

FIT1013 - Week 3 Resources

Advanced functions in Excel

Week 3 Resources

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Reference:

Microsoft Excel 2016, New Perspectives Series, Parsons, Oja, Carey,
Desjardins Comprehensive Edn., Cengage Learning, **Module 8**

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1. Objectives

- Use the IF, AND and OR functions
- Nest the IF function
- Use the VLOOKUP, HLOOKUP, IFERROR functions
- Use conditional formatting
- Summarise data using the COUNTIF, SUMIF, and AVERAGEIF functions

2. Use the IF, AND and OR functions

Working with Logical Functions

- Logical functions (IF, AND, and OR) determine whether a condition is true or false
- Conditions use a comparison operator (<, <=, =, <>, >, or >=) to compare two values
- Combine two or more functions in one formula to create more complex conditions
- To effectively communicate a table's function, keep the following guidelines in mind when creating fields in an Excel table:
 - Create fields that require the least maintenance
 - Store smallest unit of data possible in a field
 - Apply a text format to fields with numerical text data
- Using the IF Function
 - A logical function that evaluates a single condition and results in only one value
 - Returns one value if the condition is true and another value if the condition is false
 - Syntax:

IF(logical_test, value_if_true, value_if_false)

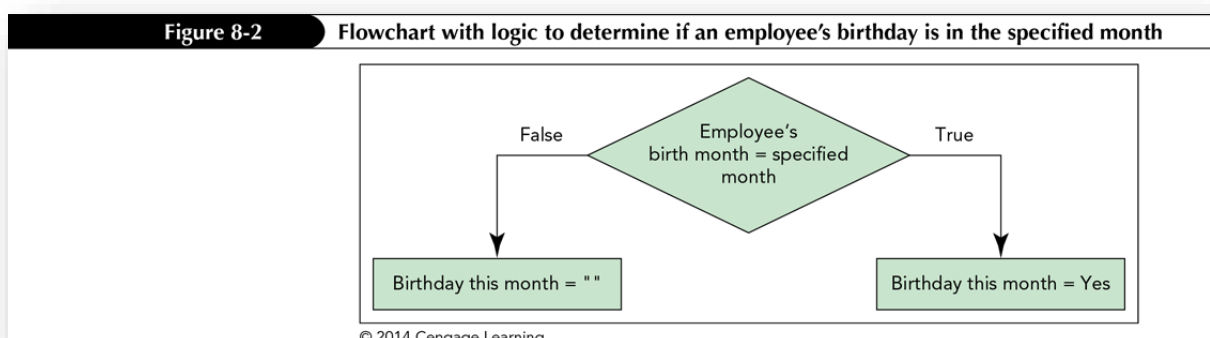


Figure 8-3 Function Arguments dialog box for the IF function

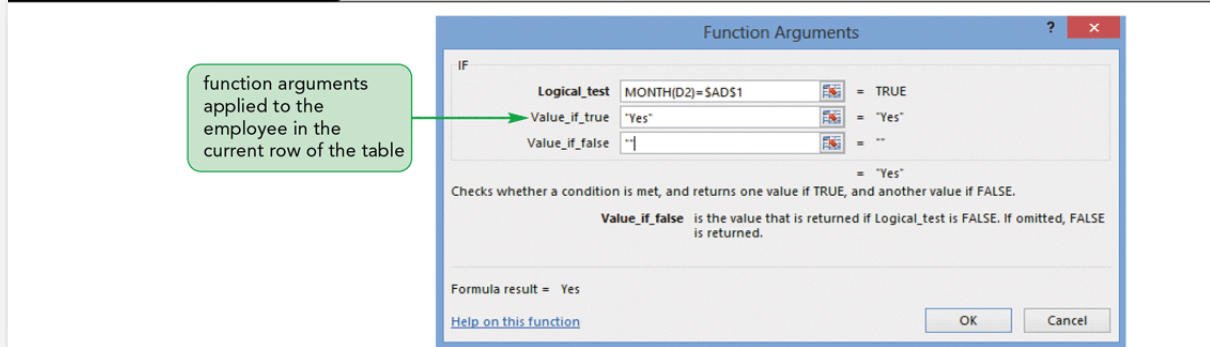


Figure 8-4 Birthday Month column added to the Employee table

formula for the Birthday Month column

calculated column

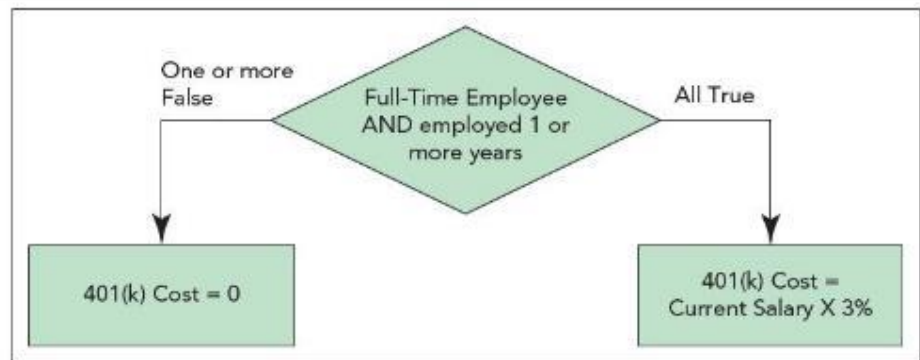
all rows in column N are filled with the IF function

