

## EXCEL

## 3

# Performing Calculations Using Functions



**I**n this chapter, you will begin using functions in your formulas to make complex calculations quicker and easier. You will also learn about the difference between a relative and an absolute reference and practice using both in your formulas.

## LEARNING OBJECTIVES

- ▶ Create formulas with functions
- ▶ Use AutoSum
- ▶ Use relative and absolute cell references in formulas
- ▶ Define names for cells and ranges
- ▶ Use names in formulas

## Project: Tracking Progress

As an instructor at LearnFast College, you have already recorded the student grades for your Introduction to Business course. Now you will use functions to perform a variety of calculations that will help you analyze the students' performance.

## Using Functions in Formulas

**Functions** are an important part of Excel. They allow you to do much more than simple mathematical operations. For example, adding two or three cells together is not a problem; however, if you needed to add up hundreds or even thousands of cells, it would be quite the tedious task! You would need a formula such as: =A1+A2+A3+A4... and so on.

The SUM function, in this case, is easier because it allows you to specify a range instead of individual cells. The function then tells Excel what operation to perform on the range, in this case addition. This is one of the reasons Excel is much more efficient than using a calculator!

Formulas with functions are inserted into a cell starting with the equals (=) sign, just like other formulas. This is followed by the function name and one or more **arguments** inside parentheses. An argument is the name for the numbers, cells, or ranges used in the function.

The function name SUM follows the = sign.

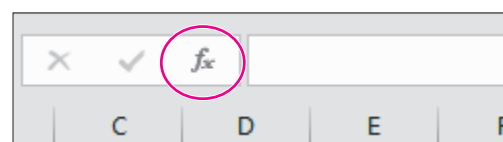
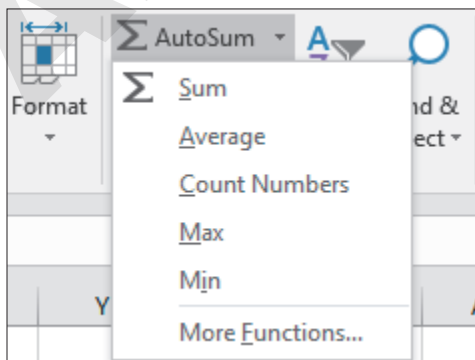
=SUM(A1:A12)

This function has three arguments; two individual cells, A1 and A4, as well as the range A7:A12, separated by commas.

=SUM(A1,A4,A7:A12)

The function arguments must be placed inside parentheses. The argument is the range A1:A12, so Excel will add all of the values contained in that range.

Functions can be typed directly into a cell, if you know the name of the function you wish to use, or inserted a number of other ways. Functions are available from the Formulas tab on the Ribbon, by using AutoSum, or by using the Insert Function button on the Formula Bar. The most common functions can be inserted quickly and easily from the AutoSum drop-down menu on the Home tab of the Ribbon.



When you insert a function by typing, Excel will suggest names for functions as you type. For example, typing `=s` will generate a list of functions that start with the letter *S*; you can ignore the prompt and type the full function name or double-click one of the suggestions that appears.

## DEVELOP YOUR SKILLS: E3-D1

*In this exercise, you will create a formula using the SUM function to calculate the final grade for each student.*

1. Start Excel; open **E3-D1-SummerGrades** from your **Excel Chapter 3** folder and save it as: **E3-D1-FallGrades**
2. On the **Final Grades** worksheet select **cell G6**, and then type `=SUM(C6:F6)` and click **Enter** ☒.

*The formula in the Formula Bar shows the SUM function, and the total of cells C6:F6 is displayed in cell G6. The final grade for the first student, Ashley, is 37%.*

*Currently there are only two grades being added (28% and 9%). The other grades will be added to the total once they are calculated on the Quizzes and Exam worksheets.*

3. In **cell G7**, type `=SUM (` and use the mouse to select the **range C7:F7**; then click **Enter** ☒.  
*It's good practice to type the closing parenthesis after the function arguments, but notice in the Formula Bar that Excel automatically inserts it for you. The sum for the second student, Atif, now shows 36%.*
4. Point to the fill handle in **cell G7** and double-click to fill the formula down **column G**.
5. Save the workbook.

## The AutoSum Feature

The AutoSum feature not only makes it easy to find some of the simplest functions, it also helps identify and enter the range of cells you are most likely to use in your function. Often when you have a column of numbers, you want to add a total at the bottom of the column. In a row, the total would be placed on the right side of the row.

AutoSum will automatically search for adjacent data, either directly above or to the left of the selected cell. Therefore, selecting the cell at the bottom of a column or the right side of a row and clicking AutoSum will very quickly enter the SUM function, as well as the range of cells necessary to add all the numbers in that column or row. If necessary, you can alter the range Excel selects by dragging to select the desired cells before completing the entry.

Another option is to select the data in the row or column first and then click AutoSum.

## SUM, AVERAGE, COUNT, MAX, and MIN

The SUM function is just one of the AutoSum options; other frequently used functions can be found via the AutoSum drop-down menu. These functions take a set of numbers identified in the arguments and can be used to find the average, count how many numbers are in the set, or locate the highest or lowest value. Similar to AutoSum, these functions automatically search for adjacent data, either directly above or to the left of the selected cell.

