## Highline Excel 2016 Class 06: Conditional Calculations with Excel Formulas: AND & OR Criteria

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### **Comparative Operators**

=	Equal: are two things equal?
<b>&lt;&gt;</b>	Not: are two things not equal? Type less than symbol, then greater than symbol.
>	Greater than: is the thing on the left greater than the thing on the right?
>=	<b>Greater than or equal to</b> : is thing on the left greater than or equal to thing on the right?
<	Less than: is the thing on the left less than the thing on the right?
<=	Less than or equal to: is the thing on the left less than or equal to the thing on the right?

## **Logical Tests**

- 1) A Logical Test is a test that evaluates to TRUE or FALSE.
- 2) Logical Tests have only two possible answers: TRUE or FALSE.
- 3) Examples of Logical Tests:
  - Single Logical Tests:
    - 1. 12=12, this evaluates to TRUE
    - 2. "Dog"="Dog", this evaluates to TRUE
    - 3. 500>=500, this evaluates to TRUE
    - 4. 11=12, this evaluates to FALSE
    - 5. "Cat"="Dog", this evaluates to FALSE
    - 6. 499.99>=500, this evaluates to FALSE
  - Array Formula Logical Tests:
    - 1. A16:A22=E16, this evaluates to {TRUE;TRUE;FALSE;TRUE;TRUE;TRUE;FALSE}
    - 2. (A16:A22=E16)+(B16:B22=F16) → {TRUE;TRUE;FALSE;TRUE;TRUE;FALSE}+{TRUE;FALSE;FALSE;TRUE;FALS
    - 3. (A16:A22=E16)\*(B16:B22=F16) → {TRUE;TRUE;FALSE;FALSE;TRUE;TRUE;FALSE}\*{TRUE;FALSE;FAL

## AND Logical Test (AND Criteria)

- 1) AND Logical Test (using AND Criteria):
  - The Goal of an AND Logical Test is to run two or more logical tests and see if **ALL** logical tests evaluate to TRUE.
  - Think of: "If you take out the garbage AND clean the table, you get desert". Only if you get two TRUEs (took out garbage AND cleaned the table) do you get desert.
  - For an AND Logical Test with two tests we can get these possible answers:
    - 1. TRUE, FALSE
    - 2. FALSE, TRUE
    - 3. FALSE, FALSE
    - 4. TRUE, TRUE.
  - Only #4 example (TRUE, TRUE) will yield a TRUE from the AND Logical Test.
  - For an AND Logical Test to evaluate to TRUE, you must get "All Are TRUE".

- Functions that can perform AND Logical Tests:
  - 1. AND function
  - 2. SUMIFS, COUNTIFS, AVERAGEIFS and other similar functions (default behavior when you use more than one criteria range and more than on criteria)
  - 3. D Functions: AND Criteria goes on same row.
  - 4. IF function
    - You can use the AND function in the logical\_test argument to deliver a single TRUE or FALSE.
    - ii. If you are creating array formulas:
      - 1. You can nest multiple IF functions or
      - 2. Multiply Arrays with TRUEs and FALSEs (Multiplication means AND)

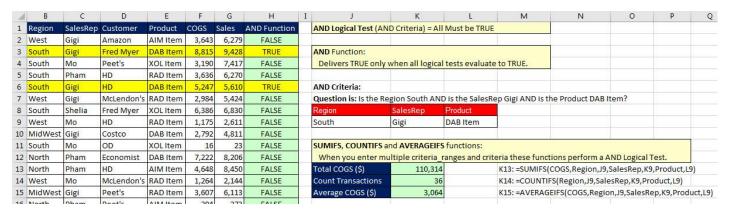
#### AND function

- 1) Performs AND Logical Test.
- Enter 2 or more logical tests into AND function separated by commas.
  - AND interprets:
    - 1. Any non-zero number and TRUE as TRUE.
    - 2. Zero and FALSE as FALSE.
- 3) AND function delivers a TRUE only when all logical tests evaluate to TRUE.
  - Example:

1	В	С	D	E	F	G	Н	I	J	K	L	M	N
1	Region	SalesRep	Customer	Product	COGS	Sales	AND Function		AND Logical Test (AN	AND Logical Test (AND Criteria) = All Must be TRUE			
2	West	Gigi	Amazon	AIM Item	3,643	6,279	FALSE	H2: =AND(B2=\$J\$9,C2=\$K\$9,E2=\$L\$9)					
3	South	Gigi	Fred Myer	DAB Item	8,815	9,428	TRUE	H3: =AND(B3=\$J\$9,C3=\$K\$9,E3=\$L\$9)	AND Function:	fa			
4	South	Mo	Peet's	XOL Item	3,190	7,417	FALSE		Delivers TRUE only				
5	South	Pham	HD	RAD Item	3,636	6,270	FALSE			1			
6	South	Gigi	HD	DAB Item	5,247	5,610	TRUE		AND Criteria:				
7	West	Gigi	McLendon's	RAD Item	2,984	5,424	FALSE		Question is: Is the Region South AND is the SalesRep Gigi AND is the				he Product DAB Item?
8	South	Shelia	Fred Myer	XOL Item	6,386	6,830	FALSE		Region	SalesRep	Product		
9	West	Mo	HD	RAD Item	1,175	2,611	FALSE		South	Gigi	DAB Item		

