18** as the data range, ensure K20 shows as the location, and click **OK**.
9. Go to **Sparkline Tools→Design→Show** and check the options for **High Point** and **Low Point**.
The columns with the highest and lowest marks are indicated in red.
10. Save the file and close Excel.

Self-Assessment

Check your knowledge of this chapter's key concepts and skills by completing the Self-Assessment on the Student Resource Center.

Apply Your Skills

APPLY YOUR SKILLS: E11-A1

Modify a Price List

In this exercise, you will turn the Universal Corporate Events price list of services into a table to make it easier to modify the list and calculate the new prices.

1. Start Excel, open **E11-A1-Prices** from your **Excel Chapter 11** folder, and save it as: **E11-A1-PkgPrices**
2. Insert a table that contains all of the service descriptions, prices, and deposit amounts.
3. Change the table style to **Light Yellow, Table Style Light 19**.
4. Insert a new table row above *Transportation and lodging* and enter this data:

| | | | |
|---|----------------------------|-----|----|
| 8 | Photographer, videographer | 200 | 50 |
|---|----------------------------|-----|----|

5. In the same row, select **cell C8** and enter the formula: **=[@[Old Price]]*108%**
6. Sort the table by **New Price**, Smallest to Largest.
7. Add a total row to the table.
8. Change the text in **cell A13** to: **Complete Package Subtotal:**
9. Add a Sum formula to the New Price column.
10. Hide **column B** from the worksheet.
11. Change the number format for the **range C5:D13** to Currency with no decimals.
12. Convert the table name to: **Prices**
13. Save your work.

APPLY YOUR SKILLS: E11-A2

Calculate Customer Discounts

In this exercise, you will create formulas with structured references to calculate the package discount if customers order all of the services in their package.

1. Save your file as: **E11-A2-PkgPrices**
2. In **cell A14**, enter: **Complete Package Discount:**
3. In **cell C14**, type **=** and select **cell C13** (in the total row below *New Price*), and then type: ***15%**
*The formula should read: =Prices[#Totals],[New Price]]*15%*
Notice the syntax Prices[#Totals],[New Price]], indicating the formula refers to the new price, in the total row, of the Prices table.
4. In **cell A15**, enter: **Complete Package Total:**

5. In **cell C15**, enter this formula, taking care to use the mouse to select the table data:
=Prices[[#Totals] , [New Price]] -C14
6. In **cell A16**, enter: **Total Services in Package:**
7. In **cell C16**, enter this formula, using the mouse to select the table data:
=COUNT(Prices [New Price])
8. Select **cell D15** and insert a Line sparkline for the data in the **range C13:C15**.
9. Add markers to the sparkline and change the style to **Blue, Sparkline Style Accent 1, Darker 25%**.
10. Save your work and close the file.

APPLY YOUR SKILLS: E11-A3

Analyze Client Feedback

In this exercise, you will use the table tools to analyze the client feedback data and add a total row and sparklines.

1. Open **E11-A3-Feedback** from your **Excel Chapter 11** folder and save it as:
E11-A3-FeedbackRevised
2. Sort the table by event date from oldest to newest.
3. Select the dates for all June events and delete those rows from the table.
4. Change the name of the table to: **Ratings**
5. Select **cell H5** and modify the formula to use structured cell references.
6. Add a total row and insert the Average function for the last four table columns.
7. Select the **range E22:H22** and apply the Number format.
8. Edit the text in **cell A22** to be: **Overall Average Ratings**
9. Select the **range I5:I21** and insert Column sparklines for the data in the **range E5:H21**.
10. Change the sparkline style to **Gold, Sparkline Style Accent 4, (no dark or light)**.
11. Save your work and close Excel.