

# Formulas

## Excel 2007

This is not an official training handout of the  
Educational Technology Center, Davis School District

Formulas .....	1	Evaluating a Formula.....	5
Entering Simple Formulas .....	2	Circular Reference .....	6
Order of Operations .....	2	Tracing Dependents .....	6
Writing a Formula .....	2	Tracing Precedents .....	6
Entering More Complex Formulas .....	2	Removing Arrows.....	6
IF Formula .....	3	Error Checking .....	6
Using IS Functions in the IF Formula .....	4	The Watch Window.....	7

### Formulas

- Formulas, also called functions, are a powerful feature of Excel.
- Formulas available in Excel are grouped into the following categories:
  - **Financial** – Formulas for calculating depreciation, interest, return on an investment, loan payment, and mortgage.
  - **Logical** – The logical operators of **And**, **True**, **False**, **If**, **Not**, and **Or**.
  - **Text** – Formulas for combining text from various cells with the concatenate formula, converting text to upper case, lower case, or proper case, and trimming extra spaces from text.
  - **Date & Time** – Formulas for calculating the number of days between two dates, the current date, and day of the week for a given date.
  - **Lookup & Reference** – Formulas for doing a horizontal or vertical lookup, a hyperlink, or getting data from a Pivot Table.
  - **Math & Trig** – Formulas for calculating trigonometric functions, logs, random numbers, Roman numerals, rounding and truncating.
  - **Statistical** – Formulas for calculating averages, frequency, percentile, quartile, and standard deviation.
  - **Engineering** – Formulas for Bessel functions, and conversions between numbering systems such as octal to binary.
  - **Cube** – Formulas for working with three dimensional sets.
  - **Information** – Includes formulas which return a true or a false response in determining if a cell is blank, or if the content of the cell is a number or text.

## Entering Simple Formulas

- Click in the desired cell.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Function Library** group, click on the down arrow to the right of the **Auto Sum** button.
- Choose the appropriate function.
  - **Sum** - Add the list of numbers.
  - **Average** - Find the mean of the list of numbers.
  - **Count Numbers** - Count the number of cells with numbers.
  - **Max** - Find the maximum (largest) number in the list.
  - **Min** - Find the minimum (smallest) number in the list.
- **Note** – The marching ants indicate the cells included in the formula.
  - If needed, click and drag to highlight the desired cells for the formula.
  - Do not include the cell with the formula in the selection.
- Press the **Enter** key.

## Order of Operations

- To be sure to get the desired results, use the proper order of operations.
- A mnemonic to remember the order is: **Please Excuse My Dear Aunt Sally**.
  1. **Please** (Parenthesis) - Things contained in parenthesis.
  2. **Excuse** (Exponents) - Exponential calculations.
  3. **My** (Multiplication) **Dear** (Division) - Multiplication or division. (A combination of these reads from left to right.)
  4. **Aunt** (Addition) **Sally** (Subtraction) - Addition or subtraction. (A combination of these reads from left to right.)

## Writing a Formula

- Click in the cell where the formula should go.
- Type an equals sign (=).
- Select cells to be included by clicking and dragging.
- Enter the proper operations
  - Addition (+)
  - Subtraction (-)
  - Multiplication (\*)
  - Division (/)
  - Exponentiation (^)
- Press the **Enter** key.

## Entering More Complex Formulas

- Click in the cell the function is to be placed in.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Function Library** group, click on the **Insert Function** button.
- Find the desired function in the list of the **Insert Function** window.
- Click on **OK**.
- Choose or enter the necessary information for the function.
- OR click on the **Insert function** button on the **Input Line**.



### Finding a Formula

- Click in the cell where the formula should go.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Function Library** group, click on the **Insert Function** button.
- In the **Search for a function** box, enter a description of what the function should do.
- Click on the **Go** button.
- Some choices appear in the **Select a function** box.
- Click on one of the functions to see a description in the space below the box.
- Click on the desired function in the **Select a function** box.
- Click on **OK**.

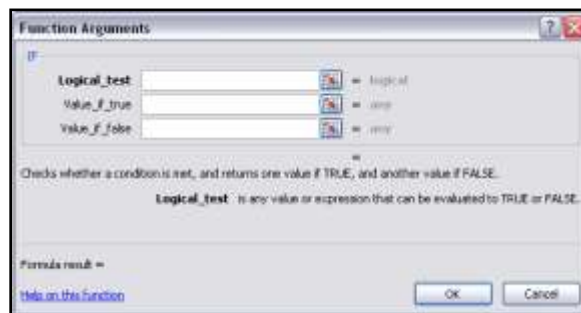


### Working with the Function

- When selecting a range for the function:
  - Click on the button with the red dot in the first box.
  - Click and drag to select the cells to be included in the function.
  - Press the **Enter** key.
- If more cells need to be selected, use the next box.
- Notice the result of the function shown at the bottom of the window. If it is not correct, make changes.
- Click on **OK**.
- The **If** formula below is an example.