## SUMIFS, COUNTIFS, AVERAGEIFS functions with AND Criteria

- 1) If we enter more than one criteria\_range argument and more than one criteria argument into SUMIFS, COUNTIFS or AVERAGEIFS we are performing an AND Logical Test with AND Criteria.
- 2) Example of AND Logical Test with AND Criteria:
  - Each of the functions below have 3 ranges in criteria\_range argument (Region, SalesRep, Product) and 3 criteria in criteria argument (South, Gigi, DAB Item).
  - Only when a record is found with Region = South AND SalesRep = Gigi AND Product = DAB Item, will the record be included in calculation.



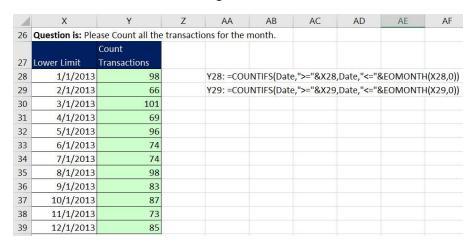
### **BETWEEN Logical Test**

- 1) BETWEEN Logical Test is a form of AND Logical Test that has an upper and lower limit.
- 2) Only items that are between the upper and lower limit are included.
- 3) Example 1:

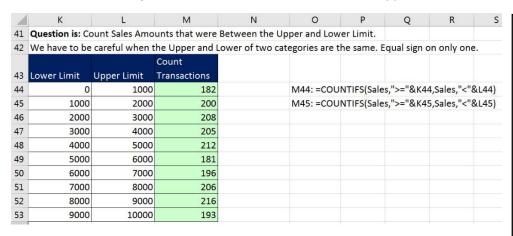
1	K	L	М	N	0	Р	Q	R	S	T
26	Question is: Is	the Date for the	Record Betwee	n the Upper and Lo	ower Limit?					
			Count	1/4						
27	Lower Limit	Upper Limit	Transactions	Total Sales (\$)						
28	1/1/2013	1/31/2013	98	446,305		M28: =CO	JNTIFS(Dat	e,">="&K28	3,Date,"<="	&L28)
29	2/1/2013	2/28/2013	66	289,246		N28: =SUN	/IFS(Sales,	)ate,">="&	K28,Date,"	<="&L28)
30	3/1/2013	3/31/2013	101	477,170						
31	4/1/2013	4/30/2013	69	347,293						
32	5/1/2013	5/31/2013	96	492,240						
33	6/1/2013	6/30/2013	74	389,902						
34	7/1/2013	7/31/2013	74	395,934						
35	8/1/2013	8/31/2013	98	465,471						
36	9/1/2013	9/30/2013	83	438,576						
37	10/1/2013	10/31/2013	87	453,616						
38	11/1/2013	11/30/2013	73	384,776						
39	12/1/2013	12/31/2013	85	443,020						

#### 4) Example 2:

- EOMONTH function calculates the end of a given month.
  - -1 gives end of last month
  - 0 gives end of this month
  - 1 gives end of next month



#### 5) **Example 3:** Count Number Sales between an Upper and Lower Limit



# Count Between Upper & Lower Limit:

- COUNTIFS allows you control over comparative Operators.
- FREQUENCY Array

   Function dictates the
   Comparative Operators
   and categories (See Array
   Formulas Handout #5).

### D Functions (Database functions)

- 1) D functions (Database functions):
  - Set of functions that make aggregate calculations using a Proper Data Set.
  - The D Functions communicate with the Proper Data Set based on Field Names.
  - D Functions are hard to copy to other cells. You can't create cross tabulated formula tables with D Functions because you can't copy the formula and have the criteria area adjust.
- 2) List of D Functions (thanks to CPearson.com)

<ul><li>DAVERAGE</li></ul>	returns the Average of the data specified by the criteria range
<ul><li>DCOUNT</li></ul>	returns the Count (numeric values only) of data specified by the criteria range
<ul><li>DCOUNTA</li></ul>	returns the CountA (all non-empty) of the data specified by the criteria range
• DGET	returns a single element of the data specified by the criteria range
<ul><li>DMAX</li></ul>	returns the Maximum of the data specified by the criteria range
• DMIN	returns the Minimum of the data specified by the criteria range
<ul><li>DPRODUCT</li></ul>	returns the Product (multiplication) of the data specified by the criteria range
<ul><li>DSTDEV</li></ul>	returns Standard Deviation of a sample on the data specified by criteria range
<ul><li>DSTDEVP</li></ul>	returns Standard Deviation of population of data specified by the criteria range
• DSUM	returns the Sum of the data specified by the criteria range
• DVAR	returns Variance of sample of population of the data specified by criteria range
<ul><li>DVARP</li></ul>	returns Variance of entire population of data specified by the criteria range