## AUTOSUM FUNCTIONS

Function Name	Description
SUM	Adds the values in the cells
AVERAGE	Calculates the average of the values in the cells
COUNT	Counts the number of cells that contain numerical values; cells containing text and blank cells are ignored
MAX	Returns the highest value
MIN	Returns the lowest value

 Home→Editing→AutoSum  menu button ▼

## Insert Function


For more complex functions, the Insert Function button opens a dialog box that allows you to search for functions and enter function arguments. In the Insert Function dialog box you can search for your desired function by keyword or browse by category. After choosing the function, the Function Arguments dialog box opens, from which you enter the numbers, cell references, or criteria to use in the function.



View the video “Entering a Formula Using Insert Function.”



## DEVELOP YOUR SKILLS: E3-D2


In this exercise, you will use AutoSum to calculate the total each student earned on their quizzes, as well as to calculate the class average for each quiz.

1. Save your workbook as: **E3-D2-FallGrades**
2. Click the **Quizzes** worksheet tab and select the empty cell under *Quiz Total* for Ashley, **cell H6**.
3. Choose **Home→Editing→AutoSum** .

The SUM function is entered into cell H6 with the range C6:G6. Excel finds five adjacent cells to the left of cell H6 containing numerical data, so the range C6:G6 is automatically entered into the function arguments within parentheses.

Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5	Quiz Total	Quiz %
91	81	88	84	60	=SUM(C6:G6)	
100	99	67	55	85	SUM(number1, [number2], ...)	

4. Click **Enter**  to finish the entry and show the result of the formula, 404, in **cell H6**.
5. Use the **fill handle** to copy the formula in **cell H6** down the column for the rest of the students.  
Next you will calculate the class average for each quiz.
6. In **cell A18**, enter: **Class Average**
7. Format **cell A18** with bold and italic formatting, and then merge and center **cells A18** and **B18**.
8. Select **cell C18** and choose **Home→Editing→AutoSum**  menu button ▼→**Average**.
9. Complete the entry in **cell C18** and then use the **fill handle** to copy the average formula from **cell C18** to the right, into the **range D18:G18** below all five quizzes.

10. Decrease the decimal in the range of selected cells so only one decimal place is displayed and then apply bold formatting and a top cell border.  
*Now you want to find the average for each student.*
11. Insert a new column to the left of **column I**.
12. Enter **Student Average** into **cell I4**.
13. Select **cell I6** and choose **Home**→**Editing**→**AutoSum**  **menu button** ▼→**Average** but do not complete the entry.  
*This time AutoSum selects the range C6:H6, which is incorrect because the average for the five quizzes should not include the total. Now you will select the correct range.*
14. Use the mouse to drag and select the correct **range C6:G6** and then complete the entry.
15. Use the **fill handle** in **cell I6** to copy the formula down the column for the rest of the students.  
*Next you need to calculate the exam grades for each student.*
16. Click the **Exam** worksheet tab and select the empty cell under *Exam Total* for Ashley, **cell H6**.
17. Use AutoSum to add the Section 1 to Section 5 exam marks for Ashley, and then copy the formula down **column H** for the other students.
18. Save your work.

## Using Relative and Absolute Cell References

Cell references make it easier to copy formulas when you want to perform the same calculation with new numbers each time. Without cell references, each calculation would need to be typed individually, like with a calculator—slowly and tediously. A *relative* cell reference, which is the default in Excel, is one in which the location of the cell remains relative to the cell that contains the formula. This makes repeating the same calculation many times quick and easy!

For example, if the formula `=A3-B3` is in cell C3, the relative position of A3 is two cells to the left of C3, and B3 is one cell to the left of C3. When you copy the formula to another cell, the cell references change to be in the same relative position. So, if you copy the formula `=A3-B3` from cell C3 down to cell C4, the formula there will be `=A4-B4`. Excel updates the new cell references to be in the same relative position to cell C4; that is, two cells to the left and one cell to the left.

**Tip!**

Remember that a relative cell reference changes when it is copied.

	A	B	C
3	64	21	43
4	68	32	

The original formula is seen in the Formula Bar, with relative references to both cells A3 and B3.

	A	B	C
3	64	21	43
4	68	32	36

The copied formula is displayed with the new cell references A4 and B4.



## Absolute Cell References

In some situations, you do not want the cell reference to change when you move or copy the formula. To ensure the cell reference does not change, use an *absolute* cell reference. You can think of an absolute cell reference as being locked in place; that is, the cell reference will not change when copied to other cells.

To make a cell reference absolute, start with a relative cell reference such as A1 and add a dollar sign in front of the column and row components, like this: \$A\$1.

There are two ways to create an absolute cell reference:

1. Type the cell reference and include dollar signs in front of the column and row references.
2. Use the mouse pointer to select the cell and then tap **[F4]** on the keyboard, which inserts both dollar signs into the cell reference at once.

Example: If the formula `=A$3-B3` is entered in cell C3 and then copied to cell C4, the formula in cell C4 would be `=A$3-B4`. `A$3` is an absolute reference, so it does not change; `B3` is a relative reference, so it changes to `B4`.

