

# Using Advanced Formulas 10

## LESSON SKILL MATRIX

Skills	Exam Objective	Objective Number
Using Formulas to Conditionally Summarize Data	Demonstrate how to apply the SUMIF function.	4.3.1
	Demonstrate how to apply the COUNTIF function.	4.3.3
	Demonstrate how to apply the AVERAGEIF function.	4.3.2
Using Formulas to Look up data in a workbook		
Adding Conditional Logic Functions to Formulas		
Using Formulas to Modify Text	Demonstrate how to use the RIGHT, LEFT, and MID functions.	4.4.1
	Demonstrate how to use the TRIM function.	4.4.2
	Demonstrate how to use the UPPER and LOWER functions.	4.4.3
	Demonstrate how to use the CONCATENATE function.	4.4.4



## KEY TERMS

- arguments
- conditional formula
- criteria
- lookup functions
- table
- table array



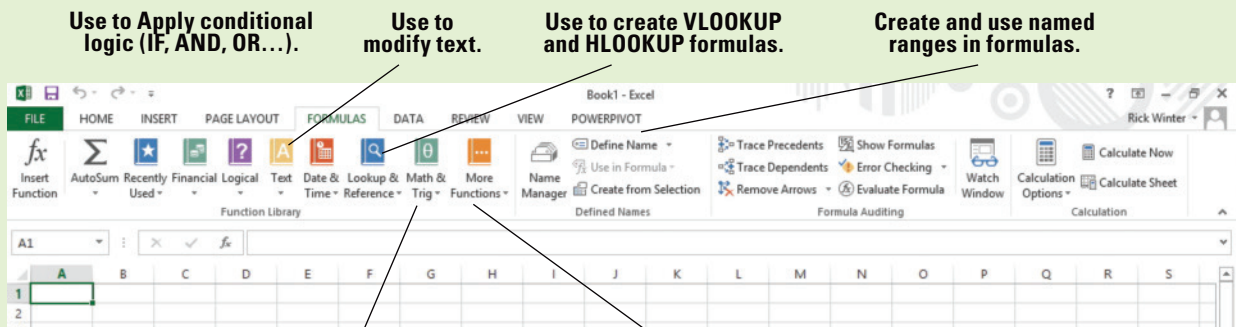
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Fabrikam, Inc. uses several of Excel's analytical tools to review sales data during strategic planning activities. Fabrikam's owners created a bonus program as part of the company's employee-retention efforts and to encourage individual sales agents and all employees to support the total sales goals. The bonus is based on years of service and when an agent reaches his or her sales goal for the year. Fabrikam realizes that all back office employees support the sales agents and so it gives a bonus to the entire staff if the total sales goal is met. To determine which agents and employees will receive the performance bonus, Fabrikam's accountants must create formulas to analyze the company's sales data. Excel's built-in formulas are the perfect solution to compute and display all the calculations the accountants need. You learn to apply these formulas in the exercises in this lesson.

## SOFTWARE ORIENTATION

### The FORMULAS Tab

In this lesson, you use commands on the FORMULAS tab to create formulas to conditionally summarize data, look up data, apply conditional logic, and modify text. The FORMULAS tab is shown in Figure 10-1.



**Figure 10-1**  
FORMULAS tab

**Math & Trigs contains  
SUM and SUMIF.**

**Use Statistical Formulas choice  
for COUNTIF, COUNTIFS,  
AVERAGEIF, AVERAGEIFS.**

The FORMULAS tab contains the command groups you use to create and apply advanced formulas in Excel. Use this illustration as a reference throughout the lesson. Table 10-1 summarizes the functions covered in this lesson and includes where the functions are located on the FORMULAS tab.

**Table 10-1**  
Location and description of  
functions in this Lesson

Function	Category	Syntax	Description
SUMIF	Math & Trig	SUMIF(Range, Criteria, [Sum_Range])	Adds the cells in Range or Sum_Range specified by a given Criteria.
SUMIFS	Math & Trig	SUMIFS(Sum_Range, Criteria_Range1, Criteria1, [Criteria_Range2, Criteria2], ...)	Adds the cells in Sum_Range that meet multiple Criteria.
COUNTIF	More Functions > Statistical	COUNTIF(Range, Criteria)	Counts the number of cells within Range that meet the Criteria.
COUNTIFS	More Functions > Statistical	COUNTIFS(Criteria_Range1, Criteria1, [Criteria_Range2, Criteria2], ...)	Counts the number of cells within multiple Criteria_Range# that meet Criteria#.
AVERAGEIF	More Functions > Statistical	AVERAGEIF(Range, Criteria, [Average_Range])	Returns the arithmetic mean of cells in Range or Average_Range that meet a Criteria.
AVERAGEIFS	More Functions > Statistical	AVERAGEIFS(Average_Range, Criteria_Range1, Criteria1, [Criteria_Range2, Criteria2], ...)	Returns the mean of cells in Average_Range that meet multiple Criteria.
VLOOKUP	Lookup & Reference	VLOOKUP(Lookup_Value, Table_Array, Col_Index_Num, [Range_Lookup])	Searches for a value in the first column of Table_Array and returns a value in the same row from Col_Index_Num.
HLOOKUP	Lookup & Reference	HLOOKUP(Lookup_Value, Table_Array, Row_Index_Num, [Range_Lookup])	Searches for a value in the top row of Table_Array and returns a value in the same column from Row_Index_Num.
IF	Logical	IF(Logical_Test, [Value_If_True], [Value_If_False])	When Logical_Test is TRUE, returns Value_If_True; otherwise, it returns Value_If_False.
AND	Logical	AND(Logical1, [Logical2], ...)	Returns TRUE if all Logical1... are TRUE; returns FALSE if any Logical1... is FALSE.
OR	Logical	OR(Logical1, [Logical2], ...)	Returns TRUE if any Logical1... is TRUE; returns FALSE if all Logical1... are FALSE.
NOT	Logical	NOT(Logical)	If Logical is TRUE, it returns FALSE and if Logical is FALSE, it returns TRUE.
IFERROR	Logical	IFERROR(Value, Value_If_Error)	Returns Value_If_Error if a formula evaluates to an error; otherwise, it returns Value.
LEFT	Text	LEFT(Text, [Num_Chars])	Returns the left Num_Chars from text.

**Table 10-1**

Location and description of functions in this Lesson

Function	Category	Syntax	Description
RIGHT	Text	RIGHT(Text,[Num_Chars])	Returns the right Num_Chars from text.
MID	Text	MID(Text, Start_Num, Num_Chars)	Returns Num_Chars from the Text starting at Start_Num.
TRIM	Text	TRIM(Text)	Removes spaces at beginning and end of text.
PROPER	Text	PROPER(Text)	Capitalizes the first letter in each word of text.
UPPER	Text	UPPER(Text)	Converts text to uppercase.
LOWER	Text	LOWER(Text)	Converts text to lowercase.
CONCATENATE	Text	CONCATENATE(Text1, [Text2], ...)	Joins Text1Text2...
FIND	Text	FIND(Find_Text, Within_Text, [Start_Num])	Gives number where Within_Text starts inside of Find_Text.
SUBSTITUTE	Text	SUBSTITUTE(Text, Old_Text, New_Text, [Instance_Num])	Substitutes New_Text for Old_Text in text.



## Workplace Ready

### BEGIN YOUR EXCEL PORTFOLIO

If you are just beginning your career, you may get the question, “How well do you know Excel?” How do you answer a general question like that? Instead of a general response such as, “I know Excel fairly well,” it might be more helpful to both you and your potential employer if you have specifics about what features of Excel you’ve used. For some employers, the number of functions you know and can use is a good indication of an answer to that question. Some people never use more than SUM and AVERAGE and perhaps a couple of other functions. One recommendation is to create a spreadsheet that lists the features and functions you use, such as the one that follows, and keep a notebook (electronic and three-ring binder) of the workbooks that illustrate those features. In addition to providing a great visual example of your work, you then have a much more meaningful answer to the “How well do you know Excel?” question.

In addition to Excel, you might want to expand this list to include all applications you use.

Date	Feature	SubFeature	For	Document
3/29/2014	Functions	MAX, MIN	Contoso Pharmaceuticals	2013 Advertising Summary.xlsx
4/5/2014	Functions	SUMIF, COUNTIF, IF	Fabrikam, Inc.	2013 Employee Bonuses.xlsx
4/16/2014	Formatting	Conditional	Lucerne Publishing	2013 Author Deadlines.xlsx
4/29/2014	Charts	Stocks	Trey Research	10 Top Stock.xlsx
5/20/2014	Functions	FIND, PROPER, CONCATENATE	Margie's Travel	2014 1st Qtr top Destinations.xlsx

## Bottom Line

## USING FORMULAS TO CONDITIONALLY SUMMARIZE DATA

As you learn in Lesson 4, “Using Basic Formulas,” a formula is an equation that performs calculations—such as addition, subtraction, multiplication, and division—on values in a worksheet. When you enter a formula in a cell, the formula is stored internally and the results are displayed in the cell. Formulas give results and solutions that help you assess and analyze data. As you learned in Lesson 6, “Formatting Cells and Ranges,” you can use a conditional format—which changes the appearance of a cell range based on a criterion—to help you analyze data, detect critical issues, identify patterns, and visually explore trends.

Conditional formulas add yet another dimension to data analysis by summarizing data that meets one or more criteria. **Criteria** can be a number, text, or expression that tests which cells to sum, count, or average. A conditional formula is one in which the result is determined by the presence or absence of a particular condition. Conditional formulas used in Excel include the functions SUMIF, COUNTIF, and AVERAGEIF that check for one criterion, or their counterparts SUMIFS, COUNTIFS, and AVERAGEIFS that check for multiple criteria.

## Using SUMIF

The SUMIF function calculates the total of only those cells that meet a given criterion or condition. The syntax for the SUMIF function is SUMIF(Range, Criteria, *Sum\_range*). The values that a function uses to perform operations or calculations in a formula are called **arguments**. Thus, the arguments of the SUMIF function are Range, Criteria, and *Sum\_range*, which, when used together, create a conditional formula in which only those cells that meet a stated Criteria are added. Cells within the Range that do not meet the criterion are not included in the total. If you use the numbers in the range for the sum, the *Sum\_range* argument is not required. However, if you are using the criteria to test which values to sum from a different column, then the range becomes the tested values and the *Sum\_range* determines which numbers to total in the same rows as the matching criteria. In this chapter, optional arguments will be in italics.

## STEP BY STEP

## Use the SUMIF Function

Table 10-2 explains the meaning of each argument in the SUMIF syntax. Note that if you omit *Sum\_range* from the formula, Excel evaluates and adds the cells in the range if they match the criterion.

**Table 10-2**  
Arguments in the  
SUMIF syntax

Argument	Explanation
Range	The range of cells that you want the function to evaluate. Also add the matched cells if the <i>Sum_range</i> is blank.
Criteria	The condition or criterion in the form of a number, expression, or text entry that defines which cells will be added.
<i>Sum_range</i>	The cells to add if the corresponding row's cells in the Range match the criteria. If this is blank, use the Range for both the cells to add and the cells to evaluate the criteria against.



GET READY. LAUNCH Excel.

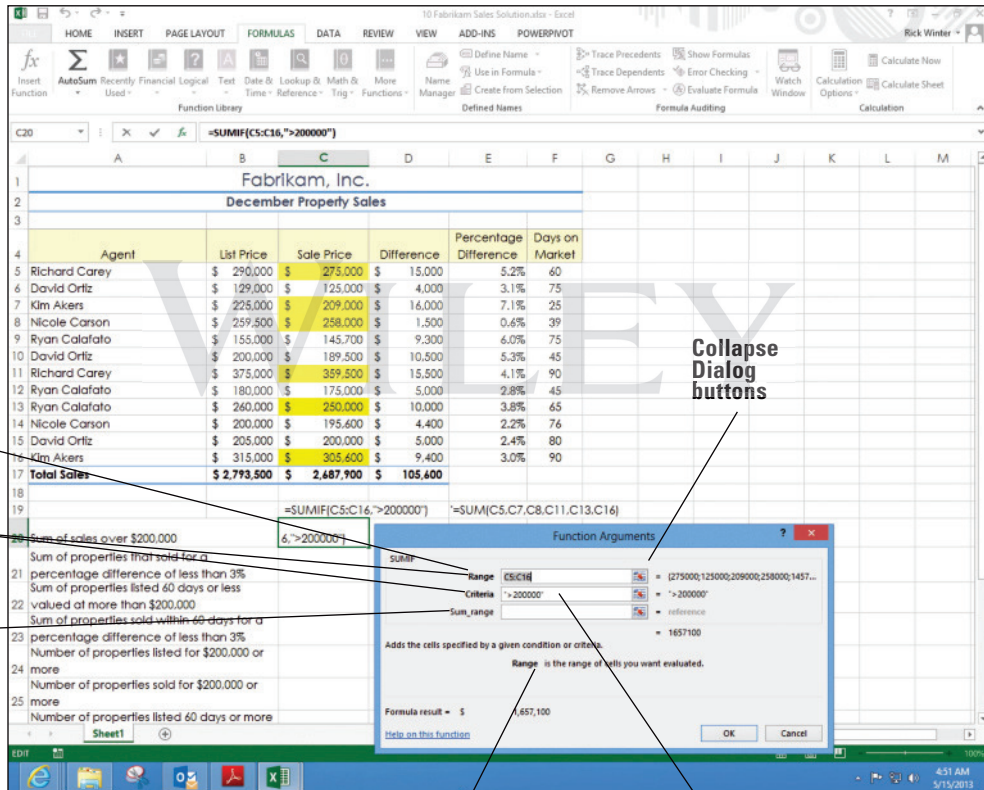
1. OPEN the **10 Fabrikam Sales** file for this lesson, and SAVE it to the Lesson 10 folder as **10 Fabrikam Sales Solution**.