- 3) D function arguments:
  - D Function arguments look like: DFunction(database, field, criteria)

Example: =DCOUNT(A1:G2000, "Sales", J67:N68)

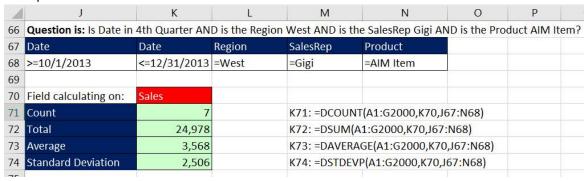
- database = Must be a Proper Data Set with Field Names.
- field = Name of field you want to make a calculation on
  - 1. Field can be: Name of field like: "Sales" or Relative position amongst other field names, like: 7
  - 2. If Sales is the 7<sup>th</sup> field in the database and you are counting sales that meet the criteria you can use:

```
=DCOUNT(A1:G2000,"Sales",J67:N68)
or
=DCOUNT(A1:G2000,7,J67:N68)
```

- criteria =
  - 1. Field Names must be above criteria. This is so D functions can communicate with Database.
  - 2. Must include criteria in cell and Comparative Operator (for equal sign use lead apostrophe, like: '=West).
  - 3. If you do not use a comparative operator, like typing just West, you are telling the D Functions to use "Contains" Criteria (Sometimes called "Partial Text" Criteria). This means that the Criteria "West" would find West and NorthWest and Western.
  - 4. AND Criteria is listed in same row.
  - 5. OR Criteria is listed on different rows.
- 4) Example of setup for D Functions are listed next two sections.

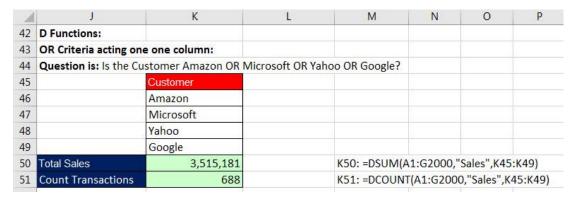
## D Functions: AND Criteria is listed in same row

- 1) In the Criteria area:
  - Field Names are listed above criteria
  - AND Criteria is listed in same row.
- 2) Example:

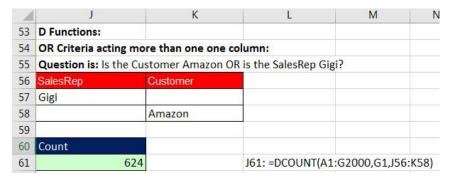


## D Functions: OR Criteria is listed in different rows

- 1) In the Criteria area:
  - Field Names are listed above criteria
  - OR Criteria is listed on different rows.
- 2) D Function OR Criteria looking at one column example:



- D Function OR Criteria looking at two columns example (Empty cells mean "any item"):
  - Notice that in order to perform OR Criteria on different columns we have to include empty cells to tell the D functions to find anything that goes along with the OR Criteria. For example, in the below example the question really is: "Find Gigi in the SalesRep column with any customer name OR find Amazon in the Customer column with any SalesRep name".



### Math Operators and Logical Tests (Boolean Calculations)

- 1) Math Operators can be used to perform Logical Tests.
- 2) When we use Math Operators to make Logical Tests we call the calculation a "Boolean Calculation".
- 3) TRUEs and FALSEs are sometimes called "Boolean" values.
- 4) Any Math Operation (+, -, \*, ?, ^) on Boolean values will convert TRUE to 1 and FALSE to 0.
- 5) Logical Tests with Math Operators:

#### • AND Logical Tests use Multiplication

1. Single cell example:

```
TRUE * TRUE = 1 = TRUE

FALSE * TRUE = 0 = FALSE

TRUE * FALSE = 0 = FALSE

FALSE * FALSE = 0 = FALSE
```

2. Array formula example (Called: AND Logical Test Array Operation):

```
(A16:A22=E16)*(B16:B22=F16) →
{TRUE;TRUE;FALSE;FALSE;TRUE;TRUE;FALSE}*{TRUE;FALSE;FALSE;TRUE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FA
```

### • OR Logical Tests use Addition

1. Single cell example:

```
TRUE + TRUE = 2 = TRUE

FALSE + TRUE = 1 = TRUE

TRUE + FALSE = 1 = TRUE

FALSE + FALSE = 0 = FALSE
```

2. Array formula example (Called: **OR Logical Test Array Operation**):

```
(A16:A22=E16)+(B16:B22=F16) →

{TRUE;TRUE;FALSE;FALSE;TRUE;TRUE;FALSE}+{TRUE;FALSE;FALSE;TRUE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;FALSE;F
```