C3		✕ ✓ f <sub>x</sub> <code>=A\$3-B3</code>	
	A	B	C
3	100	25	75
4		35	

C4		✕ ✓ f <sub>x</sub> <code>=A\$3-B4</code>	
	A	B	C
3	100	25	75
4		35	65

The original formula shows in the Formula Bar and contains an absolute reference to cell `A$3`.

After the formula is copied, the absolute reference `A$3` does not change.



View the Video “Relative and Absolute Cell References.”

## Mixed Cell References

It’s also possible to create a mix between a relative and an absolute reference in a cell reference. For example, `$A3` is a reference to cell A3 where the column reference is absolute (column A will not change when copied) and the row reference is relative (row 3 will change when copied). This can be useful when copying a formula both across a row and down a column.

After you have tapped the **[F4]** key once, tapping it a second time changes the absolute reference to a mixed reference with only a dollar \$ sign in front of the row reference. A third tap of **[F4]** places the dollar \$ sign in front of only the column reference, and a fourth tap removes all dollar \$ signs so it is once again a relative cell reference.

## Display and Print Formulas

To see a formula you have entered, you must first select the cell and then check the Formula Bar because it is the result of the formula that is displayed in the worksheet cell. This means that to check your formulas, you have to click each cell and review them one at a time. When you have many cells with formulas, this is very hard and time-consuming to do.

An easier way is to display all formulas within their cells. The Show Formulas button is a toggle that can be turned on and off as necessary.



You can still edit the formulas and print the worksheet while Show Formulas is turned on.


When Show Formulas is turned on, Excel automatically widens columns to show more of the cell contents.

✕ ✓ <i>fx</i> =C1+D1		
C	D	E
650	220	870

Normally the cell must be selected for you to see the formula.

✕ ✓ <i>fx</i>		
C	D	E
650	220	=C3+D3
480	195	=C4+D4
300	217	=C5+D5

After turning on Show Formulas, the formulas display in the worksheet without selecting the cell (but you can't see the results).

≡ Formulas→Formula Auditing→Show Formulas 

### DEVELOP YOUR SKILLS: E3-D3

In this exercise, you will use formulas with absolute references to find the percentage grades for the class's exams and quizzes.

1. Save your workbook as: **E3-D3-FallGrades**
2. On the **Exam** worksheet, enter **150** in **cell H5** and **40%** in **cell I5**.

To get a grade out of 40% for each student, you need to divide their exam score by 150 then multiply by 40%. You will use the values in cells H5 and I5 to do this.

3. In **cell I6**, type **=H6/H5** but do not complete the entry.

Exam	
Total	Exam %
150	40%
123	=H6/H5

Cell H6 shows Ashley's total exam grade. This will change for each student when we copy the formula. Cell H5 is the number of total points the exam is worth, in this case 150, which should not change for each student; therefore, cell H5 needs to be an absolute reference.

While using **F4** to edit a formula as we will, the insertion point must be immediately before or after the reference to cell H5 or the correct cell reference won't be converted.

- While still in edit mode in **cell I6**, tap **[F4]** on the keyboard to make the reference for **cell H5** absolute (dollar \$ signs are placed in front of the column and row).

**Note!**

On some keyboards, including most laptops, you must press **[Fn]** (usually beside **[Ctrl]** near the bottom of the keyboard) before using the function **[F]** keys at the top of the keyboard because these may also be used for adjusting volume or other system controls.

Section 5 Exam		
	Total	Exam %
	150	40%
26	123	=H6/\$H\$5

The last step is to multiply each mark by 40%, which also does not change for each student.

- Continuing in edit mode in **cell I6**, type **\*I5** and tap **[F4]**, and then click **Enter** ☒.

Section 5 Exam		
	Total	Exam %
	150	40%
26	123	=H6/\$H\$5*\$I\$5

Cell I5 is now an absolute cell reference. Ashley's total exam grade is calculated as 33%.

- Copy the formula down **column I** for the other students.
- Select **cell I7** and ensure the formula copied correctly. The formula should be =H7/\$H\$5\*\$I\$5 and the result for Atif is 32%.

Now you will use absolute cell references to calculate the students' quiz grades.

- Click the **Quizzes** worksheet tab and enter **500** in **cell H5** and **20%** in **cell J5**.
- Enter this formula in **cell J6** to calculate the quiz percentage: =H6/\$H\$5\*\$J\$5  
You can decide for yourself if you would prefer to type in the dollar signs individually or use the **[F4]** key!
- Copy the formula down **column J** to calculate the grades for the other students.
- Click the **Final Grades** worksheet tab and notice the Final Grade now includes grades for the quizzes and exams, along with the grades for projects and participation.
- Save your work.