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|----|--------|-----------|-----------|------------|--------|----------|------------|-------------|----------------|--------------|-------------|-----|---------------|----------------|
| | Emp ID | Last Name | Hire Date | Birth Date | Gender | Location | Job Status | Perf Rating | Current Salary | Medical Plan | Dental Plan | Age | Years Service | Birthday Month |
| 2 | 1002 | Lowe | 5/24/2010 | 9/6/1966 | F | NY | FT | 3 | \$ 108,706 | SPOUSE2500 | EMP+SPOUSE | 49 | 6.6 | Yes |
| 3 | 1006 | Forbes | 8/28/2014 | 12/15/1985 | F | SF | FT | 2 | \$ 75,818 | NONE | NONE | 30 | 2.3 | |
| 4 | 1010 | Speulda | 4/24/2015 | 9/24/1968 | M | SF | FT | 2 | \$ 46,143 | FAMILY1000 | EMP+FAMILY | 47 | 1.7 | Yes |
| 5 | 1014 | Hunt | 7/18/2014 | 8/9/1959 | M | NY | FT | 3 | \$ 84,000 | | | 56 | 2.5 | |
| 6 | 1018 | Hanson | 8/21/2015 | 7/15/1950 | F | NY | FT | 1 | \$ 68,400 | | | 65 | 1.4 | |
| 7 | 1022 | Philo | 3/5/2015 | 5/2/1958 | F | SF | FT | 2 | \$ 130,200 | | | 57 | 1.8 | |
| 8 | 1026 | Stolt | 3/1/2013 | 12/7/1977 | M | SF | FT | 3 | \$ 101,800 | | | 38 | 3.8 | |
| 9 | 1030 | Akhalaghi | 12/8/2015 | 12/4/1961 | F | NY | FT | 2 | \$ 38,421 | SPOUSE1000 | EMP+SPOUSE | 54 | 1.1 | |
| 10 | 1034 | Vankeuren | 8/11/2011 | 1/10/1959 | F | NY | PT | 3 | \$ 53,582 | FAMILY1000 | EMP+FAMILY | 56 | 5.4 | |
| 11 | 1038 | McCorkle | 6/12/2009 | 1/30/1942 | F | AT | FT | 2 | \$ 24,373 | FAMILY2500 | EMP+FAMILY | 73 | 7.6 | |

- Using the AND Function
 - A logical function that tests two or more conditions (up to 255) and determines whether all conditions are true
 - Returns the value TRUE if all logical conditions are true and the value FALSE if any or all logical conditions are false
 - Syntax:

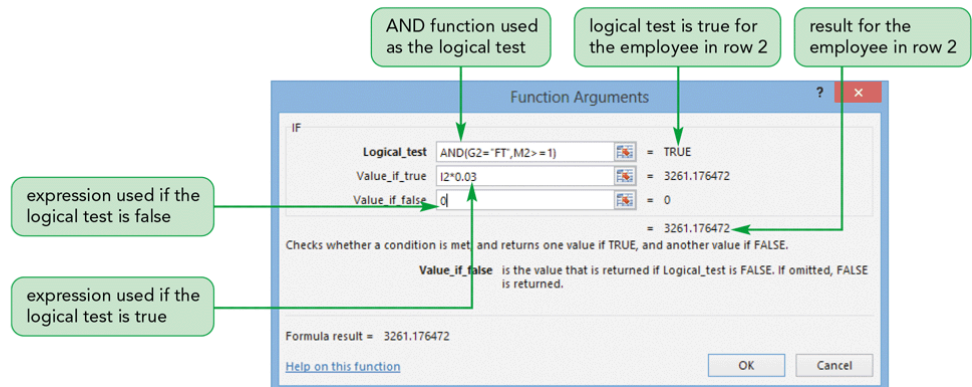
AND(logical1[,logical2]...)

Figure 8-6 Flowchart illustrating AND logic for the 401(k) benefit



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Figure 8-8 Function Arguments dialog box for the IF function with the AND function

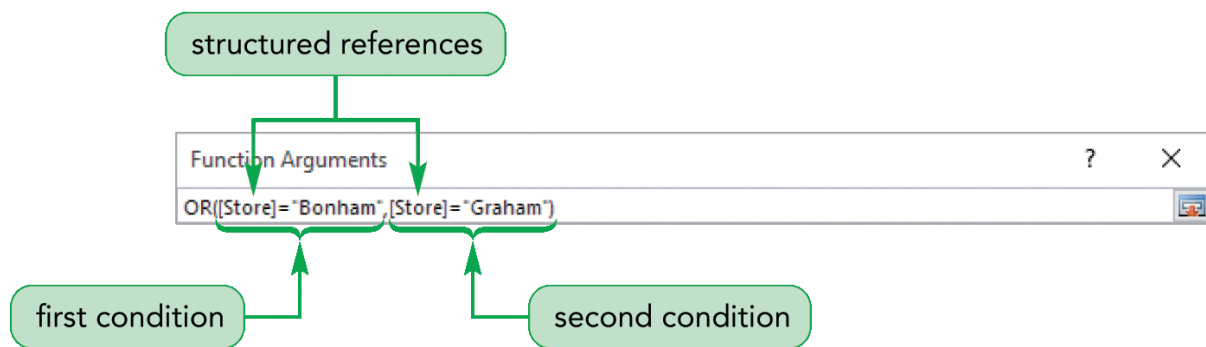


- Using the OR Function
 - A logical function that returns a TRUE value if any of the logical conditions (up to 255) are true and a FALSE value if all the logical conditions are false
 - Syntax:

OR(logical1[,logical2]...)

Using Structured References to Create Formulas in Excel Tables

- Replace specific cell or range address with a structured reference, the actual table name, or a column header
- A formula that includes a structured reference can be fully qualified or unqualified



Examples:

Unqualified structured reference: [Current Salary], [Store], [Job Status] etc.

Qualified structured reference: EmployeeTbl[Current Salary], EmployeeTbl[Store], etc.

Structured References

- <https://www.youtube.com/watch?v=NBLtGWVyXmo>
 - 8.3 mins
- <https://support.office.com/en-us/article/Using-structured-references-with-Excel-tables-f5ed2452-2337-4f71-bed3-c8ae6d2b276e>
 - Useful explanation and examples on how to use Structured References

3. Nest the IF function

Creating Nested Ifs

- To allow for three or more outcomes
- One IF function is placed inside another IF function to test an additional condition
- More than one IF function can be nested

Purpose: To determine the outcome of football games for the home team

Logic Scenario: Display Won, Lost, or Tie based on home team and visitor team scores

Formula: Nested IF functions
`=IF(B1>B2,"Won",IF(B2>B1,"Lost","Tie"))`

Data: cell B1 stores the home team score
cell B2 stores the visitor team score

Example:

| Data | | Condition1 | Condition2 | Results |
|----------------|----------------|-----------------|-----------------|------------------|
| <u>Cell B1</u> | <u>Cell B2</u> | <u>B1>B2</u> | <u>B2>B1</u> | <u>(Outcome)</u> |
| 21 | 18 | True | Not evaluated | Won |
| 17 | 24 | False | True | Lost |
| 9 | 9 | False | False | Tie |

Figure 8-17 Additional example of nested IF functions

Purpose: To determine the fee for a driver's license

Logic Scenario: Driver's license fee varies by age
 Below 16 "Too Young"
 16–45 \$30
 46–60 \$25
 61 and older \$20

Formula: Nested IF functions
`=IF(B1<16,"Too Young",IF(B1<=45,30,IF(B1<=60,25,20)))`