2. Select **C20**. Click the **FORMULAS** tab and in the Function Library group, click **Math & Trig**. Scroll and click **SUMIF**. The Function Arguments dialog box opens with text boxes for the arguments, a description of the formula, and a description of each argument.
3. In the Function Arguments dialog box, click the **Collapse Dialog** button for the Range argument. This allows you to see more of the worksheet. Select the cell range **C5:C16**. Press **Enter**. By doing this, you apply the cell range that the formula will use in the calculation.
4. In the Criteria box, type **>200000** and press **Tab**. Figure 10-2 shows that the Sum\_range text box is not bold. This means that this argument is optional. If you leave the Sum\_range blank, Excel sums the cells you enter in the Range box. You now applied your criteria to sum all values that are greater than \$200,000.

**Figure 10-2**

The Function Arguments dialog box guides you in building SUMIF formulas.

Select worksheet cells or type range that will be evaluated by the criteria  
 Bold = required arguments  
 Dimmed = optional argument



Collapse Dialog buttons

Identifies purpose of current text box argument

Look in Range and sum only values that match this Criteria

**Take Note** In your workbook, cells in column C are not highlighted and the text and amount in cells C19, E19, and E20 are empty. Figure 10-2 has been modified to show you which cells in the C5:C16 range meet the >200000 criteria (275,000+209,000+258,000+359,500+250,000+305,600) and that the total is the sum of these individual cells or 1,657,100. If you want to conditionally highlight a range, see Lesson 6.



**Troubleshooting**

It is not necessary to type dollar signs or commas when entering dollar amounts in the Function Arguments dialog box. If you type them, Excel removes them from the formula and returns an accurate value.

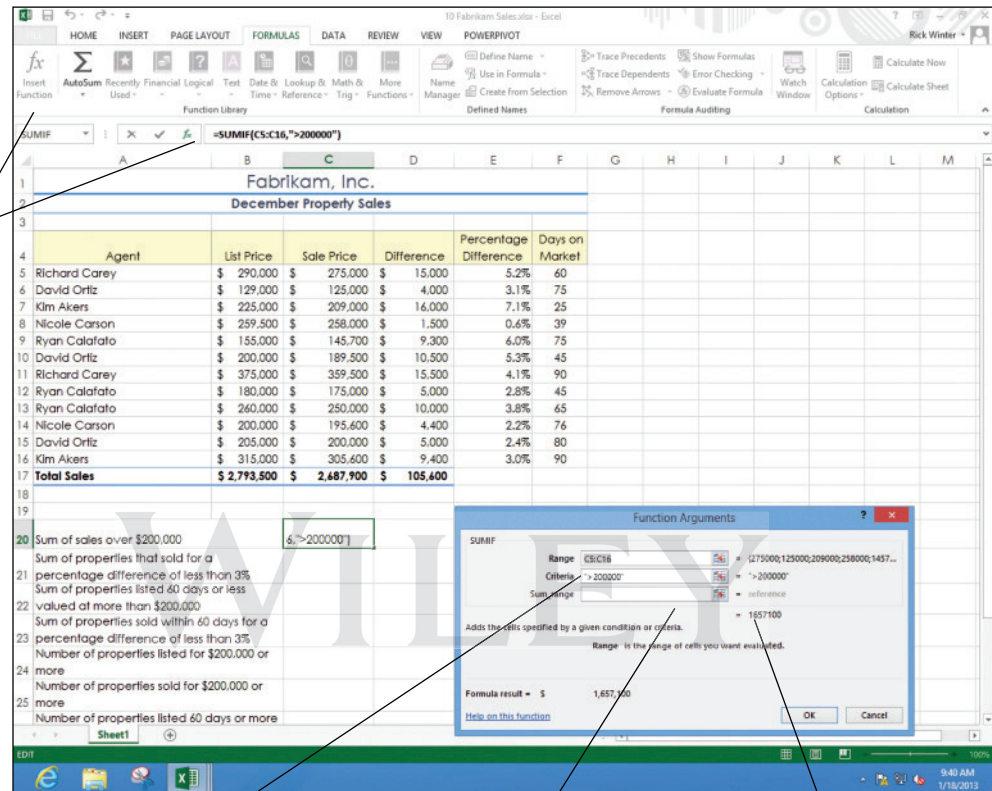
5. Click **OK** to accept the changes and close the dialog box. You see that \$1,657,100 of Fabrikam’s December revenue came from properties valued in excess of \$200,000.

6. If for some reason you need to edit the formula, select the cell that contains the function, and on the FORMULAS tab, or in the Formula Bar, click the **Insert Function** button to return to the Function Arguments dialog box (see Figure 10-3).

Figure 10-3

Insert Function buttons allow you to return to the Function Arguments dialog box.

Insert function buttons



Quotation marks added by Excel when it recognizes text or equations

Preview of arguments

Preview of result if all boxes complete

**Take Note** The result of the SUMIF formula in C20 does not include the property value in C15 because the formula specified values greater than \$200,000. To include this value, the criterion needs to be >= (greater than or equal to).

7. Click **OK** or press **Esc** if you have no changes.

8. Select cell **C21**, and in the Function Library group, click **Recently Used**, and then click **SUMIF** to once again open the Function Arguments dialog box. The insertion point should be in the Range box.

**Take Note** When you click **Recently Used**, the last function that you used appears at the top of the list. Similarly, when you click **Insert Function**, the **Insert Function** dialog box opens with the last used function highlighted.

9. In the Range field, select cells **E5:E16**. The selected range is automatically entered into the text box. Press **Tab**.

**Take Note** You do not need to collapse the dialog box as you did in Step 3. You can directly highlight the range if the dialog box is not in the way. Another option is to move the dialog box by dragging the title bar.

10. In the Criteria box, type **<3%** and press **Tab**. You enter the criteria to look at column E and find values less than 3%.

11. In the Sum\_range field, select cells **C5:C16**. The formula in C21 is different that the formula in C20. In C21, the criteria range is different than the sum range. In C20, the

CERTIFICATION  
READY? 4.3.1

How do you create a formula that sums only those values that meet criteria?

criteria range and the sum range are the same. In C21, SUMIF checks for values in column E that are less than 3% (E8 is the first one) and finds the value in the same row and column C (C8 in this case) and adds this to the total. Click **OK** to accept your changes and close the dialog box. Excel returns a value of \$1,134,200.

**12.** SAVE the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

## Using SUMIFS

The SUMIFS function adds cells in a range that meet multiple criteria. It is important to note that the order of arguments in this function is different from the order used with SUMIF. In a SUMIF formula, the Sum\_range argument is the third argument; in SUMIFS, however, it is the first argument. In this exercise, you create and use two SUMIFS formulas, each of which analyzes data based on two criteria. The first SUMIFS formula adds the selling price of the properties that Fabrikam sold for more than \$200,000 and that were on the market 60 days or less. The second formula adds the properties that sold at less than 3% difference from their listed price within 60 days.

### STEP BY STEP

#### Use the SUMIFS Function

GET READY. USE the workbook from the previous exercise.



#### Another Way

You can use the Insert Function button to find a function or one of the function buttons in the Function Library if you know the function category and name.

1. Click cell **C22**. On the FORMULAS tab, in the Function Library group, click **Insert Function**.
2. In the Search for a function box, type **SUMIFS**, and then click **Go**. SUMIFS is highlighted in the Select a function box.
3. Click **OK** to accept the function.
4. In the Function Arguments dialog box, in the Sum\_range box, select cells **C5:C16**. This adds your cell range to the argument of the formula.
5. In the Criteria\_range1 box, select cells **F5:F16**. In the Criteria1 box, type **<=60**. This specifies that you want to calculate only those values that are less than or equal to 60. When you move to the next text box, notice that Excel places quotation marks around your criteria. It applies these marks to let itself know that this is a criterion and not a calculated value.
6. In the Criteria\_range2 box, select cells **C5:C16**. You are now choosing your second cell range.
7. In the Criteria2 box, type **>200000**. Click **OK**. You now applied a second criterion that will calculate values greater than 200,000. Excel calculates your formula, returning a value of \$742,000.
8. Select **C23** and in the Function Library group, click **Recently Used**.
9. Select **SUMIFS**. In the Sum\_range box, select **C5:C16**.
10. In the Criteria\_range1 box, select cells **F5:F16**. Type **<=60** in the Criteria1 box.
11. In the Criteria\_range2 box, select cells **E5:E16**. Type **<3%** in the Criteria2 box and press **Tab**. To see all arguments, scroll back to the top of the dialog box. The Function Arguments dialog box should look like Figure 10-4.



Figure 10-4

SUMIFS formula applies two or more criteria.

Argument	Value	Preview
Sum_range	C5:C16	= (275000;125000;209000;258000;1457...
Criteria_range1	F5:F16	= (60;75;25;39;75;45;90;45;65;76;80;90)
Criteria1	<=60	= <=60
Criteria_range2	E5:E16	= (0.0517241379310345;0.0310077519...
Criteria2	<=3%	= <=3%
Preview		= 433000

Formula result = \$ 433,000

Preview indicates total will be 433000.



### Troubleshooting

It is a good idea to press Tab after your last entry and preview the result of the function to make sure you entered all arguments correctly.

- Click **OK**. After applying this formula, Excel returns a value of \$433,000.
- SAVE the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

The formulas you use in this exercise analyze the data on two criteria. You can continue to add up to 127 criteria on which data can be evaluated.

Because the order of arguments is different in SUMIF and SUMIFS, if you want to copy and edit these similar functions, be sure to put the arguments in the correct order (first, second, third, and so on).

### Using COUNTIF

In a conditional formula, the COUNTIF function counts the number of cells in a given range that meet a specific condition. The syntax for the COUNTIF function is COUNTIF(Range, Criteria). The Range is the range of cells to be counted by the formula, and the Criteria are the conditions that must be met in order for the cells to be counted. The condition can be a number, expression, or text entry. In this exercise, you practice using the COUNTIF function twice to calculate values of homes sold and listed  $\geq 200,000$ . The ranges you specify in these COUNTIF formulas are prices of homes. The criterion selects only those homes that are \$200,000 or more.

### STEP BY STEP

### Use the COUNTIF Function



#### Another Way

You can also choose Insert Function and Search for the function by

**CERTIFICATION READY?** 4.3.3

How do you create a formula that counts the number of cells within a range that meets a criterion?

GET READY. USE the workbook from the previous exercise.

- Select **C24**. In the Function Library group, click **More Functions**, select **Statistical**, and click **COUNTIF**.
- In the Function Arguments dialog box, in the Range box, select cells **B5:B16**.
- In the Criteria box, type  **$\geq 200000$**  and press **Tab**. Preview the result and click **OK**. You set your criteria of values greater than or equal to \$200,000. Excel returns a value of 9.
- Select **C25** and in the Function Library group, click **Recently Used**.
- Select **COUNTIF**. In the Functions Arguments box, in the Range box, select cells **C5:C16**.
- In the Criteria box, type  **$\geq 200000$**  and press **Tab**. Preview the result and click **OK**. Excel returns a value of 7 when the formula is applied to the cell.

7. SAVE the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

### Using COUNTIFS

The COUNTIFS formula counts the number of cells within a range that meet multiple criteria. The syntax is COUNTIFS(Criteria\_range1, Criteria1, Criteria\_range2, Criteria2, and so on). You can create up to 127 ranges and criteria. In this exercise, you perform calculations based on multiple criteria for the COUNTIFS formula.

## STEP BY STEP Use the COUNTIFS Function

GET READY. USE the workbook from the previous exercise.

1. Select **C26**. In the Function Library group, click **Insert Function**.
2. In the Search for a function box, type **COUNTIFS** and then click **Go**. COUNTIFS is highlighted in the Select a function box.
3. Click **OK** to accept the function and close the dialog box.
4. In the Function Arguments dialog box, in the Criteria\_range1 box, type **F5:F16**. You selected your first range for calculation.
5. In the Criteria1 box, type **>=60** and press **Tab**. The descriptions and tips for each argument box in the Function Arguments dialog box are replaced with the value when you navigate to the next argument box (see Figure 10-5). The formula result is also displayed, enabling you to review and make corrections if an error message occurs or an unexpected result is returned. You now set your first criterion. Excel shows the calculation up to this step as a value of 8.