## Creating Names for Cells and Ranges

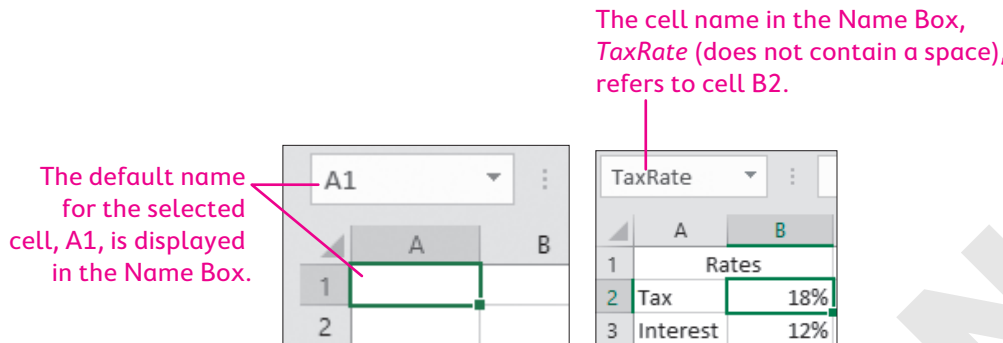
When you need to refer to the same cell or range of cells repeatedly in your formulas, consider creating a **name** for that cell or range. It's easier to remember a name than to scroll or click around your workbook looking for the cells you want to use. This is especially true if you are using a cell or range from another worksheet or even another workbook.

**Note!**

Cell names cannot contain spaces.



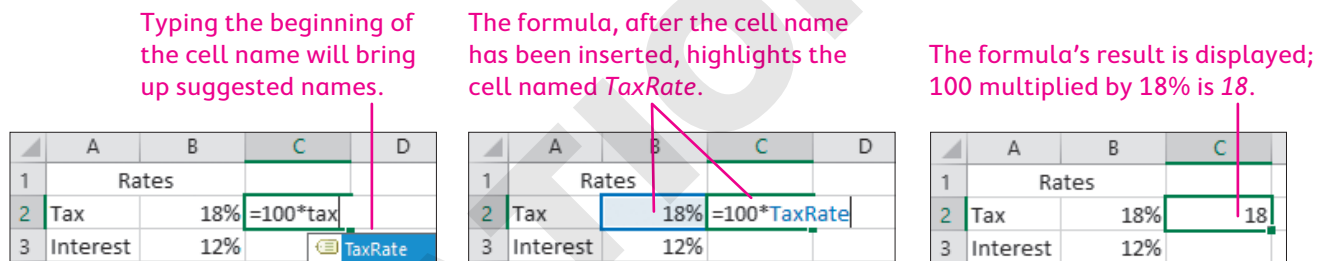
You can create names directly in the Name Box or via the Formulas tab on the Ribbon. You can also create, edit, or delete cell names using the Name Manager. Name references are automatically absolute cell references; that is, the reference will not change when moved or copied.



Formulas→Defined Names

## Using Cell Names in Formulas

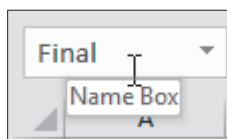
You use a cell name in a formula just as you would any other cell reference. The cell name can be typed, or the cell can be selected with the mouse. You can also begin to type the first few letters of the name and then double-click the name from the AutoComplete list that appears.



## DEVELOP YOUR SKILLS: E3-D4

In this exercise, you will define names for ranges and cells, and then enter formulas to analyze and update the grades using those names for the cell references.

1. Save your workbook as: **E3-D4-FallGrades**
2. On the **Final Grades** worksheet, select the range **G6:G17**.
3. Click inside the **Name Box**, which currently displays **G6**, and then type **Final** and tap **Enter**.  
Final is now the name that refers to the range G6:G17. The name Final can now be used in formulas to analyze the grades.



4. Beginning in **cell I5**, enter the following:

	I	
5	Grade Analysis	
6	Highest	
7	Lowest	
8	Average	

5. Add bold and italic formatting to the **range I5:I8** and AutoFit the column width to fit the text you just entered.
6. In **cell J6**, type the formula **=MAX (Final)** and tap **[Enter]**.
7. In **cell J7**, type **=MIN (** and then use the mouse to select the **range G6:G17**.  
*Excel automatically uses the name Final inside the formula for the range you just selected.*
8. Type **)** to complete the formula and then tap **[Enter]**.
9. Now type **=AVERAGE (Fi** in **cell J8** and then use the mouse to double-click the name **Final** from the suggested list.

Average	=AVERAGE(Fi	
	AVERAGE(number1, [numbe	
	FILTERXML	
	Final	
	FIND	

10. Type **)** to complete the formula and then tap **[Enter]**.
11. Apply bold formatting and the **Percent Style** number format to the **range J6:J8**.  
*The highest, lowest, and average grades for the class are now displayed.*  
*Next you will create names for the values of each part of the students' grades. This way, if the values change later you can easily update the grade formulas with the new values.*
12. Enter this data in the **range A21:B25**:

	A	B
21	Values	
22	Quizzes	20%
23	Projects	30%
24	Participation	10%
25	Exam	40%

13. AutoFit the width of **column A** to fit the word *Participation* in **cell A24**.
14. Select **cell B22** and choose **Formulas→Defined Names→Define Name** .  
*Excel adds the name Quizzes into the Name field based on the adjacent cell.*
15. Ensure that *Quizzes* is inserted in the Name field and click **OK**.
16. Repeat step 14 but select **cell B23** and use the proposed cell name *Projects*.
17. Repeat for **cell B24** and **cell B25**, using the proposed cell names *Participation* and *Exam*, respectively.
18. Choose **Formulas→Defined Names→Name Manager** and make sure all four names, as well as the name *Final* (five total names) have been added to the list, then close the Name Manager.