## Standard Deviation calculation with AND Criteria: STDEV.S & IF Functions Array Formula

- 1) There is no built-in STDEVSIF function so we have to create an Array Formula that will filter out the values we don't want to use in the calculation.
- 2) To calculate the standard deviation of the sample based on conditions or criteria, we can use the STDEV.S and IF functions and an **AND Logical Test Array Operation**.
- 3) Example:

1	Α	В	C 1	D E	F	G
1	Example of	AND Criteria A	Array Operation			
2						
3	SalesRep	Customer	Sales	SalesRep	Customer	
4	Gigi	Amazon	6,279	Gigi	Amazon	
5	Gigi	Google	9,428			
6	Mo	Microsoft	7,417	Average		
7	Pham	Amazon	6,270	473		E7: {=STDEV.S(IF(A4:A10=E4,IF(B4:B10=F4,C4:C10)))}
8	Gigi	Amazon	5,610			
9	Gigi	McLendon's	2,546			
10	Shelia	Fred Myer	1,987			

#### 4) How the **AND Logical Test Array Operation** calculates:

- 1. =STDEV.S(IF(A4:A10=E4,IF(B4:B10=F4,C4:C10)))
  - i. Because we have two AND criteria, we use two IF functions.
- =STDEV.S(IF({TRUE; FALSE; FALSE; TRUE; TRUE; FALSE}, IF(B4:B10=F4, C4:C10)))
- 3. =STDEV.S(IF({TRUE;TRUE;FALSE;TRUE;TRUE;TRUE;FALSE},IF({TRUE;FALSE;FALSE;TRUE;TRUE;FALSE;FALSE},C4:C10)))
- 4. =STDEV.S(IF({TRUE;FALSE;FALSE;TRUE;TRUE;FALSE},IF({TRUE;FALSE;FALSE;TRUE;TRUE;FALSE;FALSE},,6279;9428;7417;6270;5610;2546;1987})))
- 5. =STDEV.S(IF({**TRUE**; FALSE; FALSE; **TRUE**; TRUE; FALSE}, IF({**TRUE**; FALSE; FALSE; FALSE; TRUE; **TRUE**; FALSE}, {**6279**; 9428; 7417; 6270; **5610**; 2546; 1987})))
  - i. Only when there is a TRUE in the first AND second Resultant Array (both in the same relative position) will the number be picked out to use in the STDEV.S function.
- 6. =STDEV.S({6279;FALSE;FALSE;FALSE;5610;FALSE;FALSE})
  - i. FALSE values "filter" out numbers we don't want in AVERAGE function.
- 7. 473.05

### OR Logical Test (OR Criteria)

- 1) OR Logical Test (using OR Criteria):
  - The Goal of an OR Logical Test is to run two or more logical tests and see if at least one logical tests evaluate to TRUE.
    - 1. Think of: "If you take out the garbage OR clean the table, you get desert".
      - i. If you take out the garbage, you get desert.
      - ii. If you clean the table, you get desert.
      - iii. If you do neither, you do NOT get desert.
      - iv. If you do both, you get desert.
  - For an OR Logical Test with two tests we can get these possible answers:
    - 1. TRUE, FALSE
    - 2. FALSE, TRUE
    - 3. FALSE, FALSE
    - 4. TRUE, TRUE.
      - i. #1, #2 and #4 will yield a TRUE from the OR Logical Test.
      - ii. #1, #2 and #4 each yield at least one TRUE.
  - For an OR Logical Test to evaluate to TRUE, you must get "At Least One TRUE".
  - Functions that can perform OR Logical Tests:
    - 1. OR function
    - 2. SUMIFS and COUNTIFS if you do a Function Argument Array Operation in the criteria argument and the criteria are all in the same column.
      - i. For SUMIFS and COUNTIFS you can use the SUMPRODUCT function to add the resultant array and avoid Ctrl + Shift + Enter.
    - 3. D Functions (OR Criteria goes on different rows (lines).
    - 4. IF function
      - You can use the OR function in the logical\_test argument to deliver a single TRUE or FALSE.
      - ii. If you are creating array formulas
        - 1. Add Arrays with TRUEs and FALSEs (Adding means OR)

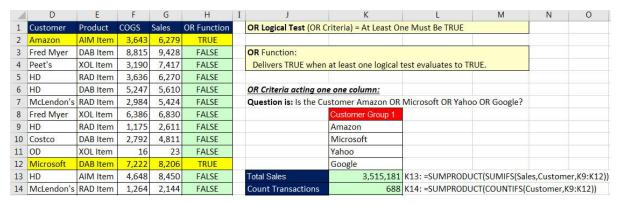
#### OR function

- 1) Performs OR Logical Test:
- 2) Enter 2 or more logical tests into OR function separated by commas.
  - OR interprets:
    - 1. Any non-zero number and TRUE = TRUE.
    - 2. Zero and FALSE = FALSE.
- 3) OR function delivers a TRUE when at least one of the logical tests evaluate to TRUE.
  - Example:

-4	D	E	F	G	Н	Ī	J	K	L	M		
1	Customer	Product	COGS	Sales	OR Function	6 A 16 A	OR Logical Test (OR Criteria) = At Least One Must Be TRUE					
2	Amazon	AIM Item	3,643	6,279	TRUE	H2: =OR(D2=\$K\$9,D2=\$K\$10,D2=\$K\$11,D2=\$K\$12)						
3	Fred Myer	DAB Item	8,815	9,428	FALSE	H3: =OR(D3=\$K\$9,D3=\$K\$10,D3=\$K\$11,D3=\$K\$12)	OR Function:			7.		
4	Peet's	XOL Item	3,190	7,417	FALSE		Delivers TRUE when at least one logical test evaluates to TRUE.					
5	HD	RAD Item	3,636	6,270	FALSE							
6	HD	DAB Item	5,247	5,610	FALSE		OR Criteria acting one one column:					
7	McLendon's	RAD Item	2,984	5,424	FALSE		Question is: Is the	Customer Amazon OF	Microsoft OR Yah	100 OR Google?		
8	Fred Myer	XOL Item	6,386	6,830	FALSE			Customer Group 1				
9	HD	RAD Item	1,175	2,611	FALSE			Amazon				
10	Costco	DAB Item	2,792	4,811	FALSE			Microsoft				
11	OD	XOL Item	16	23	FALSE			Yahoo				
12	Microsoft	DAB Item	7,222	8,206	TRUE			Google				

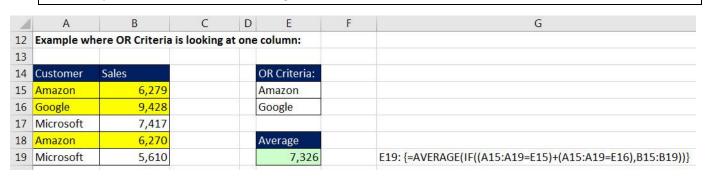
### OR Criteria looking at one column using SUMIFS and COUNTIFS

- 1) If we put multiple items into the criteria argument of SUMIFS or COUNTIFS we are:
  - Making a Function Argument Array Operation
  - Performing OR Criteria on a single column.
- 2) Example of OR Logical Test with OR Criteria:



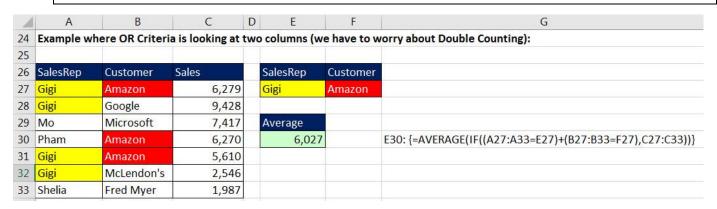
## Average calculation with OR Criteria: AVERAGE & Array Formula (for 1 or more columns)

- 5) We can't use AVERAGEIFS with a Function Argument Array Operation because the Resultant Array delivers multiple averages that cannot then be used to calculate an average (for an average you must have just one total in numerator and one count in denominator).
- 6) To calculate an average based on conditions or criteria, we can use the AVERAGE and IF functions and an **OR Logical Test Array Operation**.
- 7) Example where OR Criteria is looking at one column:



- 8) How the **OR Logical Test Array Operation** calculates:
  - 1. =AVERAGE(IF((A2:A6=D2)+(A2:A6=D3),B2:B6))
  - 2. =AVERAGE(IF(({TRUE;FALSE;FALSE;TRUE;FALSE})+(A2:A6=D3),B2:B6))
  - =AVERAGE(IF(({TRUE;FALSE;FALSE;TRUE;FALSE})+({FALSE;TRUE;FALSE;FALSE;FALSE}),B2:B6))
    - i. Any math operation on TRUEs and FALSEs convert them to 1s and 0s.
  - 4. =AVERAGE(IF({1;1;0;1;0},B2:B6))
    - i. Notice that we only get 0s or 1s because the question is asked of one column.
    - ii. The Resultant Array of 1s and 0s sits in the logical\_test argument of the IF function. The logical\_test argument interprets any non-zero number as TRUE and 0 as FALSE.
  - 5. =AVERAGE({6279;9428;FALSE;6270;FALSE})
    - i. FALSE values "filter" out numbers we don't want in AVERAGE function.
  - 6. 7325.66666666667

9) Example where OR Criteria is looking at two columns (we have to worry about Double Counting):