#### Another Way

In previous examples, you collapse the dialog box and select the range, select the range without collapsing the dialog box, and you can also type the range as in this example.

Figure 10-5

Arguments and results for COUNTIFS formula

Agent	List Price	Sale Price	Difference	Percentage Difference	Days on Market
Richard Carey	\$ 290,000	\$ 275,000	\$ 15,000	5.2%	60
David Ortiz	\$ 129,000	\$ 125,000	\$ 4,000	3.1%	75
Kim Akers	\$ 225,000	\$ 209,000	\$ 16,000	7.1%	25
Nicole Carson	\$ 259,500	\$ 258,000	\$ 1,500	0.6%	39
Ryan Calafato	\$ 155,000	\$ 145,700	\$ 9,300	6.0%	75
David Ortiz	\$ 200,000	\$ 189,500	\$ 10,500	5.3%	45
Richard Carey	\$ 375,000	\$ 359,500	\$ 15,500	4.1%	90
Ryan Calafato	\$ 180,000	\$ 175,000	\$ 5,000	2.8%	45
Ryan Calafato	\$ 260,000	\$ 250,000	\$ 10,000	3.8%	65
Nicole Carson	\$ 200,000	\$ 195,400	\$ 4,400	2.2%	76
David Ortiz	\$ 205,000	\$ 200,000	\$ 5,000	2.4%	80
Kim Akers	\$ 315,000	\$ 305,600	\$ 9,400	3.0%	90
<b>Total Sales</b>	<b>\$ 2,793,500</b>	<b>\$ 2,487,700</b>	<b>\$ 105,600</b>		

Criteria	Result
Sum of sales over \$200,000	\$ 1,657,100
Sum of properties that sold for a percentage difference of less than 3%	\$ 1,134,200
Sum of properties listed 60 days or less valued at more than \$200,000	\$ 742,000
Sum of properties sold within 60 days for a percentage difference of less than 3%	\$ 433,000
Number of properties listed for \$200,000 or more	9
Number of properties sold for \$200,000 or more	7
Number of properties listed 60 days or more and list price reduced by 5% or more	8
Average list price	
Average days on market for properties	

Preview formula result. Watch this change as each criterion is added.

6. In the Criteria\_range2 box, select cells **E5:E16**. You selected your second range to be calculated.
7. In the Criteria2 box, type **>=5%** and press **Tab** to preview. Click **OK**. Excel returns a value of 2.
8. **SAVE** the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

A cell in the range you identify in the Function Arguments dialog box is counted only if all of the corresponding criteria you specified are TRUE for that cell. If a criterion refers to an empty cell, COUNTIFS treats it as a 0 value.

**Take Note** When you create formulas, you can use the wildcard characters, question mark (?) and asterisk (\*), in your criteria. A question mark matches any single character; an asterisk matches any sequence of characters. If you want to find an actual question mark or asterisk, type a grave accent (`) preceding the character. You apply this technique later in the lesson.

### Using AVERAGEIF

The AVERAGEIF formula returns the arithmetic mean of all the cells in a range that meet a given criteria. The syntax is similar to SUMIF and is AVERAGEIF(Range, Criteria, Average\_range). In the AVERAGEIF syntax, Range is the set of cells you want to average. For example, in this exercise, you use the AVERAGEIF function to calculate the average number of days that properties valued at \$200,000 or more were on the market before they were sold. The range in this formula is B5:B16 (cells that contain the listed value of the homes that were sold). The criterion is the condition against which you want the cells to be evaluated, that is, >=200000. Average\_range is the actual set of cells to average—the number of days each home was on the market before it was sold. As in the SUMIF formula, the last argument, Average\_range, is optional if the range contains the cells that both match the criteria and are used for the average. In this exercise, you first find the average of all cells in a range and then find a conditional average.

## STEP BY STEP

### Use the AVERAGEIF Function

GET READY. USE the workbook from the previous exercise.

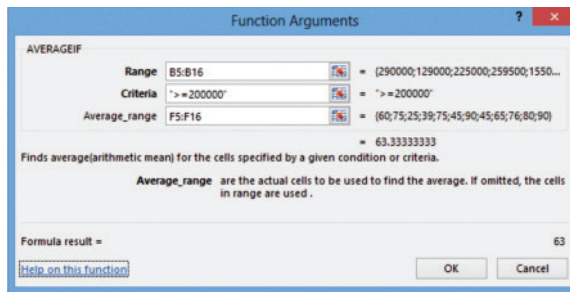
1. Select **C27** and in the Function Library group, click **More Functions**. Select **Statistical** and click **AVERAGE**.
2. In the Number1 box, type **B5:B16** and click **OK**. A mathematical average for this range is returned.
3. Select **C28** and in the Function Library group, click **Insert Function**.
4. Select **AVERAGEIF** from the function list or use the function search box to locate and accept the AVERAGEIF function. The Function Arguments dialog box opens.
5. In the Function Arguments dialog box, in the Range box, select cells **B5:B16**.
6. In the Criteria box, type **>=200000**.
7. In the Average\_range box, select **F5:F16** and press **Tab** to preview the formula. In the preview, Excel returns a value of 63.33 (see Figure 10-6).

#### CERTIFICATION READY? 4.3.2

How do you create a formula that averages the number of cells within a range that meets a criterion?

Figure 10-6

Results for AVERAGEIF formula



8. Click **OK** to close the dialog box.
9. **SAVE** the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

## Using AVERAGEIFS

An AVERAGEIFS formula returns the average (arithmetic mean) of all cells that meet multiple criteria. The syntax is AVERAGEIFS(Average\_range, Criteria\_range1, Criteria1, Criteria\_range2, Criteria2, and so on). You learn to apply the AVERAGEIFS formula in the following exercise to find the average of a set of numbers where two criteria are met.

### STEP BY STEP

#### Use the AVERAGEIFS Function

GET READY. USE the workbook from the previous exercise.

1. Click cell **C29**. In the Function Library group, click **Insert Function**.
2. Type **AVERAGEIFS** in the Search for a function box and click **Go**. AVERAGEIFS is highlighted in the Select a function box.
3. Click **OK** to accept the function and close the dialog box.
4. In the Function Arguments dialog box, in the Average\_range box, select cells **F5:F16**. Press **Tab**.
5. In the Criteria\_range1 box, select cells **B5:B16** and press **Tab**. You selected your first criteria range.
6. In the Criteria1 box, type **<200000**. You set your first criteria.
7. In the Criteria\_range2 box, select cells **E5:E16** and press **Tab**. You have selected your second criteria range.
8. In the Criteria2 box, type **<=5%** and press **Tab**. Click **OK**. Excel returns a value of 60.
9. **SAVE** the *10 Fabrikam Sales Solution* workbook, and then close it.

PAUSE. LEAVE Excel open for the next exercise.

You entered only two criteria for the SUMIFS, COUNTIFS, and AVERAGEIFS formulas you created in the previous exercises. However, in large worksheets, you often need to use multiple criteria in order for the formula to return a value that is meaningful for your analysis. You can enter up to 127 conditions that data must match in order for a cell to be included in the conditional summary that results from a SUMIFS, COUNTIFS, or AVERAGEIFS formula.

The following statements summarize how values are treated when you enter an AVERAGEIF or AVERAGEIFS formula:

- If Average\_range is omitted from the function arguments, the range is used.
- If a cell in Average\_range is an empty cell, AVERAGEIF ignores it.
- If the entire range is blank or contains text values, AVERAGEIF returns the #DIV/0! error value.
- If no cells in the range meet the criteria, AVERAGEIF returns the #DIV/0! error value.

## USING FORMULAS TO LOOK UP DATA IN A WORKBOOK

### Bottom Line

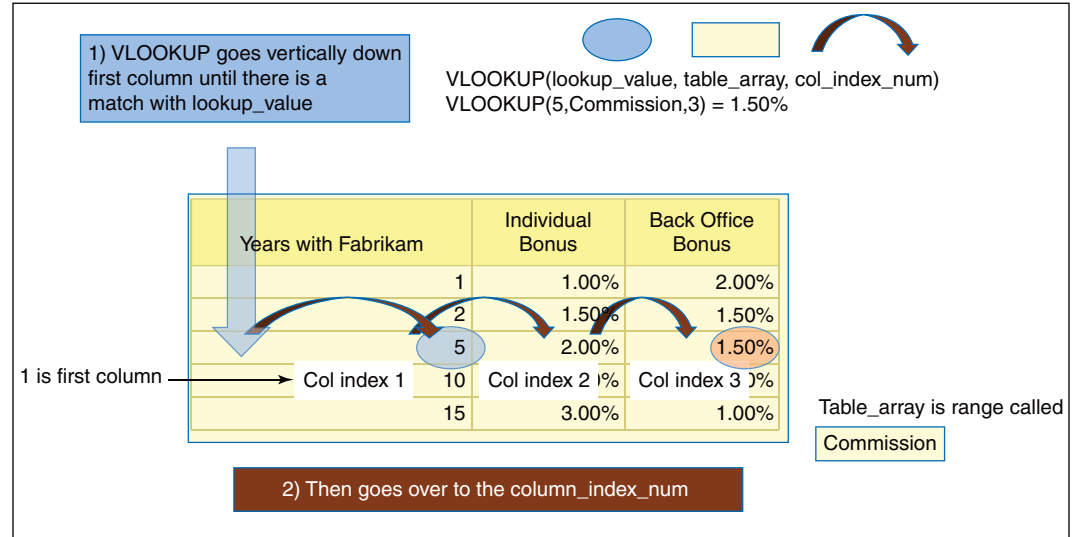
When worksheets contain long and sometimes cumbersome lists of data, you need a way to quickly find specific information within these lists. This is where Excel's lookup functions come in handy. **Lookup functions** are an efficient way to search for and insert a value in a cell when the desired value is stored elsewhere in the worksheet or even in a different workbook. VLOOKUP and HLOOKUP are the two lookup formulas that you use in this section. These functions can return the contents of the found cell. As you work through the following exercises, note that the term **table** refers to a range of cells in a worksheet that can be used by a lookup function.

### Using VLOOKUP

The "V" in VLOOKUP stands for vertical. This formula is used when the comparison value is in the first column of a table. Excel goes down the first column until a match is found and then looks in one of the columns to the right to find the value in the same row. The VLOOKUP function syntax is `VLOOKUP(lookup_value, Table_array, Col_index_num, Range_lookup)`. See Figure 10-7 for a graphical explanation of the function.

**Figure 10-7**

Vertical lookup (VLOOKUP)



Table\_array is a table of text, numbers, or values that you use for the formula. It can either be a range of cells (A1:D5) or a range name (Commission). The data in a **table array** must be arranged in rows and columns. In the next exercise, you apply this formula to calculate employee bonuses. When working with VLOOKUP functions and arguments, there are several key points to keep in mind:

- If `Lookup_value` is smaller than the smallest value in the first column of `Table_array`, `VLOOKUP` returns the #N/A error value.
- `Table_array` values can be text, numbers, or logical values. Uppercase and lowercase text is equivalent.
- The values in the first column of the `Table_array` selection must be placed in ascending sort order; otherwise, `VLOOKUP` might not give the correct value. The lookup table you use in this exercise lists years of service in ascending order.
- `Range_lookup` is an optional fourth argument not shown in Figure 10-7.
- If the `Range_lookup` argument is `True` or omitted, an exact or approximate match is returned. If `VLOOKUP` cannot find an exact match, it returns the next largest value that is less than the value you specified in `Lookup_value`.
- If `Range_lookup` is `False`, `VLOOKUP` finds only an exact match. If an exact match is not found, the error value #N/A is returned.

**Take Note** Range names or cell references used in `VLOOKUP` or `HLOOKUP` are not case sensitive, so you can type them in uppercase, lowercase, or any combination of uppercase and lowercase characters. Also, the `VLOOKUP` and `HLOOKUP` function names are not case sensitive.

## STEP BY STEP

### Use the VLOOKUP Function



GET READY. LAUNCH Excel if it is not already open.

1. OPEN the **10 Fabrikam Bonus** file for this lesson.
2. With the Performance sheet active, select cells **A15:C20** in the worksheet. Click the **FORMULAS** tab, and in the Defined Names group, click **Define Name**. The New Name dialog box opens.
3. In the New Name dialog box, in the Name box, type **Bonus**. Click **OK** to close the dialog box. You defined the range name.
4. Click cell **E5**, in the Function Library group, click **Lookup & Reference**, and select **VLOOKUP**.
5. In the `Lookup_value` text box, type **B5** and press **Tab**. The insertion point moves to the `Table_array` box.
6. In the `Table_array` box, click the **Collapse Dialog** button. In the Defined Names group, click **Use in Formula** and select **Bonus**. Press **Enter** and **Tab**. The insertion point moves to the next text box.
7. In the `Col_index_num` box, type **2**, which is the column containing the individual bonus amounts. Press **Tab**.
8. In the `Range_lookup` box, type **True**, which means that `VLOOKUP` can check for the nearest value that does not go over the number in the first column; the same bonus is paid for a range of years, so you enter **True** in the `Range_lookup` box so that a value will be returned for all agents. The Function Arguments dialog box should look similar to the one shown in Figure 10-8. Click **OK**. Excel returns a value of 2.5%.