19. Click the **Quizzes** worksheet tab, select **cell J5**, and enter: **=Quizzes**

*The formula enters the value from the cell named Quizzes (20%) in cell J5. If the value needs to be changed, it can be updated on the Final Grades sheet, and then the Quizzes sheet and all necessary formulas will instantly update, too.*

20. Click the **Exam** worksheet tab, select **cell I5**, and enter: **=Exam**

21. Switch back to the **Final Grades** sheet and change the values in **cell B22** and **cell B25** to **10%** and **50%**, respectively.

*The quiz grades now reflect a grade out of 10 in column C, and the exam grades reflect a grade out of 50 in column E. Review the Quizzes and Exam sheets to see the changes there.*

22. Save the workbook and close Excel.
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## Self-Assessment



Check your knowledge of this chapter's key concepts and skills using the Self-Assessment in your ebook or online (eLab course or Student Resource Center).



## Reinforce Your Skills

### REINFORCE YOUR SKILLS: E3-R1

#### Use Functions to Calculate Total and Average

In this exercise, you will update a worksheet to calculate totals for each student who volunteered at Kids for Change, and totals for each month of the year. You'll find the average volunteer hours per month as well.

1. Start Excel; open **E3-R1-VolunteerHours** from your **Excel Chapter 3** folder and save it as: **E3-R1-VolunteerTotals**
2. Select **cell H5** and choose **Home→Editing→AutoSum** .  
*AutoSum finds the sum of the range D5:G5.*
3. Click **Enter** to finish the entry.  
*The result of the formula displayed in cell H5 is 137.*
4. Use the **fill handle** to copy the formula in **cell H5** down the column for the rest of the students.
5. Enter the text **Total** in **cell C28** and the text **Average** in **cell C29**.
6. Apply bold and italic formatting to the **range C28:C29**, and then right-align the cell contents.
7. Select the **range D28:H28** and choose **Home→Editing→AutoSum** .  
*This time, rather than inserting the sum and copying the formula across, all five cells are filled with the formula instantly. If you are certain the AutoSum formula does not need to be edited, you can use this method.*
8. Select **cell D29**.  
*Next you will find the average. Because the average function in cell D29 will require editing, you will enter the first function in cell D29 and then copy across.*
9. Choose **Home→Editing→AutoSum** **menu button ▼→Average**.  
*Notice the AVERAGE function selects the range D5:D28; this is incorrect because the average should not include the total in cell D28.*
10. Select **cell D5** and hold down the mouse button while dragging down to **cell D27** to modify the range.
11. Once the formula displays the correct range, =AVERAGE(D5:D27), click **Enter** to complete the formula.
12. Copy the formula in **cell D29** across the row for the months of February, March, and April.
13. Save the workbook.

### REINFORCE YOUR SKILLS: E3-R2

#### Use Absolute References and Named Ranges in Formulas

In this exercise, you will calculate a tuition payment for each of the Kids for Change student volunteers. You will then calculate the highest and lowest total hours volunteered.

1. Save your workbook as: **E3-R2-VolunteerTotals**
2. Enter **Tuition** in **cell I4**.

3. Use the Format Painter to apply the formatting from **cell H4** to **cell I4**.

*Kids for Change offers high school volunteers reimbursement for volunteer hours that they can save up for college tuition. First you will enter the rate and then you will multiply each student's hours by the rate.*

4. In **cell J5**, type **Rate** and then use the Format Painter to apply the formatting from **cell C29** to **cell J5**.

5. Enter the number **3.75** in **cell K5**.


6. Select **cell I5** and enter a formula that multiplies **cell H5** by **cell K5**. Be sure to use an absolute cell reference for **cell K5** so it stays the same for each student when you copy the formula.

*The result for the first student, Ashley, should be 513.75.*

7. Copy the formula down **column I** for the other students.

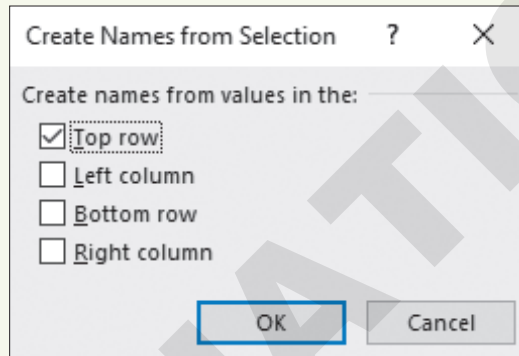
*Be sure to stop at cell I27 (do not copy the formula to cell I28 in the total row). The result for the last student, William, should be 487.5.*

*The next step is to define names for the data in the Total and Tuition columns.*

8. Select the **range H4:I27** and choose **Formulas**→**Defined Names**→**Create from Selection** .

*The Create from Selection button uses the text from the selected range to define names for multiple columns or rows simultaneously. In this case, the text is located at the top, so the top row text values can be used as names for each column; for example, the name Total will refer to the range H5:H27.*

9. Ensure the **Top Row** box is checked and click **OK**.



10. In **cell I28**, use the SUM function to find the tuition total, taking care to use the name *Tuition* for the range.
11. Apply a bottom border to the **range D27:I27** and then apply the Accounting number format to **cell I28**.
12. Adjust the rate in **cell K5** to **4.25** and notice the increase in the total in **cell I28**.
13. Enter the text **Highest** in **cell G30** and the text **Lowest** in **cell G31**.
14. Use the **Format Painter** to apply the formatting from **cell C29** to the **range G30:G31**.
15. In **cell H30**, enter a formula using the MAX function to find the highest value for the total hours, and be sure to use the name *Total* for the range.
16. Enter a formula in **cell H31** using the MIN function to find the lowest value and, again, use the name *Total* for the range.
17. Repeat steps 15–16 in **cells I30** and **I31** to find the highest and lowest values in the Tuition column.
18. Save and close the workbook.