#### 10) How the **OR Logical Test Array Operation** calculates:

- 1. =AVERAGE(IF((A16:A22=E16)+(B16:B22=F16),C16:C22))
- =AVERAGE(IF(({TRUE;TRUE;FALSE;FALSE;TRUE;TRUE;FALSE})+(B16:B22=F16),C16:C22))
- 3. =AVERAGE(IF(({TRUE;TRUE;FALSE;FALSE;TRUE;TRUE;FALSE})+({TRUE;FALSE;FALSE;TRUE;FALSE;FALSE;FALSE}),C16:C22))
  - i. Any math operation on TRUEs and FALSEs convert them to 1s and 0s.
- 4. =AVERAGE(IF({2;1;0;1;1;1;0},C16:C22))
  - i. Notice that we get 0s or 1s or 2s because the question is asked of two columns.
  - ii. The Resultant Array of 2s and 1s and 0s sits in the logical\_test argument of the IF function. The logical\_test argument interprets any non-zero number as TRUE and 0 as FALSE.
- 5. =AVERAGE({6279;9428;FALSE;6270;5610;2546;FALSE})
  - i. FALSE values "filter" out numbers we don't want in AVERAGE function.
- 6. 6026.6

# Credit Analysis for Accounts Receivable Department with AND and OR Criteria

1	Α	В	С	D	E	F	G	Н	I	j		
1	Our job in the AR Depar	rtment is to a	access wheth	er we should ex	tend credi	t to custo	mers.					
2	Rule #1:	Sales Last Year >\$250,000 AND Asset Value >\$300,000 AND Credit Rating 1 >=3										
3	Rule #2:	At least 1 of the credit ratings is exceeded.										
		Sales Last	Year >\$250,0	00 AND Asset Va	lue >\$300	,000 AND	Late Paymen	ts Last Year < 2	AND at least of	one of the credit		
4	Rule #3:	hurdles is exceeded.										
		Sales Last		Late Payments	Credit	Credit						
5		Year	Asset Value	Last Year	Rating 1	Rating 2						
,		\$250,000	\$300,000	2	3	7	_					
)	Customer Information:											
		Sales Last		Late Payments	Credit	Credit		11				
0	Name	Year	Asset Value	Last Year	Rating 1	Rating 2	Rule 1	Rule 2	Rule 3	IF For Rule 3		
1	Birch Stores Inc.	\$250,000	\$370,000		2.4	7	FALSE	FALSE	FALSE	No Credit		
2	RAD Web Design	\$430,313	\$392,808	4	3.1	9	TRUE	TRUE	FALSE	Credit		
3	Blue Acorn Design	\$280,396	\$111,622	2	2.7	7.1	FALSE	TRUE	FALSE	No Credit		
4	Shark Logistics Co.	\$280,306	\$370,448	1	4	5	TRUE	TRUE	TRUE	Credit		
5	<b>Foggy Camel Vacations</b>	\$454,172	\$369,208		3.5	6.8	TRUE	TRUE	TRUE	Credit		
6	Battalion's Moving Inc.	\$270,797	\$277,251	1	2.9	2	FALSE	FALSE	FALSE	No Credit		
7												
8				G11: =AND(B11	G11: =AND(B11>\$B\$7,C11>\$C\$7,E11>=\$E\$7)							
9				H11: =OR(E11>	H11: =OR(E11>\$E\$7,F11>\$F\$7)							
0		I11: =AND(B11>\$B\$7,C11>\$C\$7,D11<\$D\$7,OR(E11>\$E\$7,F11>\$F\$7))										
1				J11: =IF(AND(B1	L1>\$B\$7,C	11>\$C\$7,	D11<\$D\$7,0	R(E11>\$E\$7,F1	L1>\$F\$7)),"Cre	e <mark>dit","N</mark> o Credit		
2												

#### IF Function

- 1) Use IF function to put one of two things into a cell or formulas:
  - Two things can be:
    - 1. Two Numbers.
    - 2. Two Words (Text).
    - 3. Two Formulas.
    - 4. Two anything.
    - 5. **logical\_test** argument is where you put your Logical Test.
      - i. logical\_test interprets:
        - 1. Any non-zero number and TRUE as TRUE.
        - 2. Zero and FALSE as FALSE.
      - ii. logical\_test can contain:
        - 1. Single logical test like: A1>=B3
        - 2. An array operation like: A16:A22=E16
        - 3. AND function
        - 4. OR function
        - 5. ISNUMBER function
        - 6. ISTEXT function
        - 7. Any other Logical Function
        - 8. Cell references with TRUEs or FALSES or Numbers
        - 9. Numbers
  - value\_if\_true argument is what will go in cell if Logical Formula gets a TRUE.
  - value\_if\_false argument is what will go in cell if Logical Formula gets a FALSE.
- 2) Rule for using IF when you have more than 2 things to put into a cell:
  - As long as there are still more than 1 possibility left, keep adding more IFs to the value\_if\_false argument.
  - When there is only one option left, just put the last option into the value if false argument.
  - At the end, keep typing "close parenthesis until you see the black one.