Data: cell B1 stores the driver's age

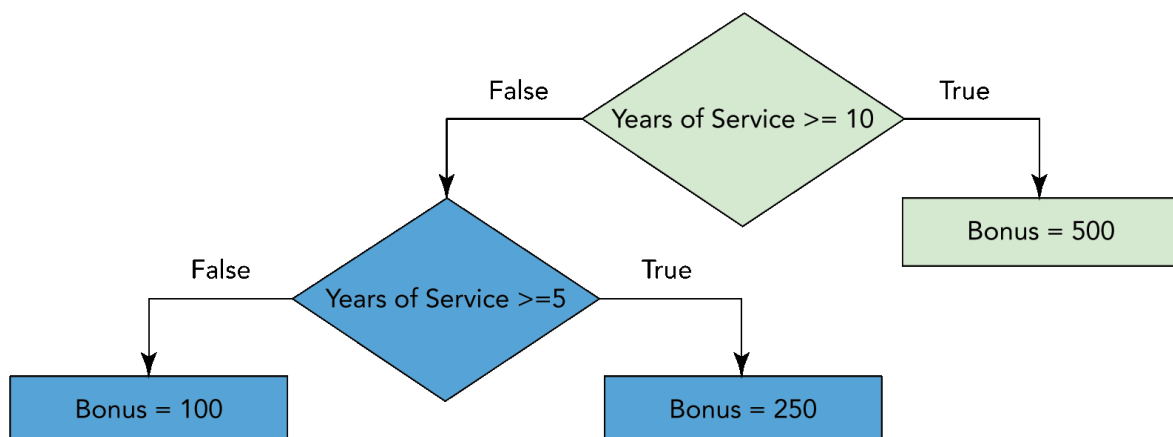
Example:

| Data | Condition1 | Condition2 | Condition3 | Results |
|----------------|-----------------|------------------|------------------|--------------|
| <u>Cell B1</u> | <u>B1<16</u> | <u>B1<=45</u> | <u>B1<=60</u> | <u>(Fee)</u> |
| 15 | True | Not evaluated | Not evaluated | Too Young |
| 25 | False | True | Not evaluated | 30 |
| 55 | False | False | True | 25 |
| 65 | False | False | False | 20 |

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- The following formula and flowchart convey the same nested IF function

`=IF([Years of Service]>=10,500, IF([Years of Service]>=5, 250, 100))`



4. Use the VLOOKUP, HLOOKUP, IFERROR functions

Using LOOKUP Functions

- Lookup functions allow you to use tables of data to find values in a table and insert them in another worksheet location
- Both the VLOOKUP and HLOOKUP functions are used to return a value from a lookup table
 - The VLOOKUP function always searches for a value in the first column of the lookup table
 - The HLOOKUP function always searches for a value in the first row of the lookup table
- Lookup tables can be constructed as either exact match or approximate match lookups
 - Exact match lookup occurs when the lookup value must match one of the values in the first column (or row) of the lookup table
 - An approximate match lookup occurs when the lookup value is found within a range of numbers in the first column (or row) of the lookup table
- Using the VLOOKUP Function to Find an Exact Match
 - Searches vertically down the first column of the lookup table
 - Syntax:

VLOOKUP(lookup_value,table_array,col_index_num[range_lookup])



- Using the VLOOKUP Function to Find an Approximate Match
 - Returns a value based on an approximate match lookup in the first column of the table
 - The values in the first column or row of a lookup table can represent a range of values
 - Quantity discounts, shipping charges, and income tax rates are a few examples of approximate match lookups

Using the IFERROR Function

- Error values
 - Indicate that an element in a formula or a cell referenced in a formula is preventing Excel from returning a calculated value
 - Begin with a number sign (#) followed by an error name that indicates the type of error
- Displays a more descriptive message that helps users fix the problem
- Can determine if a cell contains an error value and then display the message you choose rather than the default error value
- Use the IFERROR function to find and handle formula errors

- Syntax: IFERROR(expression,valueIfError)

VLOOKUP function cannot find All in the Supplier Name or Specialty Store lookup tables

data entry error

resulting error value

| Part Number | Product Category | Description | Supplier Name | Specialty |
|-------------|------------------|----------------------|----------------------------|------------------|
| 43 | 4005 | Jewelry Making | Gold Earring Wires | Stones and Glass |
| 44 | 4010 | Floral Crafting | 1-1/2" Scissors | Silk Flowers |
| 45 | 4020 | Quilting | 2-1/2" Scissors | Fabric Stores |
| 46 | 4022 | Yarn Crafting | Light Green Yarn 8 oz | Yarn House |
| 47 | 4030 | All | 3-1/2" Scissors | #N/A |
| 48 | 4040 | Model Ship Building | Cement | Hobby Warehouse |
| 49 | 4050 | Model Train Building | Glue | Hobby Warehouse |
| 50 | 4105 | Jewelry Making | Silver Earwire Spacer Bead | Stones and Glass |
| 51 | 4111 | Quilting | Ruler - 2 X 2 grid | Fabric Stores |
| 52 | 4210 | Floral Crafting | Silk Fall Leaves Stem | Silk Flowers |
| 53 | 4280 | Floral Crafting | Begonia Stem | Silk Flowers |
| 54 | 4502 | Jewelry Making | 3-Way Connector Gold | Stones and Glass |
| 55 | 4510 | Model Ship Building | USS Constitution | Hobby Warehouse |
| 56 | 4540 | Floral Crafting | Daisy Stem | Silk Flowers |
| 57 | 4820 | Model Ship Building | CVN-77 GHW Bush | Hobby Warehouse |
| 58 | 4910 | Model Train Building | Union Pacific Big Boy | Hobby Warehouse |
| 59 | 5000 | Dressmaking | White Silk - Bolt | Fabric Stores |
| 60 | 5002 | Quilting | Pins - glass head - 250 | Fabric Stores |
| 61 | 5005 | Jewelry Making | Lobster Clasps | Stones and Glass |