Figure 10-8

VLOOKUP Function Arguments dialog box

Look in Table array called Bonus

The screenshot shows the VLOOKUP function arguments dialog box in Excel. The dialog box is titled "Function Arguments" and contains the following fields:

- Lookup\_value: B5
- Table\_array: Bonus
- Col\_index\_num: 2
- Range\_lookup: True

The formula result is 0.025. The dialog box also includes a "Help on this function" link and "OK" and "Cancel" buttons.

Find in column number 2 value is in same row as 10 (closest without going over 12). Answer is 0.025 or 2.5%.

Lookup\_value is B5 (which is 12)

9. Using the fill handle in cell E5, copy the formula to the range E6:E11. This calculates bonus rates for the other sales agents. The #N/A error message appears in cell E11 because a value is not available for agents who have been employed for less than one year. (Agents become eligible for a bonus only after a full year of service.) You change this error message in another exercise.
10. Click in cell F5 and type =VLOOKUP(B5,Bonus,3). Notice that the ScreenTip gives you information and help as you go. This looks up values in the third column of the Bonus range. Press Enter.
11. Copy the formula from F5 to the range F6:F11.
12. SAVE the workbook as **10 Fabrikam Bonus Solution**.

PAUSE. LEAVE the workbook open for the next exercise.

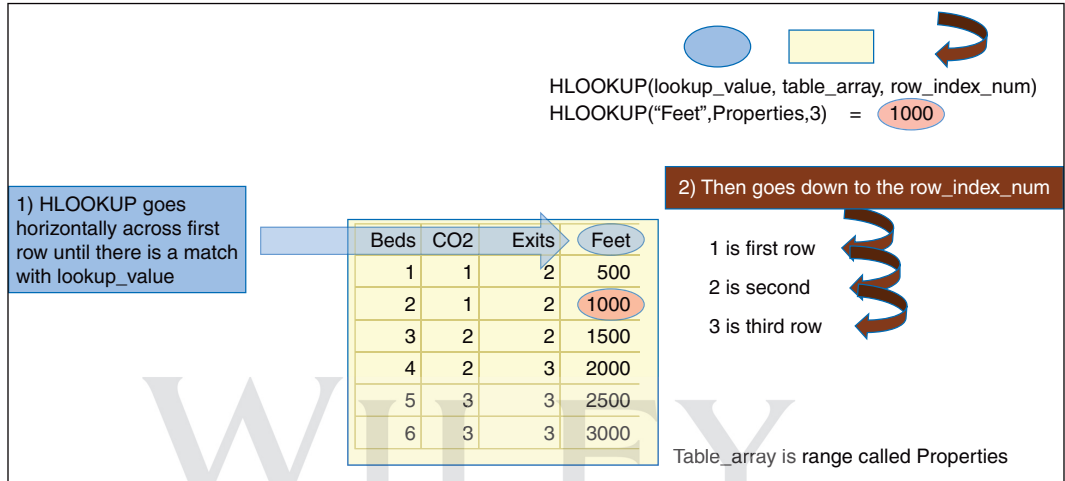
**Take Note** Entering True in the Range\_lookup box returns the closest value. False returns only an exact value. If you leave the Range\_lookup box empty as it is in Step 10 in the previous exercise, Excel enters True when you click OK.

### Using HLOOKUP

The “H” in HLOOKUP stands for horizontal. HLOOKUP searches horizontally for a value in the top row of a table or an array and then returns a value in the same column from a row you specify in the table or array. Use HLOOKUP when the comparison values are located in a row across the top of a table of data and you want to look in a specified row (see Figure 10-9). In the following exercise, you use an HLOOKUP formula to search standards for a house.

**Figure 10-9**

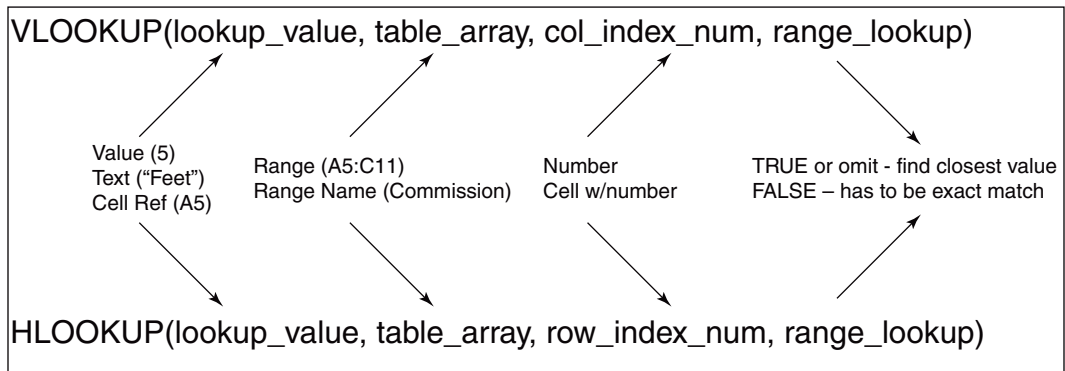
Horizontal lookup (HLOOKUP)



HLOOKUP and VLOOKUP are similar in format. Figure 10-10 and Table 10-3 compare the syntax of the two functions.

**Figure 10-10**

Comparing VLOOKUP and HLOOKUP





**Table 10-3**

Function Syntax for VLOOKUP and HLOOKUP

Argument	Notes
Lookup_value	The value to be found in the first column or row; this can be a constant value, a text value enclosed in quotation marks, or the address or name of a cell that contains a numeric or text constant.
Table_array	Two or more columns of data. Use a reference to a range or a range name. The values in the first column of Table_array are the values searched by Lookup_value in VLOOKUP. The values in the first row are values searched by Lookup_value in HLOOKUP.
Col_index_num	The numeric position of the column that is to be searched for by VLOOKUP. The column number in Table_array from which the matching value must be returned. A Col_index_num of 1 returns the value in the first column in Table_array; a Col_index_num of 2 returns the value in the second column in Table_array, and so on.
Row_index_num	The numeric position of the row that is to be searched for by HLOOKUP.
Range_lookup	A logical value that specifies whether it is ready for VLOOKUP or HLOOKUP to find an approximate match. If the function is to return the nearest value, even when there is no match, this value should be set to True; if an exact match is required, this value should be set to False; if this argument is not included, the function assumes the value to be True.

**STEP BY STEP****Use the HLOOKUP Function**

GET READY. USE the workbook from the previous exercise.

1. Click on the **Standards** worksheet tab to move to the Standards worksheet.
2. Click cell **F11**, and in the Function Library group, click **Lookup & Reference**, and select **HLOOKUP**.
3. In the Lookup\_value text box, type **E11**. This is the cell you will change and the box previews to Feet because that is what is currently typed in cell E11.
4. In the Table\_array text box, type **A1:D7**. This will be the range of cells you will look in.
5. In the Row\_index\_num, type **D11+1**. This currently evaluates to 3. If you just do the number of beds that is in D11, you don't come down enough rows because of the labels in the first row of the Table\_array. The number of beds is actually one row more than the number of beds because the labels (Beds, CO2, Exits, and Feet) count as the first row and row 2 is for 1 bed.
6. In Range\_lookup, type **FALSE** because you want an exact match. The screen should look like Figure 10-11. Click **OK**. In the following steps, you will change the values in D11 and D11 and see what happens when there are different values and when there is not an exact match.

Figure 10-11

## HLOOKUP Function Arguments

Go to column headed by Feet and count down starting with the first row and you get 1000.

The screenshot shows an Excel spreadsheet with the following data:

Beds	CO2	Exits	Feet
1	1	2	300
2	1	2	1000
3	2	2	1500
4	2	3	2000
5	3	3	2500
6	3	3	3000

The HLOOKUP function arguments dialog box is shown with the following values:

- Lookup\_value: E11 (Feet)
- Table\_array: A1:D7
- Row\_index\_num: D11+1 (3)
- Range\_lookup: FALSE

The formula result is 1500.

Notice that E11 shows as "Feet."

D11+1 currently shows as 3.

The current value of the lookup function is 1000.

- In cell D11, type 5 and notice that the result in F11 changes to 2500.
- In cell E11, type CO2 and notice that the result changes to the result for the CO2 column for 5 beds, which is 4.
- Click cell D11, and then type 7. Notice that you get a #REF! error because the table goes up to five beds.
- In cell D11, type 1. Cell F11 displays a result of 1.
- SAVE the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

It might be difficult to remember the syntax for an HLOOKUP or VLOOKUP function. You can always use the Function Arguments dialog box to help you remember the order of the arguments for any and all formulas. When you click in each field, review the tips that appear on the right side of each box, as well as the explanation below the argument boxes that tells the purpose of each argument in the formula.

## ADDING CONDITIONAL LOGIC FUNCTIONS TO FORMULAS

### Bottom Line

You can use the AND, OR, and NOT functions to create **conditional formulas** that result in a logical value, that is, True or False. Such formulas test whether a series of conditions evaluate to true or false. In addition, you can use the IF conditional formula that checks if a calculation evaluates as true or false. You can then tell IF to return one value (text, number, or logical value) if the calculation is true or a different value if it is false.

## Using IF

The result of a conditional formula is determined by the state of a specific condition or the answer to a logical question. An IF function sets up a conditional statement to test data. An IF formula returns one value if the condition you specify is true and another value if it is false. The IF function requires the following syntax: IF(Logical\_test, Value\_if\_true, Value\_if\_false). In this exercise, you use an IF function to determine who achieved his goal and is eligible for the performance bonus.

### STEP BY STEP

### Use the IF Function

GET READY. USE the workbook from the previous exercise.

1. Click the **Performance** worksheet tab to make it the active worksheet.
2. Click cell **G5**. In the Function Library group, click **Logical** and click **IF**. The Function Arguments dialog box opens.
3. In the Logical\_test box, type **D5>=C5**. This component of the formula determines whether the agent has met his or her sales goal.
4. In the Value\_if\_true box, type **Yes**. This is the value returned if the agent met his or her goal.
5. In the Value\_if\_false box, type **No** and click **OK**.
6. With G5 still selected, use the fill handle to copy the formula to **G6:G12**. Excel returns the result that three agents earned the performance award by displaying Yes in the cells (see Figure 10-12).

**Figure 10-12**

Using the IF function

Agent	Years with Fabrikam	Sales Goal*	Actual Sales	Individual Bonus Rate	Back Office Bonus Rate	Goal Achieved	Agent Bonus	Back Office Bonus	Inc in Back Office
Carey, Richard	12	\$ 3,375,000	\$ 3,200,000	2.50%	1.00%	No			
Ortiz, David	12	\$ 3,375,000	\$ 3,500,000	2.50%	1.00%	Yes			
Calafato, Ryan	10	\$ 2,875,000	\$ 2,700,000	2.50%	1.00%	No			
Akers, Kim	5	\$ 2,500,000	\$ 2,600,000	2.00%	1.50%	Yes			
Carson, Nicole	4	\$ 1,500,000	\$ 1,224,000	1.50%	1.50%	No			
Moschell, Linda	1	\$ 800,000	\$ 925,000	1.00%	2.00%	Yes			
Nash, Michael	0.5	\$ 300,000	\$ 220,000	#N/A	#N/A	No			
<b>Totals</b>		<b>\$ 14,725,000</b>	<b>\$ 14,369,000</b>			<b>No</b>			

The IF formula in the Formula bar

**Take Note** The entire company is evaluated on making the goal, and bonuses are awarded to the back office staff if the company goal is met. The result in G12 is used for the formulas in column I. When you copy, the formatting is included.

7. Click the **Auto Fill Options** button in the bottom right corner of the range and choose **Fill Without Formatting**.
8. In cell H5, type **=IF(G5="Yes",E5\*D5,0)**. Before you complete the formula, notice the ScreenTip, the cells selected, and the colors (see Figure 10-13). Move the mouse pointer to each of the arguments and they become a hyperlink. E5 is the individual bonus rate and D5 is the actual sales. The bonus is the rate times the sales.

**Figure 10-13**

Help items as you type a formula

**E5 in formula and outline of cell in red**

Performance Bonus						
Actual Sales	Individual Bonus Rate	Back Office Bonus Rate	Goal Achieved	Agent Bonus	Back Office Bonus	Inc In Back Office
\$ 3,200,000	2.50%	1.00%	No	=IF(G5="Yes",F5*D5,0)		
\$ 3,500,000	2.50%	1.00%	Yes	=IF(logical_test,value_if_true,value_if_false)		
\$ 2,700,000	2.50%	1.00%	No			
\$ 2,600,000	2.00%	1.50%	Yes			
\$ 1,224,000	1.50%	1.50%	No			
\$ 925,000	1.80%	2.00%	Yes			
\$ 220,000	#N/A	#N/A	No			
\$14,369,000						

**D5 in formula and outline of cell in violet**

**G5 in formula in blue as well as outline around cell G5**

Mouse pointer highlights each argument in ScreenTip. Click on highlight to move to argument in formula.

