Lesson 4

Using Basic Formulas

Learning Objectives

Students will learn to:

* Understand and display formulas
* Understand order of operations
* Build basic formulas
* Use cell references in formulas
* Use cell ranges in formulas

MOS Skills

* Display formulas *1.4.10*
* Define order of operations *4.1.2*
* Demonstrate how to use references (relative, mixed, absolute) *4.1.1*
* Create named ranges *2.3.4*
* Reference cell ranges in formulas *4.1.3*

Lesson Summary — Lecture Notes

In Lesson 4, students learn how to understand and display formulas, how to understand order of operations, how to build basic formulas, how to use cell references in formulas, and how to use cell ranges in formulas.

First, students learn the real strength of Excel: its capability to perform common and complex calculations. The formula is one of the essential elements of Excel, which enables you to add, subtract, multiply, and divide numbers. When you enter a formula in a cell, the formula is stored internally and the results are displayed in the cell. You can view the underlying formula in the formula bar when the cell is active, when you double-click the cell to edit it, and by using the FORMULAS tab.

Students then learn that when you use more than one operator in a formula, Excel follows a specific order—called the order of operations—to calculate the formula. Parentheses play an important role in controlling the order of operations.

Next, students learn that Excel is handy for performing basic calculations. Although you probably won’t use Excel to add or subtract a few numbers, it’s important to learn how to create simple formulas in Excel, which serve as the building blocks for more complex calculations. Students learn how to create basic formulas that let you perform addition, subtraction, multiplication, and division.

As students learned in Lesson 1, each cell in an Excel worksheet has a unique identifier indicating its column and row, such as A1 (column A, row 1) or E4 (column E, row 4). When you create a formula, you can reference a cell’s identifier rather than typing the number that appears in that cell. A cell reference identifies a cell’s location in the worksheet, based on its row number and column letter. Using a cell reference rather than the data displayed in a cell gives you more flexibility in your worksheet. If the data in a cell changes, any formulas that reference the cell change as well. For example, if cell E1 contains the number 12 but is later changed to 15, any formula that references cell E1 changes automatically. The same principle applies to a cell that contains a formula and is referenced in another formula.

Lastly, students learn that in Excel, groups of cells are called ranges. The cell groups are either contiguous or non-contiguous. You can name (define) ranges, change the size of ranges after you define them, and use named ranges in formulas. The Name box and the Name Manager help you keep track of named ranges and their cell addresses. You can also use the Paste Names command to create a list of named ranges and their addresses in a worksheet.

Key Terms

**absolute cell reference** A reference to a specific cell or range of cells regardless of where the formula is located in the worksheet. An absolute cell reference uses a dollar sign in front of the column and row markers in a cell address.

**calculation operator** Operators that specify the calculations to be performed.

**cell reference** A reference that identifies a cell’s location in the worksheet based on its row number and column letter.

**constant** A number or text value entered directly into a formula.

**external reference** A cell or range in a worksheet in another Excel workbook, or a defined name in another workbook.

**formula** An equation that performs calculations, such as addition, subtraction, multiplication, and division, on values in a worksheet.

**mixed cell reference** A cell reference that uses an absolute column or row reference, but not both.

**named range** A group of cells, and occasionally a single cell, with a designated name.

**nested parentheses** Parentheses inside of parentheses within a formula.

**operand** An element that identifies the values to be used in a calculation.

**order of operations** The rules Excel follows to calculate any formula that contains two or more operators.

**relative cell reference** A cell reference that adjusts the cell identifier automatically if you insert or delete columns or rows, or if you copy the formula to another cell.

**scope** The location within which Excel recognizes a named range, which is either a specific worksheet or the entire workbook. If you set the scope of a named range to Workbook, you can reference the named range on any sheet in the workbook.

**value** A number, a cell address, a date, text, or Boolean data in Excel. Regarding formulas, it is usually a number or cell address.

**variable** A symbol or name that represents something else; it can be a cell address, a range of cells, and so on.

Solutions for Step-by-Step Exercises

The ***Formula Practice Solution*** solution file is located in **Solutions/Lesson04** folder and is referenced in the following step-by-step exercises:

### Display Formulas

The ***Order of Operations Solution*** solution file is located in **Solutions/Lesson04** folder and is referenced in the following step-by-step exercises:

### Understand Order of Operations

The ***Budget Basic Formulas Solution*** solution file is located in **Solutions/Lesson04** folder and is referenced in the following step-by-step exercises:

### Create a Formula that Performs Addition

### Create a Formula that Performs Subtraction

### Create a Formula that Performs Multiplication

### Create a Formula that Performs Division

The ***Budget Cell References Solution*** solution file is located in **Solutions/Lesson04** folder and is referenced in the following step-by-step exercises:

### Use Relative Cell References in a Formula

### Use an Absolute Cell Reference in a Formula

### Use a Mixed Cell Reference in a Formula

### Refer to Data in Another Worksheet

### Reference Data in Another Workbook

The ***Budget Ranges Solution*** solution file is located in **Solutions/Lesson04** folder and is referenced in the following step-by-step exercises:

### Name a Range of Cells

### Change the Size of a Range

### Create a Formula that Operates on a Named Range

### Keep Track of Named Ranges

Answer Key

Knowledge Assessment

Multiple Choice

Select the best response for the following statements.