Ref for use

=IFERROR(VLOOKUP(B47,Product_Suppliers,2,FALSE),"Various")

| Part Number | Product Category | Description | Supplier Name | Specialty St | F |
|-------------|------------------|----------------------|--|------------------|---------|
| 18 | 2100 | Model Train Building | Standard Gauge Pullman Observation Car | Hobby Warehouse | Bonham |
| 19 | 2105 | Jewelry Making | Seed Beads Blue | Stones and Glass | Bowie |
| 20 | 2111 | Quilting | Flannel - Flower Patch Black - Bolt | Fabric Stores | Garland |
| 21 | 2120 | Yarn Crafting | Light Yellow Yarn - 8oz | Yarn House | Graham |
| 22 | 2190 | Quilting | White Cotton Quilt Back | Fabric Stores | Garland |
| 23 | 2191 | Quilting | Muslin Quilt Back | Fabric Stores | Garland |
| 24 | 2200 | Model Train Building | Standard Gauge Coal Hopper Car | Hobby Warehouse | Bonham |
| 25 | 2230 | Yarn Crafting | Royal Blue Yarn 8oz | Yarn House | Graham |
| 26 | 2300 | Model Train Building | O Gauge Caboose - Red | Hobby Warehouse | Bonham |
| 27 | 2310 | Yarn Crafting | Light Blue Yarn 8oz | Yarn House | Graham |
| 28 | 2430 | Yarn Crafting | Variegated Blue Yarn 8oz | Yarn House | Graham |
| 29 | 2502 | Jewelry Making | Crimp Beads Silver | Stones and Glass | Bowie |
| 30 | 2503 | Yarn Crafting | Beige Yarn 8oz | Yarn House | Graham |
| 31 | 2510 | Model Ship Building | Wooden Flying Dutchman | Hobby Warehouse | Bonham |
| 32 | 3005 | Jewelry Making | Beeswax | Stones and Glass | Bowie |
| 33 | 3022 | Yarn Crafting | Set Metal Knitting Needles | Yarn House | Graham |
| 34 | 3105 | Jewelry Making | Fish Hook Wire | Stones and Glass | Bowie |
| 35 | 3111 | Quilting | Flannel - Flower Patch Blue - Bolt | Fabric Stores | Garland |
| 36 | 3210 | Floral Crafting | Silk Poinsetta Stem | Silk Flowers | Bowie |
| 37 | 3280 | Floral Crafting | Anemone Stem | Silk Flowers | Bowie |
| 38 | 3502 | Jewelry Making | Crimp Beads Gold | Stones and Glass | Bowie |
| 39 | 3510 | Model Ship Building | Pirates of the Caribbean | Hobby Warehouse | Bonham |
| 40 | 3540 | Floral Crafting | Chrysanthemum Stem | Silk Flowers | Bowie |
| 41 | 3820 | Model Ship Building | CVN-78 Gerald Ford | Hobby Warehouse | Bonham |
| 42 | 4000 | Dressmaking | Tape Measure | Fabric Stores | Garland |
| 43 | 4005 | Jewelry Making | Gold Earring Wires | Stones and Glass | Bowie |
| 44 | 4010 | Floral Crafting | 1-1/2" Scissors | Silk Flowers | Bowie |
| 45 | 4020 | Quilting | 2-1/2" Scissors | Fabric Stores | Garland |
| 46 | 4022 | Yarn Crafting | Light Green Yarn 8 oz | Yarn House | Graham |
| 47 | 4030 | All | 3-1/2" Scissors | Various | Various |
| 48 | 4040 | Model Ship Building | Cement | Hobby Warehouse | Bonham |
| 49 | 4050 | Model Train Building | Glue | Hobby Warehouse | Bonham |

Activity 1

Convert the following criteria used to determine a student's degree classification to a table that can be used in a VLOOKUP function to display the level of each student:

| Marks | Classification |
|---------------|-----------------|
| >=0 and <=50 | Fail |
| >=51 and <=60 | Ordinary Degree |
| >=61 and <=70 | Second Lower |
| >=71 and <=90 | Second Upper |
| >=91 | First Class |

Answer:

| Marks | Classification |
|-------|-----------------|
| 0 | Fail |
| 51 | Ordinary Degree |
| 61 | Second Lower |
| 71 | Second Upper |
| 91 | First Class |

Exercise

Which function could be used with the following Sales Tax Rate table to display the sales tax rate for a customer in one of these four states?

| State | VIC | NSW | QLD | WA |
|----------------|-----|-----|-----|------|
| Sales Tax Rate | 10% | 7% | 9% | 9.5% |

Answer: HLOOKUP

5. Use conditional formatting

Visual Overview: Conditional Formatting and Functions

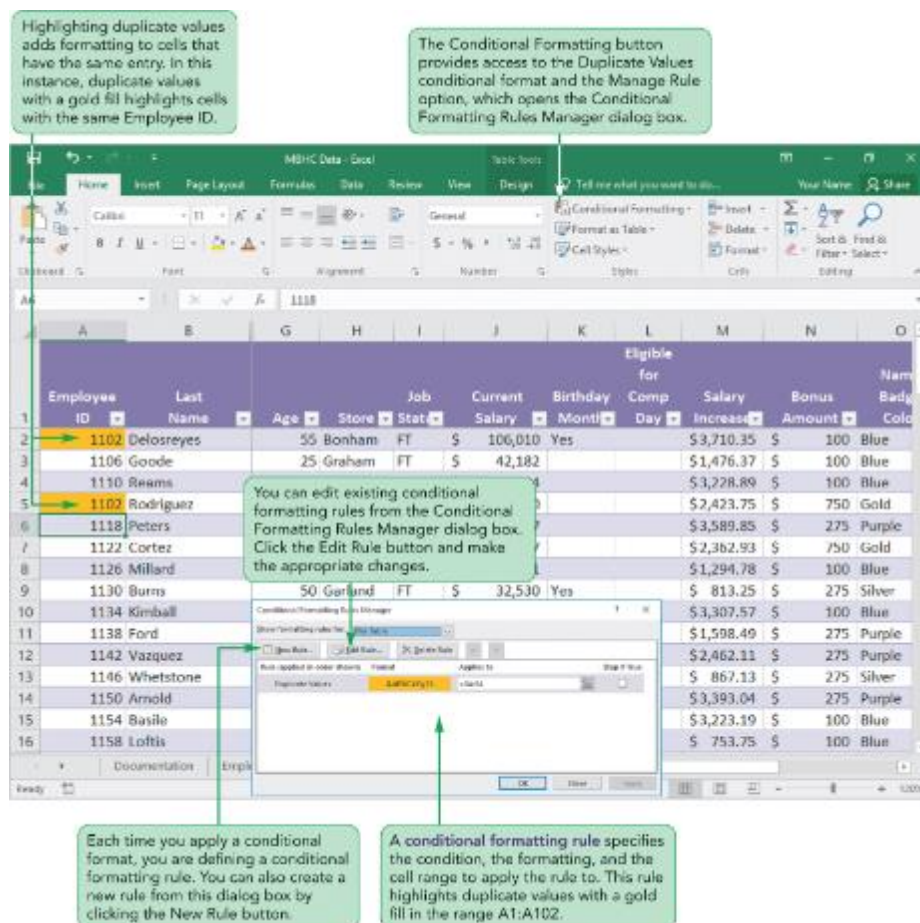
Highlighting duplicate values adds formatting to cells that have the same entry. In this instance, duplicate values with a gold fill highlights cells with the same Employee ID.