9. Press **Enter** to finish the formula.

**Take Note**

In some cases, Excel completes the formula. In Step 8, the closing parenthesis was not added, and Excel was able to complete the formula.

10. Use the fill handle in H5 to copy the formula from to **H6:H11**.

11. In I5, type **=IF(\$G\$12="Yes",F5\*D5,0)**, and then press **Enter**.



**Cross Ref**

Remember that dollar signs before the column and row indicate an absolute reference. When you copy the formula, \$G\$12 remains the same in every cell.

12. Use the fill handle in I5 to copy the formula from to **I6:I11**. Notice that Richard Carey, the Senior Partner, did not receive an Agent Bonus and there was no bonus for Back Office.

13. The final pending sale of \$700,000 of the year came through. In D5, type **\$3,900,000**. Notice that H5 and the amounts in column I go from 0 to bonuses (see Figure 10-14).

**Figure 10-14**

Bonuses change by adding sales to D5.

Agent	Years with Fabrikam	Sales Goal*	Actual Sales	Individual Bonus Rate	Back Office Bonus Rate	Goal Achieved	Agent Bonus	Back Office Bonus	Inc In Back Office
Carey, Richard	12	\$ 3,375,000	\$ 3,900,000	2.50%	1.00%	Yes	\$ 97,500	\$ 39,000	
Ortiz, David	12	\$ 3,375,000	\$ 3,500,000	2.50%	1.00%	Yes	\$ 87,500	\$ 35,000	
Calafato, Ryan	10	\$ 2,875,000	\$ 2,700,000	2.50%	1.00%	No	\$ -	\$ 27,000	
Akers, Kim	5	\$ 2,500,000	\$ 2,600,000	2.00%	1.50%	Yes	\$ 52,000	\$ 39,000	
Carson, Nicole	4	\$ 1,500,000	\$ 1,224,000	1.50%	1.50%	No	\$ -	\$ 18,360	
Moschell, Linda	1	\$ 800,000	\$ 925,000	1.00%	2.00%	Yes	\$ 9,250	\$ 18,500	
Nash, Michael	0.5	\$ 300,000	\$ 220,000	#N/A	#N/A	No	\$ -	#N/A	
<b>Totals</b>		<b>\$ 14,725,000</b>	<b>\$15,069,000</b>			<b>Yes</b>	<b>\$ 246,250</b>	<b>#N/A</b>	

Years with Fabrikam	Individual Bonus	Back Office Bonus
1	1.00%	2.50%
2	1.50%	2.50%
5	2.00%	1.50%
10	2.50%	1.00%
15	3.00%	1.00%

**Now Actual Sales > Sales Goal**

**\$3,900,000 in D5 changes total in D12.**

**G12 now is Yes.**

14. **SAVE** the workbook.

**PAUSE.** LEAVE the workbook open for the next exercise.

**Using AND**

The AND function returns True if all its arguments are true, and False if one or more arguments are false. The Syntax is AND(Logical1, Logical2, and so on). In this exercise, you use the AND function to determine whether Fabrikam's total annual sales met the strategic goal and whether the sales goal exceeded the previous year's sales by 5 percent.

## STEP BY STEP

## Use the AND Function

**Another Way**

Because you type only one condition in this formula, another option is to type  $=B3<=B16$  directly in the cell without the AND function.

GET READY. USE the workbook from the previous exercise.

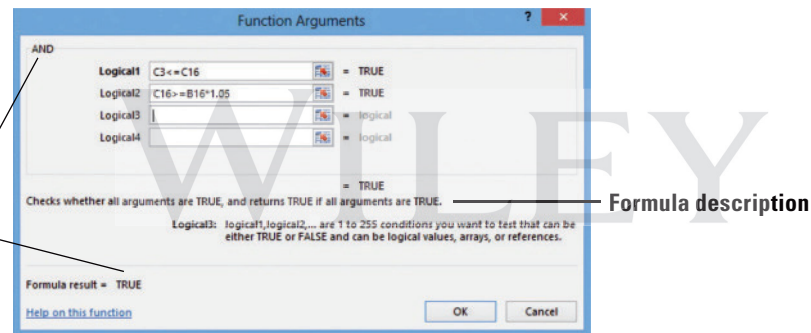
1. Click the **Annual Sales** worksheet tab. Click the **FORMULAS** tab if necessary.
2. Click cell **B6**. In the Function Library group, click **Logical** and click the **AND** option. The Function Arguments dialog box opens with the insertion point in the Logical1 box.
3. Click cell **B3**, type  $<=$ , select cell **B16**, and press **Enter**. This argument represents the first condition: Did actual sales equal or exceed the sales goal? Because this is the first year, only one logical test is entered.
4. Select cell **C6**, click the **Recently Used** button, and click **AND**. In the Logical1 box, type  $C3<=C16$ . This is the same as the condition in Step 3 (sales exceed or equals sales goal).
5. In the Logical2 box, type  $C16>=B16*1.05$  and press **Tab**. The preview of the formula returns True, which means that both conditions in the formula have been met. The AND function arguments are illustrated in Figure 10-15.

Figure 10-15

AND function arguments

AND condition

Result to be returned



Formula description

6. Click **OK** to complete the formula.
7. Select cell **C6** and copy the formula to **D6:F6** (see Figure 10-16).

Figure 10-16

The completed Annual Sales worksheet

	A	B	C	D	E	F
1		Fabrikam, Inc.				
2		Year 1	Year 2	Year 3	Year 4	Year 4
3	Sales Goal	\$10,000,000	\$12,000,000	\$13,200,000	\$14,400,000	\$14,400,000
4						
5	Sales Met: Sales					
6	Increased by 5%	TRUE	TRUE	FALSE	TRUE	FALSE
7						
8	Agent	Year 1	Year 2	Year 3	Year 4	Year 4
9	Carey, Richard	\$ 2,855,000	\$ 2,900,000	\$ 3,075,000	\$ 3,350,000	\$ 3,425,000
10	Ortiz, David	\$ 2,855,000	\$ 3,000,000	\$ 3,000,000	\$ 3,100,000	\$ 3,500,000
11	Calafato, Ryan	\$ 2,250,000	\$ 2,000,000	\$ 2,500,000	\$ 2,500,000	\$ 2,700,000
12	Akers, Kim	\$ 1,750,000	\$ 1,899,000	\$ 2,000,000	\$ 2,600,000	\$ 2,600,000
13	Carson, Nicole	\$ 1,290,000	\$ 1,400,000	\$ 1,325,000	\$ 1,450,000	\$ 1,224,000
14	Moschell, Linda		\$ 900,000	\$ 900,000	\$ 1,250,000	\$ 925,000
15	Nash, Michael				\$ 200,000	\$ 220,000
16	Totals	\$ 11,000,000	\$ 12,099,000	\$ 12,800,000	\$ 14,450,000	\$ 14,594,000
17						

Completed AND formula in C6

8. SAVE the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

Again, the AND function returns a True result only when both conditions in the formula are met. For example, consider the results you achieved in the preceding exercise. Sales in the second year exceeded sales for the previous year; therefore, the first condition is met. Year 2 sales also exceeded Year 1 sales by 5 percent. Because both conditions are met, the formula returns a True result.

Now consider the arguments for the logical tests for Year 3 (the formula in D6). Sales did not exceed the sales goal; therefore, the first argument returns a False value. However, sales did exceed the previous year's sales by 5 percent. When only one condition is met, the formula returns False.

## Using OR

Although all arguments in an AND function have to be True for the function to return a True value, only one of the arguments in the OR function has to be True for the function to return a True value. The syntax for an OR formula is similar to that for an AND formula. With this formula, the arguments must evaluate to logical values such as True or False or references that contain logical values. In this exercise, you create a formula that evaluates whether sales agents are eligible for the back office bonus when they are new or when they did not get the sales bonus (less than 4 years with the company or did not get the agent bonus). The OR formula returns True if either of the conditions are True.

### STEP BY STEP

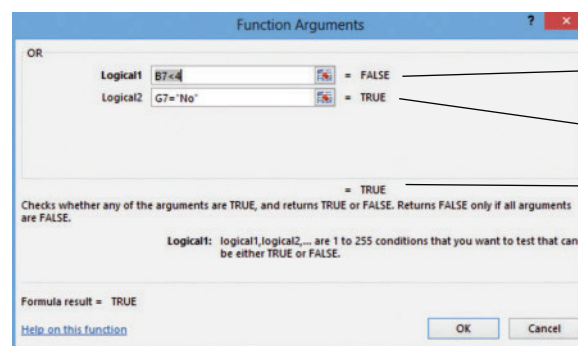
### Use the OR Function

GET READY. USE the workbook from the previous exercise.

1. Click on the **Performance** worksheet tab to activate this worksheet. Select **J5** and in the Function Library group, click **Logical**.
2. Click **OR**. The Function Arguments dialog box opens. You create a formula that answers the following question: Has Carey worked with the company for less than 4 years?
3. In the Logical1 box, type **B5<4** and press **Tab**.
4. In the Logical2 box, type **G5="No"** and press **Tab**. This argument answers the second question: Did Carey not achieve the sales goal? Each of the arguments evaluates to false and so the entire function evaluates to false.
5. Click **OK** to close the dialog box.
6. Select cell **J5** and copy the formula to **J6** through **J11**.
7. Cell **J7** is the first in the column that returns a True value. To see each of the arguments, click cell **J7** and then click the **Insert Function** button and you return to the Function Arguments dialog box (see Figure 10-17).

**Figure 10-17**

OR Function Arguments



Logical1 (B7<4) evaluates to False,

Logical2 (G7="No") evaluates to True.

So entire function evaluates to True.

8. Click **OK** to close the dialog box and return to the workbook.
9. **SAVE** the workbook.

**Take Note** As you add arguments, the Logical fields in the Function Arguments dialog box expand to allow you to enter multiple arguments.

PAUSE. LEAVE the workbook open for the next exercise.

## Using NOT

The NOT function reverses the value of its arguments. Use NOT when you want to make sure a value is not equal to one particular value. If the logical value is FALSE, NOT returns TRUE. In the following exercise, you use the NOT function to answer the following question: Do we exclude this agent from the back office bonus?

### STEP BY STEP

#### Use the NOT Function

GET READY. USE the workbook from the previous exercise. The Performance worksheet should still be active.

1. Copy cell **J4** to cell **K4** and edit the label to say **Not In Back Office**.
2. Click cell **K5**. In the Function Library group, click the **Logical** button.
3. Select **NOT** from the list of logical formulas.
4. In the Function Arguments dialog box, type **J5** and press **Enter**.
5. Copy cell **K5** to cells **K6** through **K11**. Notice that the values in K5 through K11 are the opposite of the values in column J.
6. SAVE the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

## Using IFERROR

An error message is returned when a formula does not contain sufficient or valid arguments to return a value. Use the IFERROR function to trap and handle errors in a formula. This function returns a value you specify if a formula evaluates to an error; otherwise, it returns the result of the formula. The syntax is IFERROR(Value, Value\_if\_error). In the IFERROR syntax, Value is the argument that is checked for an error. In the next exercise, you use this formula to determine eligible bonuses.

For this example, you change the functions in the Performance worksheet to no longer show #N/A because of the VLOOKUP function.

### STEP BY STEP

#### Use the IFERROR Function

GET READY. USE the workbook from the previous exercise and make sure the Performance worksheet is active.

1. Select cell **E11** and click to place the insertion point after the = in the formula bar to edit the formula. You add the IFERROR formula to correct the formula error that gave the #N/A result in a previous exercise.
2. Type **IFERROR(** before VLOOKUP. Leave the existing formula intact. Press **End** to take you to the end of the formula.

**Take Note** Notice that we write function names such as IFERROR and VLOOKUP in all uppercase. These names are not case sensitive, but Microsoft always writes them in uppercase in the function lists and Help system because doing so makes reading functions much easier. Thus, it is best to get in the habit of using function names in uppercase.

3. At the end of the original formula, type **,0**. As shown in Figure 10-18, the complete formula is =IFERROR(VLOOKUP(B11,Bonus,2,True),0). Be sure to include the closing parenthesis and the preceding comma or Excel returns an error that the formula is incorrect.

