

Mini Lesson: Logical Functions

Revised August 2016

An **IF function** is a function that checks whether a condition is met, returns one value if True and another value if False. The syntax for IF function is described below:

IF(logical_test, value_if_true, value_if_false), where:

- logical_test = condition you are testing
- value_if_true = text, numeric value, or formula if condition is true
- value_if_false = text, numeric value, or formula if condition is false

To test whether conditions are true or false, use logical operators. Examples of logical operators include:

- < less than
- greater than
- = equal to
- <= less than or equal to
- >= greater than or equal to
- not equal to

Text Example

For example, Jimmy received a grade of 85 (located in cell M2) and the passing grade is 65. To determine if his grade is a Pass or Fail using an IF function, the formula should be as follows:

- =IF(M2>65, "Pass", "Fail")
 - Which reads: If M2 is greater than 65, then he would “Pass” if the condition is true, and he would “Fail” if condition is false.

Enter the formula in cell N2.

Numeric Value Example

For example, Justin plays fetch with his dog named Jessie every day. Justin throws the stick five times a day and if Jessie makes three of those fetches or more, she gets a doggy treat. If she makes less than three, she gets no doggy treat. Yesterday Jessie made 4 (located in cell M7) of the fetches and today she made 2 (located in cell M8). To determine if Jessie gets 1 treat or 0 treat using an IF function, the formula should be as follows:

- = IF(M7>=3, 1, 0)
 - Which reads: If M7 is greater than or equal to 3, then Jessie gets 1 treat if the condition is true, and Jessie gets 0 or no treat if condition is false.
- = IF(M8>=3, 1, 0)
 - Which reads: If M8 is greater than or equal to 3, then Jessie gets 1 treat if the condition is true, and Jessie gets 0 or no treat if condition is false.

Enter the formula in cell N7 and N8.

Formula Example

For example, Jenny gets a commission of \$10 for each of the first ten shoes she sells and \$12 for every shoe she sells after that. Yesterday she sold 10 shoes (located in cell M7) and today she sold 15 shoes (located in cell M8). To determine how much commission she made using an IF function, the formula should be as follows:

- =IF(M13>10, 100+(M13-10)*12, (M13*10))
 - Which reads: If M13 is greater than 10, then she gets a commission of \$100 (from the first ten shoes she sold with a commission of \$10 each) plus the additional shoes she sells that exceeds ten multiplied by the new \$12 commission if condition is true, and she gets a commission of the amount of shoes she sells multiplied by \$10 commission per shoe if condition is false.
- =IF(M14>10, 100+(M14-10)*12, (M14*10))
 - Which reads: If M14 is greater than 10, then she gets a commission of \$100 (from the first ten shoes she sold with a commission of \$10 each) plus the additional shoes she sells that exceeds ten multiplied by the new \$12 commission if condition is true, and she gets a commission of the amount of shoes she sells multiplied by \$10 commission per shoe if condition is false.

Enter the formula in cell N13 and N14.

Click on the tab with the worksheet titled Activity 1 to begin.

Activity 1: Determining Pass/Fail using an IF Function

Ms. Kim has a total of 30 students in her Geometry class who recently took their Geometry final. She only wants to let her students know whether they passed or failed the exam. A score of 65 or higher is considered passing in her class. The name of her students and the points they received are given below. Using an IF function, determine whether or not each student passed or failed. Calculate the amount of students who passed, the amount of students who failed, and the average score in the class.

- Use “Pass” to express students who passed and “Fail” to express students who failed.

Name	Score
Detra Micek	65
Ignacio Rink	99
Genie Decastro	74
Rosemary Presgraves	56
Deanne Boatwright	63
Jessia Heyer	61
Fatimah Drewes	95
Lara Robare	75
Michaela Koll	87

Edyth Milby	91
Arlen Holston	67
Bulah Mckell	100
Demetrius Mitra	59
Lyndsay Yeatman	87
Virgina Howse	82
Chance Lockley	90
Harley Zito	84
Corene Greenidge	65
Alica Rippy	97
Katharina Greco	72
Johna Erskine	100
Megan Paton	70
Jan Sessoms	95
Kimberlie Monson	92
Millicent Kukowski	88
Katrina Quillin	76
Sammy Lozoya	62
Ma Alexis	74
Rosette Conniff	100
Armanda Indelicato	99

Directions:

- Create a copy of the current worksheet and rename the worksheet "Activity 1 Solution."
- Use the COUNTA Function in cell D35 to double check that there are 30 students.
- Select cells B4:B33 and sort A-Z.
- Type in the given test scores to match where the name of the student is.
- Center align cells C4:C33.
- Enter the IF Function formula in cell D4 that will determine whether the students passed or failed. Use "Pass" to express students who passed and "Fail" to express students who failed.
- Use the Fill Handle on cell D4 to apply to cells D5:D33.
- Center align cells D4:D33.
- Select cell D36, then use the COUNTIF Function from cells D4:D33 to determine how many students passed.
- Select cell D37, then use the COUNTIF Function from cells D4:D33 to determine how many students failed.
- Select cell D38, then use the Average Function from cells C4:C33 to determine the average score.
- Format cell D38 to Number with 2 decimal places.
- Merge and Center cells C35:D35, C36:D36, C37:D37, and B38:D38.
- Right align cells B35:B38.