**1.** Which of the following is *not* an arithmetic operator?

**a.** +

**b.** −

**c. \***

**d.** ]

**2.** In Excel, what is the result of =1 + 3 \* 2 / 2 - 1?

**a.** 2

**b.** 3

**c.** 4

**d.** 6

**3.** Per the order of operations, which of the following is calculated first?

**a.** Addition (+) and subtraction (−) (left to right)

**b.** Exponentiation (ˆ)

**c.** Percent (%)

**d.** Negative number (−)

**4.** Which of the following refers to an unnamed range in the current worksheet?

**a.** =SUM(C2:E12)

**b.** =Q3Expenses!A19

**c.** =[Media.xlsx]MasterList!$D$10

**d.** =SUM(budget.summary)

**5.** Which of the following shows a formula for a reference to another worksheet in the same workbook?

**a.** =SUM(C2:E12)

**b.** =Q3Expenses!A19

**c.** =[Media.xlsx]MasterList!$D$10

**d.** =SUM(budget.summary)

**6.** Which of the following shows a formula for a reference to another workbook?

**a.** =SUM(C2:E12)

**b.** =Q3Expenses!A19

**c.** =[Media.xlsx]MasterList!$D$10

**d.** =SUM(budget.summary)

**7.** Which of the following is an acceptable name for a named range?

**a.** C7

**b.** subtotal\_west

**c.** subtotal west

**d.** subtotal/west

**8.** Which of the following is an example of an absolute cell reference?

**a.** A9

**b.** A$9

**c.** $A$9

**d.** A9:E9

**9.** Which of the following is an example of a mixed cell reference?

**a.** A9

**b.** A$9

**c.** $A$9

**d.** A9:E9

**10.** Which of the following can you *not* do using the Name Manager?

**a.** Enter values into a range

**b.** Change a range name

**c.** Delete a named range

**d.** Verify the scope of a range

True / False

Circle T if the statement is true or F if the statement is false.

**T F 1.** To allow Excel to distinguish formulas from data, all formulas begin with an equal sign (=).

**T F 2.** Regarding a named range, the scope of a name is the location within which Excel recognizes the name without qualification.

**T F 3.** Excel recognizes a construct like 3+4= as a legitimate formula.

**T F 4.** Range names may begin with the caret (^) character.

**T F 5.** You cannot use a named range in a formula that references another worksheet.

**T F 6.** Range names cannot be the same as a cell reference, such as C10 or $D$8.

**T F 7.** Once you name a range, you can change the size of the range using the Name Manager.

**T F 8.** You can create a new range by selecting the cells and typing a name in the Name box next to the formula bar.

**T F 9.** The order of operations determines which parts of a formula are calculated before other parts of the formula.

**T F 10.** The formula = 6 \* 2 / 3 produces the same result as =6 \* (2 / 3).

Solutions for Competency Assessment

**Project 4-1**

The solution for Project 4-1 is named ***04 Project Math Solution*** and is located in the **Solutions/Lesson04** folder.

**Project 4-2**

The solution for Project 4-2 is named ***04 Project Operations Solution*** and is located in the **Solutions/Lesson04** folder.

Solutions for Proficiency Assessment

**Project 4-3**

The solution for Project 4-3 is named ***04\_ADatum\_USWest Solution*** and is located in the **Solutions/Lesson04** folder.

**Project 4-4**

The solutions for Project 4-4 are named ***04\_ADatum\_USWestSales Solution***  and

***04\_ADatum\_GlobalSales Solution*** and are located in the **Solutions/Lesson04** folder.

Solutions for Mastery Assessment

**Project 4-5**

The solution for Project 4-5 is named ***04 Income Analysis Solution*** and is located in the **Solutions/Lesson04** folder.

**Project 4-6**

The solution for Project 4-6 is named ***04 Personal Budget Solution*** and is located in the **Solutions/Lesson04** folder.

Test Projects for grading with OfficeGrader

The following test projects are designed for your to distribute directly to your students. Data and solution files are provided where required. The solution files are designed for grading with OfficeGrader.

Test Project 4-1

MOAC, Microsoft Excel Office 2013

Lesson 4, Using Basic Formulas

Complete the following task:

1. **OPEN** the ***04 Wingtip*** workbook.

2. **SAVE** the document as ***04 Wingtip Sales*** in your flash drive.

3. In E4, create formula that totals the values for January, February, and March for the Outdoor products. Copy that formula to cells E5:E10.

5. In F4, create a formula that calculates the bonus amount to be paid by multiplying the value in E4 by the value in B12. Use an absolute reference to cell B12.

6. Copy the formula from F4 to F5:F10.

7. **SAVE** the document.

**CLOSE** the workbook. Leave Excel open.

Test Project 4-2

MOAC, Microsoft Excel Office 2013

Lesson 4, Using Basic Formulas

Complete the following task:

1. **OPEN** the ***04 Check*** workbook.

. **SAVE** the document as ***04 Check Register***  in your flash drive.

2. In cell G6, enter a formula that displays the value in G5 minus the value in E6, plus the value in F6.

3. Copy the formula from G6 to G7:G20.

4. In row 10, enter the following new transaction:

Number: 1034

Date: 1/5/2015

Description: Groceries

Debit: $55.12

5. **SAVE** the workbook.

**CLOSE** the workbook. Exit Excel.