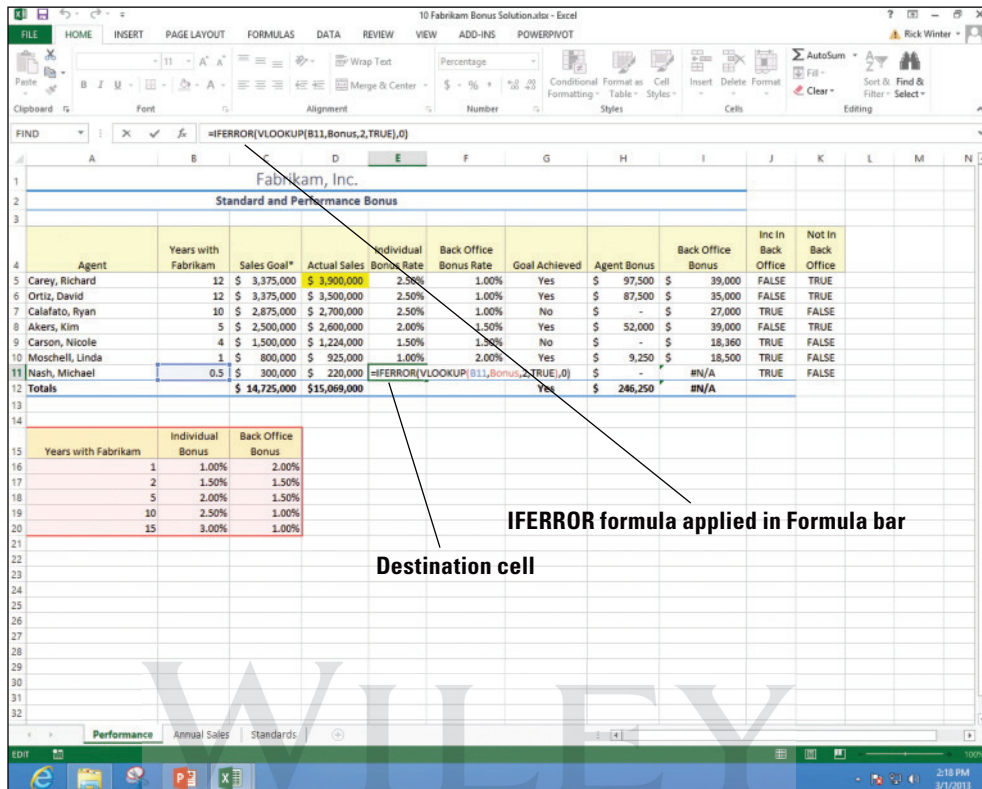


### Troubleshooting

When you start creating more complex formulas including functions within other functions, ensure that you use the same number of open parentheses as close parentheses.

Figure 10-18

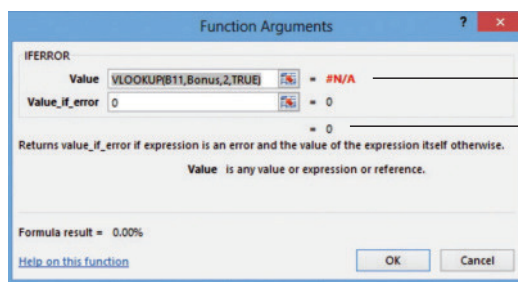
Editing a formula to enter 0 when an error occurs



- Press **Enter**. The #N/A error message is replaced by 0. If you select cell **E11** and click the **Insert Function** button next to the formula bar, the original VLOOKUP formula appears in the Value box (first argument) in the IFERROR formula. As illustrated in Figure 10-19, that argument returned a #N/A error. The Value\_if\_error box contains the 0 that replaces the error message.

Figure 10-19

IFERROR function arguments



Value returns #N/A.

However if there is an error, result is 0

- Click cell **F11** and edit the formula to include the IFERROR function **=IFERROR(VLOOKUP(B11,Bonus,3),0)**.
- Copy the formulas in **E11:F11** to **E5** through **F10**. The workbook doesn't look like it changes, but you should verify that this worked by changing B6 to 0 (as shown in Figure 10-20).



Figure 10-20

Test of worksheet

Agent	Years with Fabrikam	Sales Goal*	Actual Sales	Individual Bonus Rate	Back Office Bonus Rate	Goal Achieved	Agent Bonus	Back Office Bonus	Inc in Back Office	Not in Back Office
Carey, Richard	12	\$ 3,375,000	\$ 3,900,000	2.50%	1.00%	Yes	\$ 97,500	\$ 39,000	FALSE	TRUE
Ortiz, David	0	\$ 3,375,000	\$ 3,500,000	0.00%	0.00%	Yes	\$ -	\$ -	TRUE	FALSE
Calafato, Ryan	10	\$ 2,875,000	\$ 2,700,000	2.00%	1.00%	No	\$ -	\$ 32,000	TRUE	FALSE
Akers, Kim	8	\$ 2,500,000	\$ 2,600,000	2.00%	1.50%	Yes	\$ 52,000	\$ 39,000	FALSE	TRUE
Carson, Nicole	9	\$ 1,500,000	\$ 1,224,000	1.50%	1.50%	No	\$ -	\$ 18,360	TRUE	FALSE
Moschell, Linda	1	\$ 800,000	\$ 925,000	1.00%	2.00%	Yes	\$ 9,250	\$ 18,500	TRUE	FALSE
Nash, Michael	0.5	\$ 300,000	\$ 220,000	0.00%	0.00%	No	\$ -	\$ -	TRUE	FALSE
<b>Totals</b>		<b>\$ 14,725,000</b>	<b>\$15,069,000</b>			<b>Yes</b>	<b>\$ 158,750</b>	<b>\$ 141,860</b>		

0 typed in B6 changed E6, F6, H6, and I6 to 0

- Click **Undo** to reverse the change to cell B6 and return the worksheet to the proper values.
- SAVE the workbook.

PAUSE. CLOSE the workbook and LEAVE Excel open for the next exercise.

IFERROR recognizes and evaluates the following errors: #N/A, #VALUE!, #REF!, #DIV/0!, #NUM!, #NAME?, or #NULL!. In this exercise, you replace the #N/A error message with 0”.

## USING FORMULAS TO MODIFY TEXT

### Bottom Line

When you get files from other people or programs, you often have to do a significant amount of manipulation of the file. For example, sometimes you receive files in a text format with commas separating what should go in columns. The text is often not in the format that you need to use in Excel. Some text can be combined into one long string or other text can be all in lowercase or uppercase.

You might be familiar with Microsoft Word’s Convert Text command that enables you to change the capitalization of text. Similarly, in Excel, you can use PROPER, UPPER, and LOWER formulas to capitalize the first letter in each word of a text string or to convert all characters to uppercase or lowercase. This section presents you with a text file from the alarm company. There is a lot of useful information in the file, but it is coded for the alarm system rather than for use in a spreadsheet. The company’s president has asked you to keep the file confidential because it contains the codes for each employee, but he has also asked you to use your Excel knowledge to convert the information into a usable format.

### Converting Text to Columns

You can use the Convert Text to Columns Wizard to separate simple cell content, such as first names and last names, into different columns. Depending on how your data is organized, you can split the cell contents based on a delimiter (divider or separator), such as a space or a comma, or based on a specific column break location within your data. In the following exercise, you convert the data in column A to two columns.

**STEP BY STEP** Convert Text to Columns

LAUNCH Excel if necessary.



1. Open the **10 Fabrikam Alarm Codes** workbook. Figure 10-21 shows what the file looks like before you convert the rows to column and Figure 10-22 shows the same data after the conversion.

**Figure 10-21**

10 Fabrikam Alarm Codes original file

	A	B	C	D	E	F	G	H	I
1									
2	425oonp15210,	david,	ortiz,	37291,	IAaksdjbfl;	akjsdfjkafapr,	000000000,	000000000	
3	327sanp49612,	kim,	akers,	39868,	ljksAbdfib;	jkasfmar,	000000000,	000000000	
4	329sap151276,	linda,	moschell,	41301,	colubasdfA	ljkeaug,	000000000,	000000000	
5	330psp047373,	michael,	nash,	41530,	ozixcAuadlbfk	jedec,	000000000,	000000000	
6	328sanp37624,	nicole,	carson,	40241,	lkbbueoAiajdckl	jul,	000000000,	000000000	
7	424oonp77612,	richard,	carey,	37367,	Alajsdfljkasbdf	jan,	000000000,	000000000	
8	426esnp56690,	ryan,	calafato,	38050,	l;Ajdkfalsd;	jkbmay,	000000000,	000000000	
9									

Comma will convert text to columns

File is difficult to read

2. Select cells **A2:A8**. Click the **DATA** tab and in the Data Tools group, click **Text to Columns**.
3. The Convert Text to Columns Wizard opens with Delimited selected as the default, because Excel recognizes that the data in the selected range is separated with commas. Click **Next** to move to the next step in the wizard.
4. Select **Comma** as the delimiter. If other delimiters are checked, deselect them
5. Click **Next**, and then click **Finish**.
6. Data is separated into seven columns. To help identify the columns, type the text in row 1 and increase the column widths so you can see the cell contents (see Figure 10-22).

**Figure 10-22**

Converted text

	A	B	C	D	E	F	G
1	ExtCodeEmpID	SpFirst	SpLast	Hire Date	Alarm	Ocode1	Ocode2
2	425oonp15210	david	ortiz	37291	IAaksdjbfl;	akjsdfjkafapr	000000000
3	327sanp49612	kim	akers	39868	ljksAbdfib;	jkasfmar	000000000
4	329sap151276	linda	moschell	41301	colubasdfA	ljkeaug	000000000
5	330psp047373	michael	nash	41530	ozixcAuadlbfk	jedec	000000000
6	328sanp37624	nicole	carson	40241	lkbbueoAiajdckl	jul	000000000
7	424oonp77612	richard	carey	37367	Alajsdfljkasbdf	jan	000000000
8	426esnp56690	ryan	calafato	38050	l;Ajdkfalsd;	jkbmay	000000000
9							

Type column headers.

Double-click column borders to change column widths to match the widest column entries.



**Another Way**

You can also use text functions such as LEFT, MID, and RIGHT to convert text data from one column to multiple columns.

7. SAVE the workbook as **10 Fabrikam Alarm Codes Solution**.

PAUSE. LEAVE the workbook open for the next exercise.

**USING LEFT**

The LEFT function evaluates a string and takes any number of characters on the left side of the string. The format of the function is LEFT(Text, Num\_chars). The first string in the Alarm Data workbook contains the employee’s phone extension and floor number, which you grab by using the LEFT function.

**STEP BY STEP** Use the LEFT Function

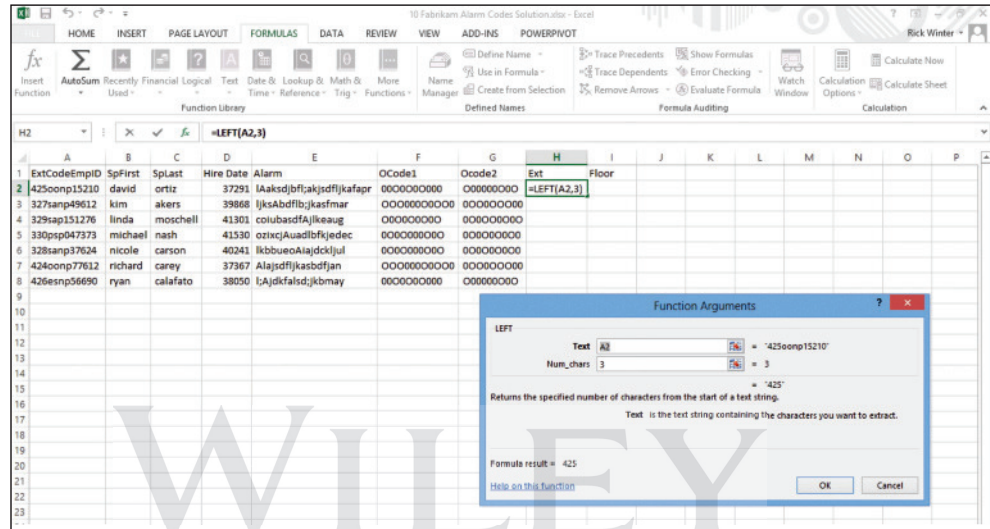
GET READY. USE the workbook from the previous exercise.

1. Click cell **H1**, type **Ext**, and in I1, type **Floor** to label the columns.

2. Select cell **H2**.
3. Click the **FORMULAS** tab. In the Function Library group, click **Text** and choose **LEFT**. The Function Arguments dialog box opens.
4. In the Text box, click **A2** and press **Tab**.
5. In the Num\_chars box, type **3** and press **Tab**. The preview of the result shows 425 (see Figure 10-23).

Figure 10-23

LEFT function arguments



**CERTIFICATION  
READY?** 4.4.1

How do you create a formula that extracts a certain number of characters on the left of a string?

**Take Note**

The result of this exercise on the LEFT function and the following exercises on the RIGHT and MID functions are shown in Figure 10-24.

7. Select cell **I2**, click the **Recently Used** button, and select **LEFT**.
8. In the Text box, type **A2**, press **Tab**, and in the Num\_chars box, type **1**. Click **OK**.
9. Copy the formula in I2 from **I3** to **I8**.
10. **SAVE** the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

**USING RIGHT**

The RIGHT function is almost identical to the LEFT function except that the function returns the number of characters on the right side of the text string. In the Alarm codes file, the first converted column contains the five-digit employee ID at the end, and the Alarm code in column E contains the employee's birth month.