#### IS functions

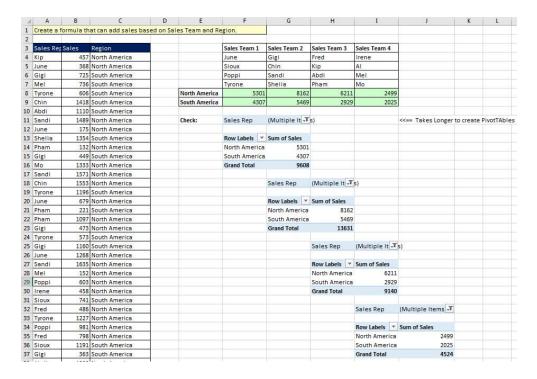
- 1) IS Functions allow you to ask a question and get a TRUE or FALSE answer.
- 2) Types of questions that you ask with IS Functions:
  - Is the value a Number?
  - Is the value Text?
  - Is the value a formula?
- 3) List of ISFUNCTIONS:
  - ISNUMBER(value) Value refers to a number.
  - ISTEXT(value) Value refers to text.
  - ISBLANK(value) Value refers to an empty cell.
  - ISERROR(value) Value refers to any error value.
  - ISNA(value) Value refers to the #N/A error value.
  - ISERR(value) Value refers to any error value except #N/A.
  - ISNONTEXT(value) Value refers to any item that is not text.
  - ISLOGICAL(value) Value refers to a logical value.
  - ISFORMULA(value) Value refers to a formula

#### Conditional Calculations: PivotTable or Formulas?

- 1) Things to consider when deciding whether to use Formulas or PivotTables for Calculations with Conditions or Criteria:
  - If the solution needs to instantly update when formula inputs or source data changes, then formulas are preferable.
  - If you are making aggregate calculations with many criteria and you don't need the solution to update instantly when source data changes, then PivotTables are preferable.
  - There are more functions in an Excel spreadsheet than there are in a PivotTable.
  - PivotTable only do Aggregate Calculations.
  - For Big Data formulas calculate slowly.
  - PivotTables are easy to create.
  - Sometimes it is easier to create your solution with formulas, sometimes it is easier with a PivotTable.
    - 1. Example: Calculating totals for months is usually easier in a PivotTable:

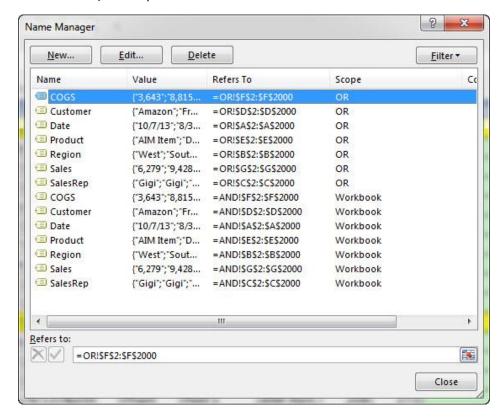
8	Date	Units	Months Sur	n of Units
9	3/10/2016	338	Jan	625
10	3/14/2016	556	Feb	1,199
11	1/28/2016	124	Mar	1,181
12	1/16/2016	205	Grand Tota	3,005
13	2/29/2016	311		
14	2/4/2016	484		
15	3/9/2016	287		
16	1/8/2016	296		
17	2/5/2016	167		
18	2/21/2016	237		

2. Some OR Criteria Calculations are easier to do with formulas:



## Defined Name Scope

- 1) If you use the same name for a Defined Name on a different sheet, then:
  - The first name used has a "Workbook Scope" and can be used and accessed on any sheet
  - Any subsequent names used have a "Worksheet Scope" and can be accessed and used on the sheet that they were created (If you want to use the Worksheet Defined Name on different sheet you can place a sheet reference in from of it like: OR!COGS)
- 2) Example:



# Cumulative List of Keyboards Throughout Class:

- 1) Esc Key:
  - i. Closes Backstage View (like Print Preview).
  - ii. Closes most dialog boxes.
  - iii. If you are in Edit mode in a Cell, Esc will revert back to what you had in the cell before you put the Cell in Edit mode.
- 2) F2 Key = Puts formula in Edit Mode and shows the rainbow colored Range Finder.
- 3) SUM Function: Alt + =
- 4) **Ctrl + Shift + Arrow** = Highlight column (Current Region).
- 5) Ctrl + Backspace = Jumps back to Active Cell
- 6) Ctrl + Z = Undo.
- 7) Ctrl + Y = Undo the Undo.
- 8) **Ctrl + C** = Copy.
- 9) **Ctrl + X** = Cut.
- 10) Ctrl + V = Paste.
- 11) **Ctrl + PageDown** = expose next sheet to right.
- 12) Ctrl + PageUp = expose next sheet to left.
- 13) Ctrl + 1 = Format Cells dialog box, or in a chart it opens Format Chart Element Task Pane.
- 14) **Ctrl + Arrow**: jumps to the bottom of the "**Current Region**", which means it jumps to the last cell that has data, right before the first empty cell.
- 15) Ctrl + Home = Go to Cell A1.
- 16) **Ctrl + End** = Go to last cell used.
- 17) Alt keyboards are keys that you hit in succession. Alt keyboards are keyboards you can teach yourself by hitting the Alt key and looking at the screen tips.
  - i. Create PivotTable dialog box: Alt, N, V
  - ii. Page Setup dialog box: Alt, P, S, P
  - iii. Keyboard to open Sort dialog box: Alt, D, S
- 18) ENTER = When you are in Edit Mode in a Cell, it will put thing in cell and move selected cell DOWN.
- 19) CTRL + ENTER = When you are in Edit Mode in a Cell, it will put thing in cell and keep cell selected.
- 20) TAB = When you are in Edit Mode in a Cell, it will put thing in cell and move selected cell RIGHT.
- 21) SHIFT + ENTER = When you are in Edit Mode in a Cell, it will put thing in cell and move selected cell UP.
- 22) **SHIFT + TAB** = When you are in Edit Mode in a Cell, it will put thing in cell and move selected cell LEFT.
- 23) Ctrl + T = Create Excel Table (with dynamic ranges) from a Proper Data Set.
  - i. Keyboard to name Excel Table: Alt, J, T, A
  - ii. **Tab** = Enter Raw Data into an Excel Table.
- 24) Ctrl + Shift + ~ (`) = General Number Formatting Keyboard.
- 25) **Ctrl + ;** = Keyboard for hardcoding today's date.
- 26) **Ctrl + Shift + ;** = Keyboard for hardcoding current time.
- 27) Arrow Key = If you are making a formula, Arrow key will "hunt" for Cell Reference.
- 28) Ctrl + B = Bold the Font
- 29) Ctrl + \* (on Number Pad) or Ctrl + Shift + 8 = Highlight Current Table.
- 30) Alt + Enter = Add Manual Line Break (Word Wrap)
- 31) Ctrl + P = Print dialog Backstage View and Print Preview
- 32) **F4 Key** = If you are in Edit mode while making a formula AND your cursor is touching a particular Cell Reference, F4 key will toggle through the different Cell References:
  - i. **A1** = Relative
  - ii. \$A\$1 = Absolute or "Locked"

- iii. **A\$1** = Mixed with Row Locked (Relative as you copy across the columns AND Locked as you copy down the rows)
- iv. **\$A1** = Mixed with Column Locked (Relative as you copy down the rows AND Locked as you across the columns)
- 33) Ctrl + Shift + 4 = Apply Currency Number Formatting
- 34) **Tab key** = When you are selecting a Function from the Function Drop-down list, you can select the function that is highlighted in blue by using the Tab key.
- 35) **F9 Key** = To evaluate just a single part of formula while you are in edit mode, highlight part of formula and hit the F9 key.
  - i. If you are creating an Array Constant in your formula: Hit F9.
  - ii. If you are evaluating the formula element just to see what that part of the formula looks like, REMEMBER: to Undo with Ctrl + Z.
- 36) Alt, E, A, A = Clear All (Content and Formatting)
- 37) Evaluate Formula One Step at a Time Keyboard: Alt, M, V
- 38) Keyboard to open Sort dialog box: Alt, D, S
- 39) Ctrl + Shift + L = Filter (or Alt, D, F, F) = Toggle key for Filter Drop-down Arrows
- 40) Ctrl + N = Open New File
- 41) **F12** = Save As (Change File Name, Location, File Type)
- 42) Import Excel Table into Power Query Editor: Alt, A, P, T
- 43) Ctrl + 1 (When Chart element in selected): Open Task Pane for Chart Element
- 44) **F4 Key** = If you are in Edit mode while making a formula AND your cursor is touching a particular Cell Reference, F4 key will toggle through the different Cell References:
  - i. **A1** = Relative
  - ii. **\$A\$1** = Absolute or "Locked"
  - iii. **A\$1** = Mixed with Row Locked (Relative as you copy across the columns AND Locked as you copy down the rows)
  - iv. **\$A1** = Mixed with Column Locked (Relative as you copy down the rows AND Locked as you across the columns)
- 45) Keyboard to open Scenario Manager = Alt, T, E
- 46) Ctrl + Tab = Toggle between Excel Workbook File Windows
- 47) Ctrl + Shift + F3 = Create Names From Selection
- 48) Ctrl + F3 = open Name Manager
- 49) **F3** = Paste Name or List of Names
- 50) Alt + F4 = Close Active Window
- 51) Window Key + Up Arrow = Maximize Active Window
- 52) **Ctrl + Shift + Enter** = Keystroke to enter Array Formulas that: 1) have a function argument that requires it, or 2) whether or not you are entering the Resultant Array into multiple cells simultaneously.
- 53) **Ctrl + /** = Highlight current Array

## **New In This Video:**

54)