- o. Change column width for column B to 20 and change column width for columns C and D to 15.
- p. Insert row above row 3.
- q. Merge and Center cells B3:B4, C3:C4, and D3:D4.
- r. Use Thick Box Border for cell areas B3:D39, B3:B4, C3:C4, D3:D4, B5:B34, C5:C34, D5:D34, and B36:D39.
- s. Change cells B3:D4 to Bold Font and font size 14.
- t. Fill color for cell areas B3:B4 and B35:D35 to Light Green.
- u. Change cells B36:B39 to Bold Font.
- v. Use red font across columns B through D for students who failed.
- w. Save file as IF Function XX, where XX are you your initials.
- x. Click on the tab for the worksheet titled Activity 2 to continue.

Activity 2: Determining Letter Grade using an IF Function

Ms. Kim decides that she wants to give her students a letter grade instead. The table below details Ms. Kim's grading policy. Use this table to create and IF function that will determine letter grades for each student.

IF SCORE IS	LETTER GRADE
Greater than 89	A
From 80 to 89	B
From 70 to 79	C
From 60 to 65	D
Less than 65	F

Directions:

- a. Create a copy of the current worksheet and rename the worksheet "Activity 2 Solution."
- b. Insert column between Score and Pass/Fail.
- c. Select cell D4, then title the new column "Grade."
- d. Enter an IF Function formula in cell D5 that will calculate the letter grade. IF(B3>89, "A"), IF(B3>=80, "B"... etc.)
- e. Use the Fill Handle on cell D5 to cells D6:D34.
- f. Use Thick Box Borders from cells D5:D34.
- g. Use red font across columns B:E for students who have an "F" as their letter grade.
- h. Insert a Header and type your full name on the top right corner. Use the undo command (hold down on CTRL and Z) to return to the normal Excel spreadsheet layout.
- i. Set Margins to 1 for Top, Bottom, Left, and Right.
- j. Set Print Area from cells A1:E39.
- k. Print Preview this current worksheet. On Print Preview, you should see this current table and your name on the top right hand corner.

- l. Print this current worksheet ONLY.
- m. Save file.
- n. Click on the tab for the worksheet titled Activity 3 to continue.

Activity 3: Determining Over Budget/Within Budget using an IF Function

Suppose you wanted to review all of your spending for the prior year to determine how often you were within or exceeded your monthly budget. Last year you earned a weekly pay of \$770 and every month consisted of four weeks except for March, June, September, and December, which consisted of five weeks instead. Determine your monthly budget, the amount of times you exceeded your budget, amount of times you remained within your budget, and your total yearly spending.

- Use an IF function to determine whether you did or did not exceed your monthly budget. Use "Over budget" to express exceeding your monthly budget and "Within budget" to express remaining within your monthly budget.

Directions:

- a. Create a copy of the current worksheet and rename the worksheet "Activity 3 Solution."
- b. Type your name in cell B3.
- c. Type in the prior year in cell B4.
- d. Type in January in cell B6.
- e. Use the Fill Handle to fill in the rest of the months from cells C7:C17.
- f. Insert a comment in the cells with the months of March, June, September, and December that state there were 5 weeks during those months.
- g. Enter formula in cell D21 to calculate Monthly Net Pay for four weeks.
- h. Enter formula in cell D22 to calculate Monthly Net Pay for five weeks.
- i. Enter an IF function formula with an absolute cell reference to the Monthly Net Pay for four weeks in cells D6, D7, D9, D10, D12, D13, D15, and D16 to calculate whether these months were "Within budget" or "Over budget."
- j. Enter an IF function formula with an absolute cell reference to the Monthly Net Pay for five weeks in cells D8, D11, D14, and D17 to calculate whether these months were "Within budget" or "Over budget."
- k. Use AutoSum to select cells C6:C17 to calculate the Total Yearly Spending in cell C18.
- l. Use the Countif function to select cells D6:D17 to determine how many times you were "Within budget" in cell D24.
- m. Use the Countif function to select cells D6:D17 to determine how many times you were "Over budget" in cell D25.
- n. Use Thick Box Borders to surround cells B3:D25 and B3:D4.
- o. Merge and center row 1 and 2 across columns B through D.
- p. Change cells B3:D4, B5:D5, and B18 to Bold Font.
- q. Center align B5:D5 and C6:D17.

- r. Set column width to 15 for columns B through D.
- s. Fill color for cell areas B3:D4, B19:D19, and B23:D23 to Light Green.
- t. Right align cell B18.
- u. Format cells C6:C17 and D20:D22 to Currency with 0 decimal places and \$ symbol.
- v. Underline cell C17.
- w. Use Bottom Border for cells B5:D5, B18:D18, B19:D19, B22:D22, and B23:D23.
- x. Merge and right align cells B20:C20, B21:C21, B22:C22, B24:C24, and B25:C25.
- y. Use red font for the rows that were over budget.
- z. Save file.