## REINFORCE YOUR SKILLS: E3-R3

### Calculate Funds Raised with Formulas and Functions

*In this exercise, you will calculate the funds raised at the Kids for Change Summer Charity Race using the appropriate formulas and functions.*

1. Open **E3-R3-Pledges** from your **Excel Chapter 3** folder and save it as: **E3-R3-TotalRaised**

*Each participant has obtained pledges from donors at a rate of \$2.50 for each mile run. The first step is to calculate the subtotal, which is the number of pledges multiplied by the pledge rate, then multiply by the number of miles each participant ran.*

2. In **cell F7**, insert a formula that multiplies **cell D7** by **cell E3** and then multiplies that amount by **cell E7**.

*Be sure to use an absolute cell reference to cell E3 since the pledge rate is the same for all runners.*

3. Copy the formula in **cell F7** down **column F** for all participants.

*Each participant also pays an entry fee of \$25, so the fee is added to the subtotal to calculate the total raised.*

4. Insert a formula in **cell G7** that adds **cell F7** to **cell E4**—and remember that you don't want the reference to cell E4 to change when you copy it!

5. Copy the formula down **column G**.

6. Enter the text in the cells specified:

Cell F29	<b>Grand Total</b>
Cell F30	<b>Average</b>
Cell F31	<b>Most Raised</b>

7. Copy the format from **cell A6** to the **range F29:F31**.
8. Select the **range G7:G28** and name it: **Total**
9. Use the name *Total* in functions to find the sum, average, and maximum in the appropriate cells in **column G**.
10. Apply a bottom border to **cell G28** and bold format to the **range G29:G31**.
11. Save the workbook and close Excel.



# Apply Your Skills

## APPLY YOUR SKILLS: E3-A1

### Create an Invoice Using Formulas

In this exercise, you will create an invoice for Universal Corporate Events services using formulas with functions and absolute cell references. Once the appropriate formulas are entered, the invoice can be modified for each customer simply by changing the name, date, and number of guests at the top.

1. Start Excel; open **E3-A1-Bill** from your **Excel Chapter 3** folder and save it as:  
**E3-A1-Invoice**  
*There are two sections to the invoice, the flat rate fees and per person fees. For flat rate fees the customer pays the price plus the deposit.*
2. Use the SUM function in **cell D7** to add the price plus deposit for the first item and then copy the formula down to **cell D10**.  
*The per-person fees must multiply the price by the number of guests, so you will do that next.*
3. In **cell D14**, multiply the price for meals in **cell B14** by the number of guests in **cell D3**. Use an absolute reference for the cell that does not change.
4. Copy the formula from **cell D14** down to **cell D17**.
5. Enter a function in **cell D20** to find the subtotal, which is the sum of all item totals in **column D**.  
*Be sure to include all flat-rate fees plus all per-person fees in the subtotal. You may need to manually change the range since there are blank cells between the two sections.*
6. Test your formulas by changing the number of guests in **cell D3** to: **150**  
*Your subtotal should increase from \$3,840 to \$5,165.*
7. Save the workbook.

## APPLY YOUR SKILLS: E3-A2

### Calculate Tax and Discount Amount

In this exercise, you will take the Universal Corporate Events invoice and enter formulas for tax and discount using named cells.

1. Save your workbook as: **E3-A2-Invoice**
2. Select **cell C26** and define the name **TaxRate** to refer to that cell.  
*Remember: Cell names cannot contain spaces!*
3. Use the name you just created in a formula to calculate the tax in **cell D21**; that is, multiply the subtotal by the tax rate.  
*Universal Corporate Events offers terms of 2/10, n/30 to their customers, which means customers get a 2% discount if they pay the invoice within 10 days or the net amount is due in 30 days.*
4. Create a name for **cell C25** and use the name: **Discount**
5. In **cell D22**, calculate the discount if the customer pays early using the name **Discount** in your formula.
6. In **cell D23**, calculate the total due, which is the subtotal plus the tax, minus the discount.

7. Test your formulas again by changing the tax and discount rates: Change the discount to zero (if the customer does not pay within ten days) and adjust the tax rate to 8%.
8. Save and close the workbook.