The Conditional Formatting button provides access to the Duplicate Values conditional format and the Manage Rule option, which opens the Conditional Formatting Rules Manager dialog box.

You can edit existing conditional formatting rules from the Conditional Formatting Rules Manager dialog box. Click the Edit Rule button and make the appropriate changes.

Each time you apply a conditional format, you are defining a conditional formatting rule. You can also create a new rule from this dialog box by clicking the New Rule button.

A conditional formatting rule specifies the condition, the formatting, and the cell range to apply the rule to. This rule highlights duplicate values with a gold fill in the range A1:A102.



This formula uses fully qualified structured references to make it easier to create and understand.

The **AVERAGEIF** function calculates the average of values in a range that match criteria you specify, such as calculating the average salary paid to employees in each of the four stores.

| Location | Total Employees | Total Salary | Average Salary |
|----------|-----------------|--------------|----------------|
| Bonham | 17 | \$ 1,490,304 | \$ 87,665 |
| Bowie | 13 | \$ 1,076,702 | \$ 82,823 |
| Garland | 23 | \$ 1,129,314 | \$ 49,101 |
| Graham | 48 | \$ 3,580,464 | \$ 74,593 |

The **COUNTIF** function calculates the number of cells in a range that match criteria you specify, such as counting the number of company employees located in Bonham.

The **SUMIF** function adds the values in a range that match criteria you specify, such as adding the total salary paid in Bonham.

Applying Conditional Formatting

- Changes a cell's formatting when its contents match a specified condition
- Can be used to:
 - Highlight cells based on their values
 - Add data bars that graph relative values in a range
 - Highlight duplicate values in a column of data
- Highlighting Duplicate Values
 - Excel is often used to manage lists of data, such as:
 - Employee information
 - Inventory
 - Phone numbers
 - Some of the data is unique for each record, such as an employee ID or a social security number
 - One way to identify unintended duplicate entries is to use conditional formatting to highlight duplicate values in a range with a font and/or fill color

duplicate value is highlighted in red

| Employee ID | Last Name | First Name | Hire Date | Years of Service | Birth Date | Age | Store |
|-------------|------------|------------|-----------|------------------|------------|-----|--------|
| 1102 | Delosreyes | Lori | 7/10/2014 | 3.5 | 4/11/1961 | 55 | Bonham |
| 1106 | Goode | Bari | 11/6/2015 | 2.2 | 11/23/1991 | 25 | Graham |
| 1110 | Reams | Linda | 12/4/2015 | 2.1 | 10/15/1966 | 50 | Bonham |
| 1102 | Rodriguez | Richard | 3/24/2003 | 14.8 | 12/8/1964 | 52 | Graham |
| 1118 | Peters | Jessica | 5/23/2011 | 6.6 | 2/15/1962 | 54 | Bonham |

- Using the Conditional Formatting Rules Manager
 - A conditional formatting rule specifies:
 - Type of condition
 - Type of formatting when that condition occurs
 - Cell or range the formatting is applied to
 - Use Conditional Formatting Rules Manager dialog box to edit existing conditional formatting rules
- Changes a cell's formatting when its contents match a specified condition
- Can be used to:
 - Highlight cells based on their values
 - Add data bars that graph relative values in a range
 - Highlight duplicate values in a column of data

| on | Location | Appraised Value |
|----|---------------|-----------------|
| t | East Pavilion | \$ 18,000 |
| t | East Pavilion | \$ 10,000 |
| t | East Pavilion | \$ 2,400 |
| t | Courtyard | \$ 52,000 |
| t | East Pavilion | \$ 8,000 |
| | East Pavilion | \$ 700 |
| t | East Pavilion | \$ 1,200 |
| t | East Pavilion | \$ 1,900 |
| t | East Pavilion | \$ 3,000 |
| t | East Pavilion | \$ 800 |
| t | East Pavilion | \$ 975 |
| | East Pavilion | \$ 8,000 |

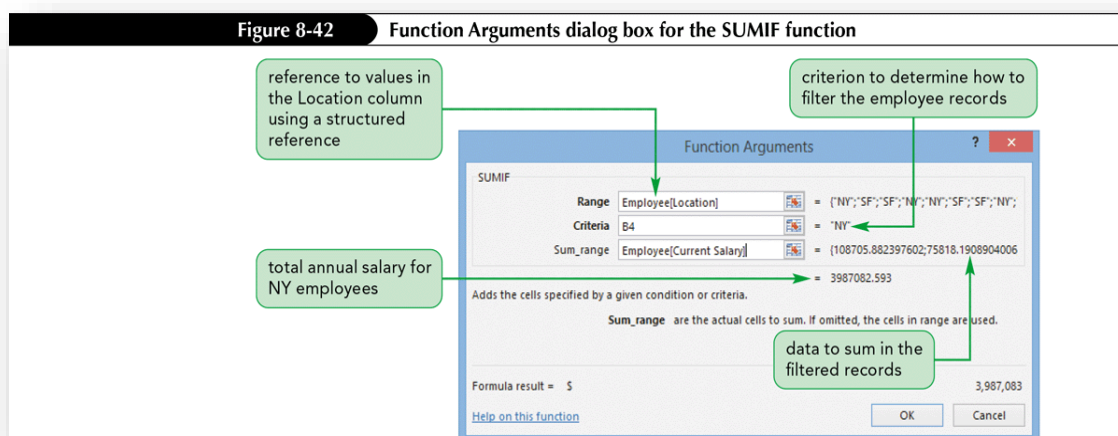
6. Summarise data using the COUNTIF, SUMIF, and AVERAGEIF functions