### IF Formula

- The IF formula performs a test to see if a given condition is true and then displays/calculates information based on the truth of the condition.
- Click in the cell the formula is to be in.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Function Library** group, click on the **Insert Function** button.
  - OR click on the **Insert function** button on the **Input Line**.
- Click on **IF** in the **Select a function** box.
- When **IF** is not in the **Select a function** box:
  - In the **Search for a function** box, enter **if**.
  - Click on the **Go** button.
  - Click on **IF** in the **Select a function** box.
- Click on **OK**.
- **Logical Test**
  - The test is the condition that must be met. The computer measures whether it is true or false.
  - The contents of a cell(s) can be examined.
  - If the cell is empty or contains a 0, a result of false is given. If the cell contains a number other than 0, true.
  - Another example, “Is the total in cell D5 larger than 32?” would be entered as **D5>32**.
  - To choose a particular cell, click on the red dot at the end of the box, click on the desired cell, and then press the **Enter** key.



- **Value if true**
  - The content of the cell appears when the results of the logical test is true.
  - Text must be enclosed in double quotes. For example, “**Number is too large**”.
  - To have no text appear, type in double quotes. For example, “”.
  - To have the contents of another cell appear, click on the red dot at the end of the box, click on the desired cell, and then press the **Enter** key.
- **Value if false**
  - The content of the cell appears when the results of the logical test is false.
  - Text must be enclosed in double quotes. For example, “**Number is too small**”.
  - To have no text appear, type in double quotes. For example, “”.
  - To have the contents of another cell appear, click on the red dot at the end of the box, click on the desired cell, and then press the **Enter** key.
- Click on **OK**.

### ***Nested IF Statements***

- A **Nested IF Statement** is when an IF statement is included as a value in another IF statement or other function. For example, if the cell should remain empty until the student has entered a response, use the Nested IF Statement.
- Create the regular IF statement.
- Decide whether the Nested If Statement should be in the value\_if\_true portion or the value\_if\_false portion.
- For the example above, the Nested IF Statement should be in the value\_if\_false portion.
- Click in the desired value area.
- Enter **IF**(
- In the example above, click on the cell where the student is entering the information. The result of the logical test is **true** if the student has entered a number other than zero and **false** if they have not.
- Enter a comma and then the message surrounded by double quotation marks. (i.e. “**Try Again**”)
- Enter a comma and then a set of double quotations with nothing in the middle. (i.e. “”)
- Enter a closing parenthesis, ).
- Press the **Enter** key to finish the formula.

### **Using IS Functions in the IF Formula**

- The **IS** functions help in creating effective **IF** formulas.
- An **IS** function returns either **True** or **False**. This makes them very useable in the logical test of an **IF** formula.
- Some of the **IS** functions are:
  - **ISBLANK** – Returns **True** if the cell referred to is blank. Returns **False** is the cell if not blank.
  - **ISERROR** – Returns **True** if the cell referred to has errors. Returns **False** if the cell does not have errors.
  - **ISNONTTEXT** – Returns **True** if the cell referred to does not have text in it. Blank cells do not have text. Returns **False** if the cell contains only numbers.
  - **ISNUMBER** – Returns **True** if the cell referred to is a number. Returns **False** if the cell is not a number.
  - **ISTEXT** - Returns **True** if the cell referred to text. Returns **False** is the cell is not text.

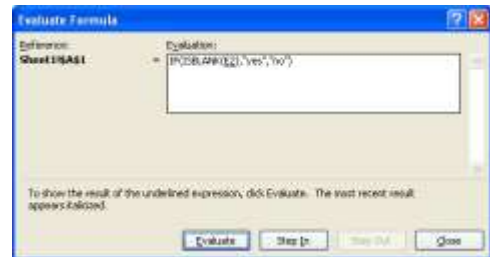
### Using IS Functions in an IF Formula

- Click in the cell the formula is to be in.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Function Library** group, click on the **Insert Function** button.
- OR click on the **Insert function** button on the **Input Line**.
- Click on **IF** in the **Select a function** box.
- If **IF** is not in the **Select a function** box:
  - Click on the down arrow to **Select a category**.
  - Choose **All**.
  - Scroll through the **Select a function** box and choose **IF**.
- Click on **OK**.
- **Logical Test**
  - The test is the condition that must be met. The computer measures whether it is true or false.
  - Enter the **IS** function to be used.
  - Type (, click on the cell(s) to refer to, and then type ).
  - For example, **ISBLANK(C16)** would test to see if cell C16 is blank.
- Enter the desired information in the **Value\_if\_true** box and the **Value\_if\_false** box.
- Click on **OK**.