## APPLY YOUR SKILLS: E3-A3

### Create Formulas Using Names

*Universal Corporate Events has started a customer loyalty program. In this exercise, you will use formulas to calculate customer loyalty points.*

1. Open **E3-A3-Customers** from your **Excel Chapter 3** folder and save it as: **E3-A3-Points**
2. Begin by entering **Points Earned** in **cell C5** and **Total Points** in **cell D5**.
3. Copy the formatting from **cell B5** to the **range C5:D5**.
4. Enter the text **Points Per Dollar** in **cell A25** and **15** in **cell B25**.
5. Apply bold and italic formatting to the **range A25:B25**.
6. In **cell C6**, insert a formula to calculate points for the first customer, Green Clean, by multiplying the total spent by the Points Per Dollar amount.
7. Change the number format in **cell C6** to Number with no decimal places.
8. Copy the formula down the column for all customers.

*All customers should show points. If any customers show 0 (zero), modify your formula to use an absolute cell reference.*

*You also want to give all of your customers a welcome bonus, which you will now add to their points earned.*
9. Enter the text **Welcome Bonus** in **cell A26** and **250** in **cell B26**.
10. Copy the formatting from **cell A25** to the **range A26:B26**.
11. Name **cell B26: Welcome**
12. Enter a formula in **cell D6** to add the welcome bonus amount to the points earned for Green Clean, and then copy the formula down the column for all customers.
13. Enter the text **Average Points Per Customer** in **cell A20** and then use the Average function in **cell D20** to calculate the average points per customer.
14. Copy the formatting from **cell A25** to the **range A20:D20**.
15. Apply Number formatting with no decimal places to **cell D20**.
16. Save the workbook and close Excel.

# Project Grader

*If your class is using eLab (labyrinthelab.com), you may upload your completed Project Grader assignments for automatic grading. You may complete these projects even if your class doesn't use eLab, though you will not be able to upload your work.*

## PROJECT GRADER: E3-P1

### Taylor Games Financial Modeling

*The Taylor Games management team wants to do some what-if analysis to help them price items for retail sale and for sales promotions. In this exercise, you will build a model in which they can enter key values, and your worksheet will then automatically recalculate based upon their inputs.*

1. Download and open your Project Grader starting file.
  - *Using eLab:* Download **E3\_P1\_eStart** from the Assignments page. You must start with this file or your work cannot be automatically graded.
  - *Not using eLab:* Open **E3\_P1\_Start** from your **Excel Chapter 3** folder.
2. In **cell E8**, use a formula with cell references to multiply the Qty by the Unit Cost: (Qty \* Unit Cost).
3. Copy the formula down to the **range E9:E22**.
4. In **cell F8**, use a formula with cell references to multiply the Inventory Value (**cell E8**) by the Markup Percentage (**cell B2**): (Inventory Value \* Markup Percentage). Use an absolute cell reference to the Markup Percentage in **cell B2**.
5. Copy the formula down to the **range F9:F22**.
6. In **cell G8**, use a formula with cell references to add the Inventory Value to the Retail Markup: (Inventory Value + Retail Markup).
7. Copy the formula down to the **range G9:G22**.
8. In **cell B3**, create the cell name: **Markdown**
9. In **cell H8**, use a formula to multiply the Retail Value (cell G8) by the Markdown % (cell B3): (Retail Value \* Markdown %). In your formula, use a cell reference to **cell G8** and the cell name **Markdown** to reference **cell B3**.
10. Copy the formula down to the **range H9:H22**.
11. In **cell I8**, use a formula with cell references to subtract the Sale Markdown from the Retail Value: (Retail Value – Sale Markdown).
12. Copy the formula down to the **range I9:I22**.
13. In the **range E23:I23**, use **AutoSum** to create column totals.
14. In **cell G2**, use the **COUNT** function to count the SKUs in the **range B8:B22**.
15. In **cell G3**, create a link to the Inventory Value total in **cell E23**. The **cell E23** total should now appear in **cell G3**.
16. In **cell G4**, use the **AVERAGE** function to determine the average Retail Value in the **range G8:G22**.
17. In **cell G5**, use the **AVERAGE** function to determine the average Sale Value in the **range I8:I22**.

18. In **cell B2**, enter **80** as the Markup Percentage, and in **cell B3**, enter **10** as the Markdown Percentage. Feel free to enter other numbers in **cells B2** and **B3** if you want to do some what-if analysis. But when you're finished, make sure you have **80** in **cell B2** and **10** in **cell B3** if you want to get credit for this step.
19. Save your workbook.
  - *Using eLab:* Save it to your **Excel Chapter 3** folder as **E3\_P1\_eSubmission** and attach the file to your eLab assignment for grading.
  - *Not using eLab:* Save it to your **Excel Chapter 3** folder as: **E3\_P1\_Submission**

## PROJECT GRADER: E3-P2

### Classic Cars Club Rebates and Rewards Financial Model

*The Classic Cars management team is considering a Rewards & Rebates program for members. In this exercise, you will build a financial model with various inputs that will help them make informed decisions.*