Using Functions to Summarize Data Conditionally

- Use COUNTIF, SUMIF, and AVERAGEIF functions to calculate a conditional count, sum, or average using only cells that meet a particular condition
- Using the COUNTIF Function
 - Calculates the number of cells in a range that match specified criteria
 - Sometimes referred to as a **conditional count**
 - Syntax: COUNTIF(*range*, *criteria*)

| Formula | Explanation of Formula | Result |
|-----------------------------|--|--------|
| =COUNTIF(H2:H101,"Bonham") | Number of employees in Bonham | 17 |
| =COUNTIF(H2:H101,H3) | Number of employees in cell H3 (Graham) | 48 |
| =COUNTIF(J2:J101,<50000) | Number of employees with salary <50000 | 22 |
| =COUNTIF(J2:J101,">=" & J2) | Number of employees with salary >= value in cell J2 (106010) | 7 |

- Using the SUMIF Function
 - Adds values in a range that meet your criteria
 - Also called a **conditional sum**
 - Syntax: SUMIF(*range*, *criteria*, *sum_range*)



- Using the AVERAGEIF Function
 - Similar to SUMIF function
 - Calculates the average of values in a range that meet criteria you specify
 - Syntax: AVERAGEIF(*range*, *criteria*, *average_range*)

Figure 8-43 Function Arguments dialog box for the AVERAGEIF function

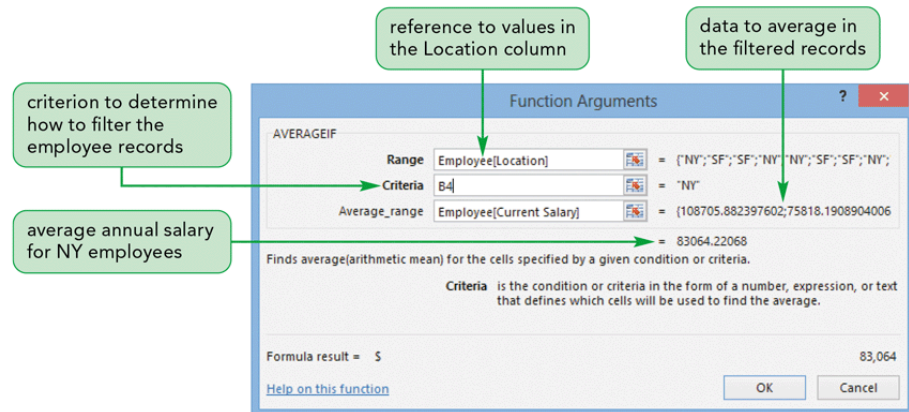


Figure 8-44 Completed Location Analysis report

The screenshot shows the Excel interface with the "Completed Location Analysis report" open. The formula bar displays the formula: `=AVERAGEIF(Employee[Location],B5,Employee[Current Salary])`. The report table is as follows:

| Location Summary | | | | |
|------------------|----------|---------------|--------------|----------------|
| | Location | Nbr Employees | Total Salary | Average Salary |
| 4 | NY | 48 | \$ 3,987,083 | \$ 83,064 |
| 5 | SF | 17 | \$ 1,917,420 | \$ 112,789 |

Callouts indicate:

- "completed AVERAGEIF function" points to the formula bar.
- "average salary of employees located in SF" points to the value \$ 112,789 in the table.

Exercise

Explain what the following formula calculates:

=AVERAGEIF(Employee[Age], ">50", Employee[Current Salary])

Answer: It calculates the average salary for all employees over age 50.

To display the number of employees working in Dallas (DA), which function would you use?

- a. VLOOKUP
- b. COUNTIF
- c. IF
- d. COUNT

Answer: b

Using the CHOOSE function (see Grades.xlsx)

CHOOSE(index_num,value1,value2,...)

- **Index_num** specifies which value argument is selected. Index_num must be a number between 1 and 254, or a formula or reference to a cell containing a number between 1 and 254.
- If index_num is 1, CHOOSE returns *value1*; if it is 2, CHOOSE returns *value2*; and so on.
- If index_num is less than 1 or greater than the number of the last value in the list, CHOOSE returns the #VALUE! error value.
- If index_num is a fraction, it is truncated to the lowest integer before being used.
- **Value1,value2,...** are 1 to 254 value arguments from which CHOOSE selects a value or an action to perform based on index_num. The arguments can be numbers, cell references, defined names, formulas, functions, or text.
- Uses index_num to return a value from the list of value arguments. Use CHOOSE to select one of up to 254 values based on the index number. For example, if value1 through value7 are the days of the week, CHOOSE returns one of the days when a number between 1 and 7 is used as index_num.
- E.g. [Grades.xlsx](#) (Choose worksheet)
- =CHOOSE(WEEKDAY(B3,2),"Mon","Tues","Wed","Thurs","Fri","Sat","Sun")
- WEEKDAY(3/8/2010,2) = 2
 - Converts the date in cell B3 to the corresponding number of a day of the week
 - E.g. WEEKDAY(B3,2) =
- =CHOOSE(WEEKDAY(B3,2),"Mon","Tues","Wed","Thurs","Fri","Sat","Sun")
 - Converts the number into the name of the day of the week
 - E.g. CHOOSE(3,"Mon","Tues","Wed","Thurs","Fri","Sat","Sun") = Wed

Advanced Filters

See Excel New Perspectives Appendix B (B2-B5)

If **two or more** columns/fields are required in the filter and **ALL conditions** must be satisfied, then applying Custom autofilters to each field in turn will suffice (e.g. Garage=Oak AND Status=O)

However if **two or more** fields/columns are required with **at least one OR** conjunction then the Advanced Filter command should be used.