**STEP BY STEP****Use the RIGHT Function**

GET READY. USE the workbook from the previous exercise.

1. Click cell **J1**, and then type **Birthday**. In cell K1, type **EmpID** to label the columns.
2. Select cell **J2**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **RIGHT**. The Function Arguments dialog box opens.
4. In the Text box, click **E2** and press **Tab**.

**CERTIFICATION READY? 4.4.1**

How do you create a formula that extracts a certain number of characters on the right of a string?

5. In the Num\_chars box, type **3** and press **Tab**. The preview of the result shows *apr*.
6. Click **OK** and copy the formula in J2 from **J3** to **J8**.
7. Select cell **K2**, type **=RIGHT(A2,5)**, and press **Enter**.
8. Copy the formula in K2 from **K3** to **K8**.
9. **SAVE** the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

### Using MID

Whereas LEFT and RIGHT return the number of the characters on either side of a text string, MID returns characters in the middle. For this reason, your arguments need to include the Text string and then a starting point (Start\_num) and number of characters (Num\_chars). In the first column of the Alarm file, there are codes indicating two different categories of employees.

**STEP BY STEP**

### Use the Mid Function

GET READY. USE the workbook from the previous exercise.

1. Click cell **L1**, and then type **empcat1**, and in cell M1, type **empcat2** to label the columns.
2. Select cell **L2**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **MID**. The Function Arguments dialog box opens.
4. In the Text box, click **A2** and press **Tab**.
5. The starting point of the empcat1 value is the fourth character of (425oonp15210), so type a **4** in the Start\_num text box.
6. In the Num\_chars box, type **2**. The preview of the result shows *oo*.
7. Click **OK** and copy the formula in L2 from **L3** to **L8**.
8. Select cell **M2**, and type **=MID(A2,6,2)**, and press **Enter**.
9. Copy the formula in M2 from **M3** to **M8**.
10. **SAVE** the workbook. The worksheet should look like Figure 10-24.

**CERTIFICATION READY? 4.4.1**

How do you create a formula that extracts a certain number of characters in the middle of a string?

**Figure 10-24**

Alarm Data workbook after the MID functions are entered and copied

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	ExtCodeEmpID	SpFirst	Splast	Hire Date	Alarm	OCode1	Ocode2	Ext	Floor	Birthday	EmpID	empcat1	empcat2
2	425oonp15210	david	ortiz	37291	!aaksd bfl;akjsdf kafapr	000000000	00000000	425	4	apr	15210	oo	np
3	327tanp49612	kim	akers	39868	!jksAbdfb jka;sfmar	000000000	00000000	327	3	mar	49612	sa	np
4	329tanp151276	linda	moschell	41301	colubasd f jka;eug	000000000	00000000	329	3	aug	51276	sa	p1
5	330psp047373	michael	nash	41530	ozicjAuaad bf jke;dec	000000000	00000000	330	3	dec	47373	ps	p0
6	328tanp37624	nicole	carson	40241	!kbbueoAlajdk jul	000000000	00000000	328	3	jul	37624	sa	np
7	424oonp377612	richard	carey	37367	Alajsd f jka;sb fjan	000000000	00000000	424	4	jan	77612	oo	np
8	426enp56690	ryan	calafato	38050	!Ajdkfatsd;jk;bm;ay	000000000	00000000	426	4	may	56690	es	np

PAUSE. LEAVE the workbook open for the next exercise.

### Using TRIM

Sometimes there are extra spaces in a cell—either at the end or the beginning of the string, especially after converting a text file like the alarm file—see the SPFirst and SPLast columns. The TRIM function removes characters at both ends of the string. There is only one argument: Text. Thus the syntax of the function is TRIM(Text).

**STEP BY STEP****Use the TRIM Function**

GET READY. USE the workbook from the previous exercise.

1. Click cell **N1**, type **first**, and in cell O1, type **last** to label the columns.
2. Click cell **N2**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **TRIM**. The Function Arguments dialog box opens.
4. In the Text box, click **B2**. If you look closely, you see that the original value of cell B2 is "david" with a space before the first name.
5. Click **OK** and copy the formula in N2 from **N3** to **N8**.
6. Select cell **O2**, type **=TRIM(C2)**, and press **Enter**.
7. Copy the formula in O2 from **O3** to **O8**.
8. **SAVE** the workbook. The results of the next few exercises appear in Figure 10-25.

PAUSE. LEAVE the workbook open for the next exercise.

**CERTIFICATION  
READY? 4.4.2**

How do you create a formula that removes blank characters at the beginning and/or end a string?

**Using PROPER**

The PROPER function capitalizes the first letter in a text string and any other letters in text that follow any character other than a letter. All other letters are converted to lowercase. In the PROPER(Text) syntax, Text can be text enclosed in quotation marks, a formula that returns text, or a reference to a cell containing the text you want to capitalize. In this exercise, you use PROPER to change lowercase text to initial capitals.

**STEP BY STEP****Use the PROPER Function**

GET READY. USE the workbook from the previous exercise.

1. Click cell **A11**, and then type **First**. In cell B11, type **Last**, and in cell C11, type **Birthday** to label the columns.
2. Select cell **A12**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **PROPER**. The Function Arguments dialog box opens.
4. In the Text box, click **N2**. You see that *david* is converted to *David*.
5. Click **OK** and copy the formula in A12 from **A12** through **B18** (both First and Last name columns).
6. Select cell **C12**, type **=PROPER(J2)**, and press **Enter**.
7. Copy the formula in C12 from **C13** to **C18**.
8. **SAVE** the workbook.

**Take Note** You can see the results of this and the next few exercises in Figure 10-25 later in the lesson.

PAUSE. LEAVE the workbook open for the next exercise.

The PROPER function capitalizes the first letter in each word in a text string. All other letters are converted to lowercase. If you have an apostrophe such as David's, Excel recognizes the apostrophe as a break and capitalizes the result as David'S.

**Using UPPER**

The UPPER function allows you to convert text to uppercase (all capital letters) text. The syntax is UPPER(Text), with Text referring to the text you want converted to uppercase. Text can be a reference or a text string. In this exercise, you convert the employee category (empcat1 and emp-cat2) to uppercase.

**STEP BY STEP****Use the UPPER Function**

GET READY. USE the workbook from the previous exercise.

1. Click cell **D11**, type **EmpCat1**, and in cell E11, type **EmpCat2** to label the columns.
2. Click cell **D12**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **UPPER**. The Function Arguments dialog box opens.
4. In the Text box, click **L2**. You see that *oo* is converted to *OO*.
5. Click **OK** and copy the formula in D12 from **D12** through **E18** (both EmpCat1 and EmpCat2 columns).
6. **SAVE** the workbook.

**CERTIFICATION READY? 4.4.3**

How do you create a formula that capitalizes all characters in a string?

PAUSE. LEAVE the workbook open for the next exercise.

**Using LOWER**

The LOWER function converts all uppercase letters in a text string to lowercase. LOWER does not change characters in text that are not letters. You use the LOWER formula in the following exercise to apply lowercase text in order to more easily tell an O (letter O) from a 0 (zero).

**STEP BY STEP****Use the LOWER Function**

GET READY. USE the workbook from the previous exercise.

1. Click cell **F11** and type **oCode1**. In cell G11, type **oCode2** to label the columns.
2. Click cell **F12**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **LOWER**. The Function Arguments dialog box opens.
4. In the Text box, click **F2**. You see that *0000000000* is converted to *00o0o0o000*.
5. Click **OK** and copy the formula in F12 from cell **F12** through **G18** (both oCode1 and oCode2 columns).
6. **SAVE** the workbook.

**CERTIFICATION READY? 4.4.3**

How do you create a formula that changes all the characters of a string to lowercase?

PAUSE. LEAVE the workbook open for the next exercise.

**Using CONCATENATE**

In some cases, you need to combine text strings together. Use CONCATENATE for this purpose. The syntax of the function is CONCATENATE(Text1, Text2, Text3 ... up to Text30). In this case, you combine the first and last names into two different formats for future mail merges. In the first format, you use a comma to separate the last and first name but because the character can change to a semi-colon or other character, you type the comma in a cell and use the cell reference in the CONCATENATE formula.

**STEP BY STEP****Use the CONCATENATE Function**

GET READY. USE the workbook from the previous exercise.

1. Click cell **H11** and type **,** (a comma followed by a space), and in cell I11, type **First Last** to label the columns.
2. Click cell **H12**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose

**CONCATENATE.** The Function Arguments dialog box opens.

- In the Text box, click cell **B12** and press **Tab**. Click cell **H11**, press **Tab**, and click **A12**. In the preview area, you see "Ortiz, David."
- Click **OK** and copy the formula in cell H12 from cell **H13** through cell **H18**. The result is an error (see Figure 10-25). Notice that the string gets longer and longer and Ortiz is in every string.
- In the Formula Bar, click the cell H11 reference and press **F4** (Absolute). Cell H11 should become **\$H\$11**.

**Figure 10-25**

Copy formula for Last and First did not work.

ExtCode	EmpID	SrFirst	SrLast	Hire Date	Alarm	oCode1	oCode2	Ext	Floor	BirthDay	EmpID	empcat1	empcat2	first	last
425	15210	david	ortiz	37291	lAaksdjbflakjsdfjksapr	000000000	000000000	425	4	apr	15210	oo	np	david	ortiz
327	49612	kim	akers	39868	lksAbdfbijkasfmar	000000000	000000000	327	3	mar	49612	sa	np	kim	akers
329	151276	linda	moschell	41301	colubasdfljikeaug	000000000	000000000	329	3	aug	51276	sa	p1	linda	moschell
330	47373	michael	nash	41530	ozixcAuadbfkjedec	000000000	000000000	330	3	dec	47373	ps	p0	michael	nash
328	37624	nicole	carson	40241	lkbueoAlajdckjul	000000000	000000000	328	3	jul	37624	sa	np	nicole	carson
424	77612	richard	carey	37367	Alajsdflkasbdfjan	000000000	000000000	424	4	jan	77612	oo	np	richard	carey
426	56690	ryan	calafato	38050	lAjdkfalsd;jkmbay	000000000	000000000	426	4	may	56690	es	np	ryan	calafato

Comma string (H11) needs to become absolute.

- Press **Enter** and copy the formula in cell H12 from cell **H13** through cell **H18** again. This time the formula is copied correctly.
- Type a ; (a semi-colon followed by a space) in H11, and notice that all values in the column now have semi-colons instead of commas.
- Select cell **I12** and type **=CONCATENATE(A12," ",B12)**. Notice that the second argument is a quote, space, and a quote. This separates the first and last names.
- Press **Enter** and copy the formula in cell I12 from cell **I13** through cell **I18**.
- SAVE** the workbook.

**PAUSE.** LEAVE the workbook open for the next exercise.

## Using FIND

Use the FIND function to locate a specific string in a text string. The syntax of the function is **FIND(Find\_text, Within\_text, Start\_num)**. The Find\_text argument can be one character as in this example or a longer string. The Within\_text is usually a longer string and most often is a cell reference with a string. The Start\_num argument tells you which position in the Within\_text string to begin the counting. This argument is optional and if left off assumes you will begin searching at the beginning of the string. In the Alarm Data file, there are two hidden letters in one of the strings (A and B) whose position actually tells you the digits of the first entry code. The second entry is the month number of the employee's birthday.

**CERTIFICATION  
READY? 4.4.4**

How do you create a formula that combines two strings together to form one string?

## STEP BY STEP

### Use the FIND Function

**GET READY.** USE the workbook from the previous exercise.

- Click cell **J11** and type **APos**, and in cell K11, type **bPos** to label the columns.
- Click cell **J12**.
- Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **FIND**. The Function Arguments dialog box opens.

4. In the Find\_text box, type **A** and press **Tab**. Notice that the preview shows “A” (with quotes) in the row.
5. In the Within\_text box, click **E2**. Notice that the result returns a 3 for the function. The first character in the string is a space, the second is an l (lowercase “L”), and the third is a capital A.
6. Click **OK** and copy the formula in cell J11 from cell **J12** through cell **J18**.
7. Select cell **K12**, type **=FIND(“b”,E2)**, and press **Enter**. In this case, you are looking for a lowercase b—the argument is case sensitive.
8. Copy the formula in cell K12 from cell **K13** to cell **K18**.
9. SAVE the workbook.

PAUSE. LEAVE the workbook open for the next exercise.

## Using SUBSTITUTE

Excel’s SUBSTITUTE function is especially useful when you need to edit data and you want to substitute new text for existing text in a text string. Use SUBSTITUTE when you want to replace specific text in a text string; use REPLACE when you want to replace any text that occurs in a specific location in a text string, such as when a name change occurs. In the Alarm Data file, the employee category fields can identify probationary employees and the level of probation. The syntax of the function is `SUBSTITUTE(Text, Old_text, New_text, Instance_num)`. The Text argument is the string you will search. In this exercise you will replace the Old\_text with New\_text.

### STEP BY STEP

#### Use the SUBSTITUTE Function

GET READY. USE the workbook from the previous exercise.