1. Download and open your Project Grader starting file.
  - *Using eLab:* Download **E3\_P2\_eStart** from the Assignments page. You *must* start with this file or your work cannot be automatically graded.
  - *Not using eLab:* Open **E3\_P2\_Start** from your **Excel Chapter 3** folder.
2. In the **Rebates & Rewards** sheet, use Autofill to create a sequential list of Member #s starting with **cells A9** and **A10** and continuing down to **cell A21**.
3. Copy the Member #s in the **range A9:A21** and paste them into the same cells in the **Car Values** sheet.
4. In **cell K9** in the **Car Values** sheet, use a formula with cell references to subtract the Original Value from the Current Value: (Current Value – Original Value).
5. In **cell K9**, apply the Accounting number format and decrease the decimals to zero (no decimals displayed).
6. Copy the formula down to the **range K10:K21**.
7. In **cell C4**, use the **MAX** function to determine the greatest appreciation in the **range K9:K21**.
8. In **cell C5**, use the **MIN** function to determine the least appreciation in the **range K9:K21**.
9. In **cell C6**, use the **AVERAGE** function to determine the average appreciation in the **range K9:K21**.
10. In **cell C4** of the **Rebates & Rewards** sheet, use the **COUNT** function to count the Member #s in the **range A9:A21**.
11. In **cell C5**, create the cell name: **Reward**
12. In **cell I9**, use a formula to multiply the Contract Years (cell H9) by the Reward (Each Year) (cell C5): (Contract Years \* Reward (Each Year)). In your formula, use a cell reference to **cell H9** and the cell name *Reward* to reference **cell C5**.
13. Copy the formula down to the **range I10:I21**.
14. In **cell K9**, use a formula with cell references to multiply the Merchandise Purchases (cell J8) by the Merchandise Rebate % (cell C6): (Merchandise Purchases \* Merchandise Rebate %). Use an absolute cell reference to the Merchandise Rebate % in **cell C6**.
15. Copy the formula down to the **range K10:K21**.

16. In **cell L9**, use a formula with cell references to add the Contract Reward (I9) to the Merchandise Rebate (K9): (Contract Reward + Merchandise Rebate).
17. Copy the formula down to the **range L10:L21**.
18. In the **range I22:L22**, use **AutoSum** to create column totals.
19. In **cell C5**, enter **50** as the Reward (Each Year), and in **cell C6**, enter **30** as the Merchandise Rebate %. Feel free to enter other numbers in **cells C5** and **C6** if you want to do some what-if analysis, but when you're finished, make sure you have **50** in **cell C5** and **30** in **cell C6** if you want to get credit for this step.
20. Save your workbook.
  - *Using eLab:* Save it to your **Excel Chapter 3** folder as **E3\_P2\_eSubmission** and attach the file to your eLab assignment for grading.
  - *Not using eLab:* Save it to your **Excel Chapter 3** folder as: **E3\_P2\_Submission**

## Extend Your Skills

*These exercises challenge you to think critically and apply your new skills in a real-world setting. You will be evaluated on your ability to follow directions, completeness, creativity, and the use of proper grammar and mechanics. Save files to your chapter folder. Submit assignments as directed.*

### E3-E1 That's the Way I See It

You are house shopping and have started a worksheet (E3-E1-RealEstate) to compare your top-three properties. Open and save **E3-E1-RealEstate** as **E3-E1-3Houses** and review the overall structure and content. Then, enter prices for three houses you might wish to buy, using the Internet as necessary to research housing prices in your area. Create formulas in all gray-shaded cells, starting with the Down Payment cells, multiplying the price by the rate for the first house and using an absolute reference so you can copy the formula across each row (subtract down payment from the price to find the mortgage amount). Repeat for the fees, then use the SUM function to find the total fees and add that to the mortgage amount to complete the Total Mortgage Plus Fees rows. Finally, apply appropriate cell and number formatting as desired.

### E3-E2 Be Your Own Boss

Open **E3-E2-Revenue** and save it as: **E3-E2-Projections**

Blue Jean Landscaping has four divisions, and each division has already reported their customer hours for Q1–Q3. You now need to calculate total invoices and make revenue projections for Q4. Start by calculating total hours and average hours, using the Q1–Q3 hours and the appropriate function. Then create names for the Hourly Rate and Projected Growth cells, to be used in your formulas. In the Total Invoices column, use a formula with the total hours and the hourly rate to calculate the total dollar amount for Q1–Q3. Once that is done you can calculate the Q4 projected hours using the average hours and multiplying by one plus the projected growth rate (in parentheses). Multiply the hours again by the rate to get the Q4 projected invoices. As the last step, find the total for each column in row 10. Format the worksheet appropriately with borders and number formatting so the total in row 10 stands out.

### E3-E3 Demonstrate Proficiency

After introducing two new flavors of BBQ sauce last year, Stormy BBQ wants you to do an analysis of its sales for each type of sauce and calculate total revenue for each. Open **E3-E3-Sales**; save the workbook as **E3-E3-SauceSalesRevised** and then begin by defining names for each of the columns of sauce data. (Hint: This can be done one column at a time or for all three columns at once using the Create from Selection tool.) Once you have named the three ranges, create row headings and insert the appropriate formulas below December to find the *Total Annual Sales*, *Average Sales*, *Highest Sale Amount*, and *Lowest Sale Amount*. Do this for each sauce and use the names you have created in your formulas. Then, create a heading and a formula to find total annual revenue for each sauce. Each bottle sells for \$5.99. (Hint: Enter the price somewhere on the worksheet and then either use a name or an absolute cell reference to refer to that cell in your formula.) Apply appropriate formatting to the total annual revenue because this is now a dollar amount, as well as other areas of the worksheet as you see fit.