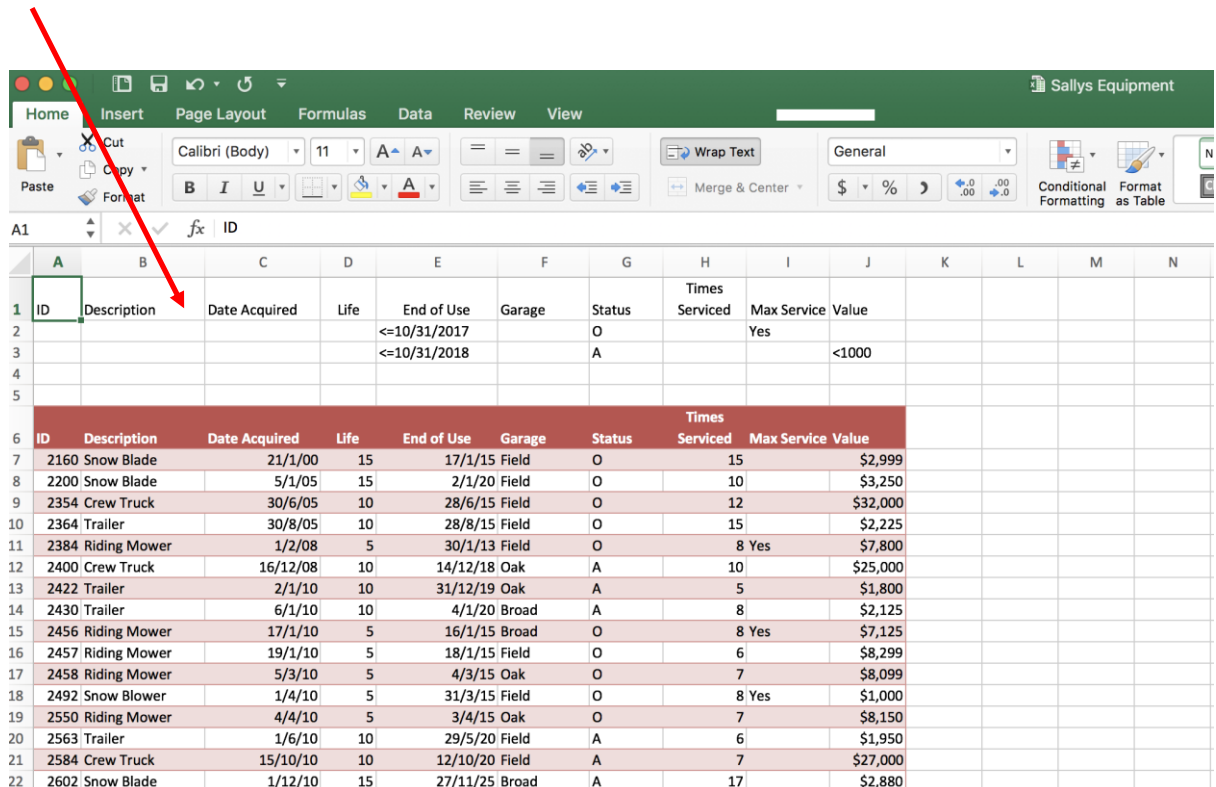
e.g. (Garage=Oak AND Status=O) OR (Garage=Oak AND Times Service >3)

Example file: [Sallys Equipment](#)

To use advanced filter

- Set up a criteria range, separate from the table or structured range (above is a good idea).
- The column headings in the criteria range must comprise one or more of the columns in the table.
(A good idea is to make a copy of the table column headings wherever you want to locate the criteria).

Set up a criteria region



The screenshot shows an Excel spreadsheet with a table of equipment data. The criteria range is set up in cells A1:B2, with a red arrow pointing to it from the 'Set up a criteria region' header.

| ID | Description | Date Acquired | Life | End of Use | Garage | Status | Times Serviced | Max Service | Value |
|------|--------------|---------------|------|------------|--------|--------|----------------|-------------|----------|
| 2160 | Snow Blade | 21/1/00 | 15 | 17/1/15 | Field | O | 15 | | \$2,999 |
| 2200 | Snow Blade | 5/1/05 | 15 | 2/1/20 | Field | O | 10 | | \$3,250 |
| 2354 | Crew Truck | 30/6/05 | 10 | 28/6/15 | Field | O | 12 | | \$32,000 |
| 2364 | Trailer | 30/8/05 | 10 | 28/8/15 | Field | O | 15 | | \$2,225 |
| 2384 | Riding Mower | 1/2/08 | 5 | 30/1/13 | Field | O | 8 | Yes | \$7,800 |
| 2400 | Crew Truck | 16/12/08 | 10 | 14/12/18 | Oak | A | 10 | | \$25,000 |
| 2422 | Trailer | 2/1/10 | 10 | 31/12/19 | Oak | A | 5 | | \$1,800 |
| 2430 | Trailer | 6/1/10 | 10 | 4/1/20 | Broad | A | 8 | | \$2,125 |
| 2456 | Riding Mower | 17/1/10 | 5 | 16/1/15 | Broad | O | 8 | Yes | \$7,125 |
| 2457 | Riding Mower | 19/1/10 | 5 | 18/1/15 | Field | O | 6 | | \$8,299 |
| 2458 | Riding Mower | 5/3/10 | 5 | 4/3/15 | Oak | O | 7 | | \$8,099 |
| 2492 | Snow Blower | 1/4/10 | 5 | 31/3/15 | Field | O | 8 | Yes | \$1,000 |
| 2550 | Riding Mower | 4/4/10 | 5 | 3/4/15 | Oak | O | 7 | | \$8,150 |
| 2563 | Trailer | 1/6/10 | 10 | 29/5/20 | Field | A | 6 | | \$1,950 |
| 2584 | Crew Truck | 15/10/10 | 10 | 12/10/20 | Field | A | 7 | | \$27,000 |
| 2602 | Snow Blade | 1/12/10 | 15 | 27/11/25 | Broad | A | 17 | | \$2,880 |

Advanced filter criteria

- If 2 or more conditions occur on the **same** line, this is specifying that all conditions must be met e.g.:

| Garage | Status |
|--------|--------|
| Oak | A |

- Is interpreted as find all artworks whose Garage is Oak and Status is A

- If 2 or more conditions occur on different lines, this is specifying that at least one condition must be met e.g.:

| Garage | Appraised Value |
|-----------|-----------------|
| Excellent | |
| | >10,000 |

- Is interpreted as find all art works whose Condition is Excellent **OR** whose Appraised values is greater than \$10,000

Advanced filter

- Select: **Data** tab, **Sort and Filter** group, **Advanced Filter**
- Filter with List in place or Copy to Another Location
- Specify list range
- Specify criteria range

Specifying text criteria with advanced filter

- Single letter means accept any value that starts with this letter (e.g. E in Condition field will select all Conditions starting with E)
- >,< symbols means accept any values that come after this or before this point in the alphabet (e.g. >M)

Functions for Summarising and Analysing a table

- The Database Functions
- SUMIF and SUMIFS
- COUNTIF and COUNTIFS
- AVERAGEIF and AVERAGEIFS
- Example Workbook **Sallys Equipment (See Module Appendix B)**

Using Database Functions to Summarize Data

Functions that perform summary data analysis (SUM, AVERAGE, COUNT, and so on) on a table of values based on criteria that you set are called the **Database functions**, or **Dfunctions**

Syntax: DfunctionName(*table range*, *column to summarize*, *criteria range*)