1. Click cell **L11** and type **S1**, and in M11, type **Probationary Level** to label the columns.
2. Select cell **L12**.
3. Click the **FORMULAS** tab and in the Function Library group, click **Text** and choose **SUBSTITUTE**. The Function Arguments dialog box opens.
4. In the Text box, click **E12** and press **Tab**.
5. In the Old\_text box, type **NP**. This is a code for employees who are not probationary.
6. In the New\_text box, type **Non** and press **Tab**. Because the first value is NP, the result of the formula will be Non.
7. Click **OK** and copy the formula in L11 from **L12** through **L18**.
8. Select cell **M12** and type **=SUBSTITUTE(L12,“P”,“Probationary Level ”)** and press **Enter**. In this case, you are looking for the letter P and changing the string to Probationary Level with a space at the end because a number will follow.
9. Copy the formula in cell M12 from cell **M13** to cell **M18**. See Figure 10-26 to see the worksheet values.



Figure 10-26

Text exercises

ExtCode	EmpID	SpFirst	SpLast	Hire Date	Alarm	OCode1	OCode2	Ext	Floor	BirthDay	EmpID	empcat1	empcat2	first	last
425oosp15210	david	ortiz	37291	1AaKsdjbfj;akjsdfj;akfap	0000000000	0000000000	425	4	apr	15210	oo	np	david	ortiz	
327sapp49612	kim	akers	39868	lksAbdfbfj;akjsdfj;akfap	0000000000	0000000000	327	3	mar	49612	sa	np	kim	akers	
329sapp151276	linda	moschell	41301	colubasdfj;akjsdfj;akfap	0000000000	0000000000	329	3	aug	51276	sa	p1	linda	moschell	
330spp047373	michael	nash	41530	ozixc;Aasadbfj;akfap	0000000000	0000000000	330	3	dec	47373	ps	p0	michael	nash	
328sapp37624	nicole	carson	40241	lkbbueoAiajckj;ul	0000000000	0000000000	328	3	jul	37624	sa	np	nicole	carson	
424oosp77612	richard	carey	37367	Alajsdj;akjsdfj;akfap	0000000000	0000000000	424	4	jan	77612	oo	np	richard	carey	
426esnp56690	ryan	calafato	38050	l;Ajckfalsd;jkbm	0000000000	0000000000	426	4	may	56690	es	np	ryan	calafato	

10. Press **Ctrl + `** to display the formulas, as shown in Figure 10-27. Press **Ctrl + `** again to switch back to the formula results.

Figure 10-27

Text exercise worksheet formulas

ExtCode	EmpID	SpFirst	SpLast	Hire Date	Alarm	OCode1	OCode2	Ext	Floor	BirthDay	EmpID	empcat1	empcat2	first	last
425oosp15210	david	ortiz	37291	1AaKsdjbfj;akjsdfj;akfap	0000000000	0000000000	425	4	apr	15210	oo	np	david	ortiz	
327sapp49612	kim	akers	39868	lksAbdfbfj;akjsdfj;akfap	0000000000	0000000000	327	3	mar	49612	sa	np	kim	akers	
329sapp151276	linda	moschell	41301	colubasdfj;akjsdfj;akfap	0000000000	0000000000	329	3	aug	51276	sa	p1	linda	moschell	
330spp047373	michael	nash	41530	ozixc;Aasadbfj;akfap	0000000000	0000000000	330	3	dec	47373	ps	p0	michael	nash	
328sapp37624	nicole	carson	40241	lkbbueoAiajckj;ul	0000000000	0000000000	328	3	jul	37624	sa	np	nicole	carson	
424oosp77612	richard	carey	37367	Alajsdj;akjsdfj;akfap	0000000000	0000000000	424	4	jan	77612	oo	np	richard	carey	
426esnp56690	ryan	calafato	38050	l;Ajckfalsd;jkbm	0000000000	0000000000	426	4	may	56690	es	np	ryan	calafato	

11. SAVE the workbook.

CLOSE Excel.

To use existing text with small changes, you can use the **SUBSTITUTE** function. In the Function Arguments dialog box, Text can be the actual text you want to substitute, or it can be a cell reference.

## SKILL SUMMARY

In this lesson you learned how:	Exam Objective	Objective Number
To use formulas to conditionally summarize data.	Demonstrate how to apply the SUMIF function.	4.3.1
	Demonstrate how to apply the COUNTIF function.	4.3.3
	Demonstrate how to apply the AVERAGEIF function.	4.3.2
To use formulas to look up data in a workbook.		
To use formulas to modify text.	Demonstrate how to use the RIGHT, LEFT, and MID functions.	4.4.1
	Demonstrate how to use the TRIM function.	4.4.2
	Demonstrate how to use the UPPER and LOWER functions.	4.4.3
	Demonstrate how to use the CONCATENATE function.	4.4.4

## Knowledge Assessment

### Multiple Choice

Select the best response for the following statements.

- Which of the following functions would you use to convert text from uppercase to title case?
  - UPPER
  - PROPER
  - LOWER
  - SUBSTITUTE
- Which function automatically counts cells that meet multiple conditions?
  - COUNTIF
  - COUNT
  - COUNTIFS
  - SUMIFS
- Which function automatically counts cells that meet a specific condition?
  - COUNTIF
  - COUNT
  - COUNTIFS
  - SUMIFS
- In the formula =SUMIFS(C5:C16, F5:F16, "<=60", B5:B16, ">200000"), what is the range of cells to be added?
  - a. = C5:C16
  - b. = F5:F16
  - c. = B5:B16
  - d. = C5:F16

5. In the formula =SUMIFS(C5:C16, F5:F16,"<=60", B5:B16, ">200000"), what does <=60 mean?
- If the value in C5:C16 is greater than or equal to 60, the value in C5:C16 will be included in the total.
  - If the value in F5:F16 is greater than or equal to 60, the value in C5:C16 will be included in the total.
  - If the value in B5:BF16 is less than or equal to 60, the value in C5:C16 will be included in the total.
  - If the value in F5:F16 is less than or equal to 60, the value in C5:C16 will be included in the total.
6. What does criteria range in a formula refer to?
- The worksheet data to be included in the formula's results
  - The range containing a condition that must be met in order for data to be included in the result
  - The type of formula being used for the calculation
  - The type of data contained in the cells to be included in the formula
7. Which function returns one value if a condition is true and a different value when the condition is not true?
- AND
  - OR
  - IF
  - IFERROR
8. Which function returns a value if all conditions are met?
- AND
  - OR
  - IF
  - IFERROR
9. Which function checks to see whether the result is something like #N/A (not available) and can return something else instead?
- AND
  - OR
  - NOT
  - IFERROR
10. Which function reverses the value of the function arguments?
- AND
  - NOT
  - IF
  - IFERROR

### Matching

Match each term with its definition.

- |                         |           |  |
|-------------------------|-----------|--|
| a. AND function         | _____ 1.  | A function used to look up information stored in the first column of an Excel table in the worksheet.                                  |
| b. arguments            | _____ 2.  | A function in which a True result is returned if data meets any condition specified in the formula.                                    |
| c. CONCATENATE function | _____ 3.  | The values that a function uses to perform operations or calculations.   |
| d. COUNTIF              | _____ 4.  | A function in which a True result is returned if data meets all conditions specified in the formula.                                   |
| e. HLOOKUP              | _____ 5.  | A function that combines two or more strings together.   |
| f. OR function          | _____ 6.  | A formula component used to build single formulas that produce multiple results.   |
| g. SUMIF                | _____ 7.  | A function in which the result is determined by the state of multiple criteria.  |
| h. SUMIFS               | _____ 8.  | A function that references the first row of an Excel table in the worksheet in order to look up information stored in the same column. |
| i. table                | _____ 9.  | A function that returns the total number of cells that meet one condition.   |
| j. VLOOKUP              | _____ 10. | A function in which the result is determined by the state of a particular condition.   |

## Competency Assessment

### Project 10-1: Separating Text into Columns

In this project, you take a text file of student grades and separate the information into seven columns rather than one.

GET READY. LAUNCH Excel if it is not already running.



1. OPEN the **10 SFA Grades Import** file.
2. Select cells **A4:A41**. Click the **DATA** tab and in the Data Tools group, click **Text to Columns**.
3. The Convert Text to Columns Wizard opens with Delimited selected as the default, because Excel recognized that the data in the selected range is separated with delimiters. Click **Next**.
4. Select **Comma** and **Space** as the delimiters. If other delimiters are checked (such as Tab), deselect them and click **Next**. Click **Finish**.
5. Label each of the columns in row 3 (A3 through G3): **Last, First, Initial, ID, Final, Quarter, Semester**.
6. SAVE the workbook in the Lesson 10 folder as **10 SFA Grades Import Solution**. CLOSE the workbook.

LEAVE Excel open for the next project.

### Project 10-2: Creating SUMIF and SUMIFS Formulas to Conditionally Summarize Data

Salary information for Contoso, Ltd. has been entered in a workbook so the office manager can analyze and summarize the data. In the following exercise, you calculate sums with conditions.

GET READY. LAUNCH Excel if it is not already running.



1. OPEN the **10 Contoso Salaries** data file for this lesson.
2. Select cell **C35**. Click the **FORMULAS** tab and in the Function Library group, click **Insert Function**.
3. If the SUMIF function is not visible, type **SUMIF** in the Search for a function box and click **Go**. From the Select a function list, click **SUMIF**. Click **OK**.
4. In the Function Arguments dialog box, in the Range field select **C4:C33**.
5. In the Criteria box, type **>100000**.
6. Click **OK**. Because the range and sum range are the same, it is not necessary to enter a Sum\_range argument.
7. Select **C36** and click **Insert Function**. Select **SUMIFS** and click **OK**.
8. In the Function Arguments dialog box, select **C4:C33** as the sum range.
9. Select **D4:D33** as the first criteria range.
10. Type **>=10** as the first criterion.
11. Select **C4:C33** as the second criteria range.
12. Type **<60000** as the second criterion. Click **OK** to finish the formula.
13. SAVE the workbook as **10 Contoso Salaries Solution**. CLOSE the file.

LEAVE Excel open for the next project.

## Proficiency Assessment

### Project 10-3: Using a Formula to Format Text

Use a formula to format text for employees to decide on 401K investments for Fabrikam, Inc.

GET READY. LAUNCH Excel if it is not already running.



1. OPEN the **10 Fabrikam Investments** data file for this lesson.
2. Enter formulas in column **F** to convert the text in column **A** to title case.
3. Copy the values from column **F** to column **A** and delete column **F**.
4. SAVE the workbook in the Lesson 10 folder as **10 Fabrikam Investments Solution** and then CLOSE the file.

LEAVE Excel open for the next project.

### Project 10-4: Create COUNTIF and AVERAGEIF Formulas

In this exercise, you enter COUNTIF and AVERAGEIF formulas to analyze and summarize grades for a course at the School of Fine Arts.

GET READY. LAUNCH Excel if it is not already running.



1. OPEN the **10 SFA Grades** data file for this lesson.
2. In cell **J2** enter a formula that counts the total number of students.
3. In the grades table on the right side of the worksheet, create formulas using COUNTIF that will count how many students got an A for the Final, Quarter, and Semester. In the Range field, use an absolute reference.
4. Create formulas for each of the other grades in the grades table.
5. SAVE the workbook as **10 SFA Grades Solution** and then CLOSE the file.

LEAVE Excel open for the next project.

## Mastery Assessment

### Project 10-5: Creating Conditional Logic Formulas

Professor Garrett Young has asked you to create formulas to identify the highest and lowest achieving students on his first test.

GET READY. LAUNCH Excel if it is not already running.



1. OPEN the **10 SFA Test Grades** file for this lesson.
2. In column **F**, use a function that will place the word "High" in each cell when the Test1 result is greater than 90. There will be a blank for all other values in this column.
3. In column **G**, use a function that will place the word "Low" in each cell when the test result is less than 70. There will be a blank for all other values in this column.
4. In cell **A43**, type **Count**, and then create two formulas that will count the High and Low labels in columns **F** and **G**. Best Practice Hint: Use the labels in **F3** and **G3** in your formulas instead of the word High or Low.
5. SAVE the workbook in the Lesson 10 folder as **10 SFA Test Grades Solution** and then CLOSE the file.

LEAVE Excel open for the next project.

**Project 10-6: Creating COUNTIF, AVERAGEIF, and LOOKUP Formulas**

In this project, you use a lookup table to determine an employee's end-of-year bonus.

GET READY. LAUNCH Excel if it is not already running.



1. OPEN the **10 Contoso Bonus** data file for this lesson.
2. In the table starting in row 35, create formulas to count the number of employees in each position in column B and the average salary of each position in column C.
3. Calculate the bonus by multiplying the Average salary by the rate/100.
4. Starting in F4, create a formula and copy it down that will look up the bonus for each position and put it in column F.
5. SAVE the workbook in the Lesson 10 folder as **10 Contoso Bonus Solution**, and then CLOSE the file.

CLOSE Excel.

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WILEY