

FORMULAS AND FUNCTIONS

FORMULAS

- A **formula** is “a collection of values and symbols that” are combined to perform a calculation (McFedries 2007, 255).
- All Excel formulas include the following:
 - An equals sign (=)
 - One or more **operands** (i.e., cell reference, a value, a range, a range or function name) separated by **operators** (i.e., plus sign, minus sign).
- Virtually all Excel formulas are either **arithmetic** or **comparison**, with each type having its own set of operators.
 - **Arithmetic formulas** perform numeric calculations by combining numbers, cell addresses, and function results using mathematical operators. Table 1 provides a list of Excel’s commonly used arithmetic operators, together with examples.

	A
1	5
2	10
3	15

Table 1. Arithmetic Operators Used in Excel

Operator	Example	Result
+ (addition)	=A1+A2	15
- (subtraction)	=A1-A2	-5
* (multiplication)	=A1*A2	50
/ (division)	=A1/A2	0.5
^ (exponentiation)	=A1^A2	9765625

- **Comparison formulas** compare two or more numbers, text strings, cell contents, or function results. “If the statement is **true**, the result of the formula is given the logical value **TRUE**” (equivalent to a nonzero value). If the statement is **false**, the formula returns the logical value **FALSE** (i.e., equivalent to 0). Table 2 provides a list of Excel’s commonly used comparison operators, together with examples.

Table 2. Comparison Operators Used in Excel

Operator	Example	Result
= (equal to)	=IFA1=A2	FALSE
> (greater than)	=IFA1>A2	FALSE
< (less than)	=IFA1<A2	TRUE
>= (greater than or equal to)	=IFA1>=A2	FALSE
<= (less than or equal to)	=IFA1<=A2	TRUE
<> (not equal to)	=IFA1<>A2	TRUE

CREATE A SIMPLE FORMULA

To **create** a simple formula:

1. Open Excel and create a new blank workbook. Click **cell A1** and type **10**. Click **cell A2** and type **5**.
2. Click cell **A3**, the cell in which you want the formula result to appear.
3. Type an equals sign (=)
4. *Click* cell **A1**.
5. Type a minus sign (-)
6. *Click* cell **A2**.
7. Press **Enter**. The result (5) should appear in cell **A3**.

EDIT AN EXISTING FORMULA

To edit an existing formula, do one of the following:

1. Press **F2**.
OR
2. **Double-click** the cell containing the formula.
OR
3. In the **Formula Bar**, click anywhere within the formula text.

RELATIVE, ABSOLUTE, AND MIXED CELL REFERENCES IN FORMULAS

RELATIVE CELL REFERENCE

- A **relative cell address** indicates a cell's location relative to the formula cell.
- When you copy the formula, the relative cell reference changes.
 - *Example:* If we copy the formula in cell A3 and paste it into cell B3, the cell references automatically change from **A1** and **A2** to **B1** and **B2**

	A	B
1	10	
2	5	
3	=A1-A2	=B1-B2

A relative cell reference changes when you copy it to another location on a worksheet.

ABSOLUTE CELL REFERENCE

- An **absolute cell reference** is a permanent pointer to a particular cell, indicated with a **\$** before the column letter and the row number.
- When you copy the formula, the absolute cell reference *does not change*.
- *Example:* If we make both cell references in the cell A3 formula **absolute**, and then copy and paste the formula into cell **B3**, the cell references will remain **A1** and **A2**.

	A	B
1	10	
2	5	
3	= $\$A\$1-\$A\2	= $\$A\$1-\$A\2

An **absolute cell reference** will not change when you copy it to another location on a worksheet.

MIXED CELL REFERENCE

- A **mixed cell reference** contains part absolute and part relative reference.
- When you copy the formula, either the column or the row reference changes, while the other remains constant.
- *Examples:*

	A	B
1	10	
2	5	
3	= $\$A1-\$A2$	
4		= $\$A2-\$A3$

The row references change when copied to another location, but the column references remain the same.

	A	B
1	10	
2	5	
3	= $A\$1-A\2	
4		= $B\$1-B\2

The column references change when copied to another location, but the row references remain the same.

FUNCTIONS

- A **function** is a predefined formula that performs a calculation.
- The function includes two parts: (1) the **function name** and (2) **arguments**.

FREQUENTLY USED MATH, STATISTICS, AND DATE FUNCTIONS

SUM FUNCTION

- The **SUM** function calculates the total of a range of values.
- **Shortcut:** Press **Alt+=** to add a sum to a cell by using **AutoSum**
- “When building an AutoSum formula, Excel uses the cells above the current cell, and stops when it encounters a blank cell (or the top of the worksheet).” If you want to include other cells in your calculation, use your mouse to select the other cells (McFedries 2007, p. 258).

	A
1	5
2	10
3	15
4	20
5	=SUM(A1:A4)

	A
1	5
2	10
3	15
4	20
5	50

AVERAGE FUNCTION

The **AVERAGE** function calculates the *arithmetic mean* of values in a range.

	A		A
1	5	1	5
2	10	2	10
3	15	3	15
4	20	4	20
5	=AVERAGE(A1:A4)	5	12.5

MEDIAN FUNCTION

The **MEDIAN** function identifies the *midpoint value* in a set of values.

	A		A
1	5	1	5
2	10	2	10
3	15	3	15
4	20	4	20
5	=MEDIAN(A1:A4)	5	12.5

MIN AND MAX FUNCTIONS

The **MIN** function identifies the *lowest value* in a range.

	A		A
1	5	1	5
2	10	2	10
3	15	3	15
4	20	4	20
5	=MIN(A1:A4)	5	5

The **MAX** function identifies the *highest value* in a range.

	A		A
1	5	1	5
2	10	2	10
3	15	3	15
4	20	4	20
5	=MAX(A1:A4)	5	20

COUNT FUNCTION

The **COUNT** function tallies the *number of cells in a range that contain values*.

Note: Use the **COUNTA** function (see below) if the cells contain text.

	A		A
1	5	1	5
2	10	2	10
3	15	3	15
4	20	4	20
5	=COUNT(A1:A4)	5	4

COUNTA FUNCTION

The **COUNTA** function tallies the *number of cells in a range that **are not empty***. For example, use **COUNTA** if cells contain text instead of numbers.

	A		A
1	Wilma	1	Wilma
2	Betty	2	Betty
3	Fred	3	Fred
4	Wilma	4	Wilma
5	=COUNTA(A1:A4)	5	4

TODAY FUNCTION

The **TODAY** function displays the current date.

8		8	
9	=TODAY()	9	5/13/2020
10		10	

SOURCES

McFedries, Paul. *The Unofficial Guide to Microsoft Office 2007*. Hoboken, NJ: Wiley, 2007, 142–143.

Perry, Greg. *Microsoft® Office 2007 All in One*. Indianapolis, IN: SAMS, 2007.

Poatsy, Mary Anne, Keith Mulbery, Cynthia Krebs, Lynn Hogan, Eric Cameron, Jason Davidson, Linda K. Lau, Rebecca Lawson, and Jerri Williams. *Microsoft Office 2016 Volume 1*. Exploring Series, series editor Mary Anne Poatsy. Boston, MA: Pearson, 2017.

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