Reference Excel New Perspectives Excel 2016 Appendix B

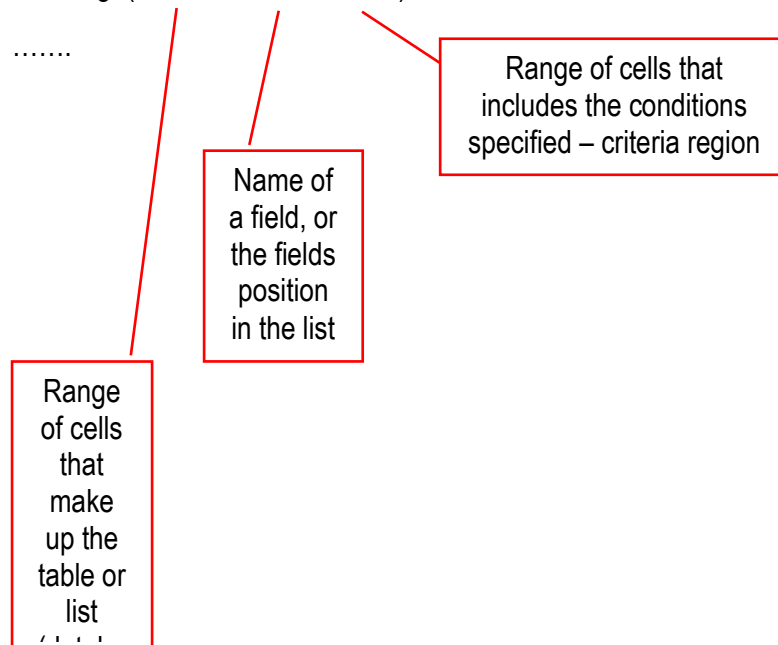
| Database functions | |
|--------------------|--|
| Function Name | Description |
| DAVERAGE | Returns the average of the values that meet specified criteria |
| DCOUNT | Returns the number of cells containing numbers that meet specified criteria |
| DCOUNTA | Returns the number of nonblank cells that meets specified criteria |
| DMAX | Returns the maximum value in search column that meets specified criteria |
| DMIN | Returns the minimum value in search column that meets specified criteria |
| DSTDEV | Returns the estimate of standard deviation based on a sample of entries that meet the specified criteria |
| DSUM | Returns the sum of the values in the summary column that meets specified criteria |

Figure B-10 NP Excel 2016 Textbook

e.g. DAVERAGE function:

Syntax:

Daverage(*database*, *field*, *criteria*)



Using Database Functions to Summarize Data

Criteria Ranges

The screenshot shows an Excel spreadsheet with the following data tables:

| Average Value of Equipment | | | | |
|----------------------------|----------|----------|--|--|
| Garage | Active | Outdated | | |
| Broad | \$ 5,917 | \$ 2,126 | | |
| Field | \$ 5,529 | \$ 4,283 | | |
| Oak | \$ 6,145 | \$ 2,358 | | |

| Equipment Life Summary* | | | | |
|-------------------------|--------------|-------------|---------------|--------|
| Life | Number/Items | Total Value | Average Value | |
| 2 | 15 | \$ 2,395 | \$ | 160 |
| 5 | 11 | \$ 54,378 | \$ | 4,943 |
| >5 | 17 | \$ 194,805 | \$ | 11,459 |

* Excluding Outdated Equipment

| Criteria | | | |
|------------------|--------|--------------------|--------|
| Active Equipment | | Outdated Equipment | |
| Garage | Status | Garage | Status |
| Broad | A | Broad | O |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

The COUNTIFS function

Syntax:

COUNTIFS(criteria_range1, criteria1 [, criteria_range2,criteria2, ...])

Where:

- *criteria_range1, criteria_range2, and so on represent up to 127 ranges (columns of data) in which to evaluate the associated criteria;*
- *criteria1, criteria2, and so on represent up to 127 criteria*

e.g. **=COUNTIFS(EquipTbl[Status], "A",EquipTbl[Garage], "Broad", EquipTbl[Value], ">500")**

Counts the number of pieces of Active(A) equipment in the Broad garage (Broad) and with a value more than \$500

The SUMIFS function

Syntax:

SUMIFS(*sum_range*, *criteria_range1*, *criteria1*
[,criteria_range2,criteria2,...])

Where:

- *sum_range* is the range you want to add
- *criteria_range1*, *criteria_range2*, and so on represent up to 127 ranges (columns of data) in which to evaluate the associated criteria
- *criteria1*, *criteria2*, and so on represent up to 127 criteria in the form of a number, expression, a cell reference or text that define which cells will be added

e.g. **=SUMIFS(EquipTbl[Value],EquipTbl[Status],"A", EquipTbl[Life], "2")**

To calculate the total value of **active** equipment whose **lifetime** is **2**

AVERAGEIFS function

Syntax:

=AVERAGEIFS(*average_range*,*criteria_range1*, *criteria1* *[,criteria_range2,criteria2,...]*)

Where:

- *average_range* is the range to average
- *criteria_range1*, *criteria_range2*, and so on represent up to 127 ranges in which to evaluate the associated criteria
- *Criteria1*, *criteria2*, and so on represent up to 127 criteria in the form of a number, expression, a cell reference, or text that define which cells will be averaged

e.g. **=AVERAGEIFS(EquipTbl[Value],EquipTbl[Status],"A", EquipTbl[Life],"2")**

To calculate the value of active equipment that has a 2-year life

COUNTIFS, SUMIFS, AVERAGIFS

COUNTIFS, SUMIFS, AVERAGIFS are similar to COUNTIF, SUMIF, and AVERAGIF except that more than one criteria range and criteria may be used:

- The **COUNTIFS function** counts the number of cells within a range that meet multiple criteria
 - **COUNTIFS**(*criteria_range1*,*criteria1**[,criteria_range2,criteria2...]*)
- The **SUMIFS function** adds values in a range that meet multiple criteria
 - **SUMIFS**(*sum_range*,*criteria_range1*,*criteria1**[,criteria_range2, criteria2...]*)
- The **AVERAGEIFS function** calculates the average of values within a range of cells that meet multiple conditions
 - **AVERAGEIFS**(*average_range*,*criteria_range1*,*criteria1**[,criteria_range2, criteria2...]*)

6. Practice and Apply

1. Understanding the IF, AND and OR functions
2. Understanding nested IF function
3. Understanding the VLOOKUP, HLOOKUP, IFERROR functions
4. Understanding the COUNTIF, SUMIF, and AVERAGEIF functions
5. Complete Tutorial 3 exercises