### Evaluating a Formula

- Evaluating a formula allows the user to examine the formula one step at a time, seeing the results of the formula at each step.
- Click in the cell containing the formula to be evaluated.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Formula Auditing** group, click on the **Evaluate Formula** button.
- In the **Evaluation** window, the first portion of the formula is underlined.
- To evaluate or come up with the answer to the underlined portion of the formula, click on the **Evaluate** button. The result of the evaluation is shown in italics.
- To see the details of the next step of the formula, click on the **Step In** button.
- To come back out, click on the **Step Out** button.
- Continue clicking on the **Evaluate** button to work through the formula step by step.
- Each time the **Evaluate** button is clicked, the next calculation is performed and the resulting number replaces the formula in the **Evaluation** window.
- Click on the **Close** button when finished.



## Circular Reference

- **Circular Reference** refers to the mistake of including the cell where the formula is located in the cells used for the calculation. i.e. when the formula in cell E10 calculates the sum of cells E4 through E10.
- **Excel** works to prevent circular references by providing a warning message.

### Locating Circular References

- On the **Ribbon**, click on the **Formulas** tab.
- In the **Formula Auditing** group, click on the **Error Checking** down arrow.
- Move the cursor down to **Circular References** and a list of the cells with circular references appears.

## Tracing Dependents

- Tracing Dependents allows the user to find which cells use the selected cell in their formulas.
- Click in the cell in question.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Formula Auditing** group, click on the **Trace Dependents** button.
- Arrows are displayed from the selected cell to all cells which use it in their formulas.

## Tracing Precedents

- Tracing Precedents allows the user to find which cells are used in a formula.
- Click in the cell with the formula to be analyzed.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Formula Auditing** group, click on the **Trace Precedents** button.
- A box is drawn around the cells used in the formula and an arrow is displayed from the box to the cell with the formula.

## Removing Arrows

- Tracing Dependents or Tracing Precedents draws arrows and boxes on the spreadsheet.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Formula Auditing** group, click on the **Remove Arrows** button.

## Error Checking

- A spreadsheet can be quickly checked for errors.
- The types of errors checked can be changed by the user.
- Click on the **Microsoft Office Button** and then click on the **Excel Options** button at the bottom.
- Click on **Formulas** in the left pane.
- The choices are in the **Error Checking Rules** section.
- Click on **OK** when finished.

## Checking for Errors

- On the **Ribbon**, click on the **Formulas** tab.
- In the **Formula Auditing** group, click on the **Error Checking** button.
- Choose from the available options:
  - Help on this error
  - Show Calculation Steps...
  - Ignore Error
  - Edit in Formula Bar
- Make the desired choice.



## Calculation Steps...

- Begin checking for errors as noted above.
- Click on the **Show Calculation Steps...** button.
- Follow the steps noted above in the **Evaluating a Formula** section.

## Edit in Formula Bar

- Click on the **Edit in Formula Bar** button.
- Make corrections in the **Input Line**.
- Click on the **Resume** button.
- Continue checking for errors as needed.

## Types of Errors

- The types of errors displayed in Excel include:
  - ### - The column is too narrow to display the contents.
  - #VALUE! – The wrong type of argument or operand (operation such as multiplication) was used.
  - #DIV/0! – A number is being divided by zero (0).
  - #NAME? – Excel does not recognize the text in the formula.
  - #N/A – A value is not available to the formula.
  - #REF! – A cell reference is not valid.
  - #NUM! – Invalid numeric values are in the formula.
- Further explanation can be found in **Help** in Excel.

## The Watch Window

- The **Watch Window** toolbar allows the contents of selected cells to be monitored.
- On the **Ribbon**, click on the **Formulas** tab.
- In the **Formula Auditing** group, click on the **Watch Window** button.
- **Adding a Watch**
  - Click in the spreadsheet on the cell to be watched.
  - Click on the **Add Watch...** button in the **Watch Window**.
- **Deleting a Watch**
  - Click on the watch to be deleted.
  - Click on the **Delete Watch** button in the **Watch Window**.
- Cells can be watched in any spreadsheet that is open.

