

**Office 2016– Excel Basics 12**  
**Video/Class Project #24**  
**Excel Basics 12: Formula Types and Formula Elements**

**Goal in video # 12:** Learn about the different types of formulas and learn about the different formula elements.

Topics Covered in Video:

- 1) Types of Formulas in Excel:
  - i. **Number formulas** that deliver a single number answers such as a tax deduction amount or a budgetary expense amount.
  - ii. **Text formulas** deliver a text item such as a name or category.
  - iii. **Logical formulas** (Boolean Formulas) deliver a TRUE or FALSE.
- 2) The types of Formula Elements that are allowed in formulas are:
  - i. Equal sign, =
  - ii. Cell references, like A1, \$A\$1, A1:A10, \$A\$1:\$A\$10
  - iii. Math operators, -, +, ?, \*, ^, and ( )
  - iv. Numbers (if they won't change)
  - v. Built-in Functions, like SUM and ROUND
  - vi. Join operator: Ampersand (&)
  - vii. Text within quotation marks, like ", "
  - viii. Comparative operators, >, <, >=, <=, =, <>
- 3) Join Operator = & = Ampersand or And Symbol
  - i. Join Operator allows to join to items together into one cell, like joining First and Last Name
  - ii. Formula like; ="Item # "&C43 joins text in double quotes and a number from a cell
  - iii. Antitime you have to put text into a formula, you must use Double Quotes
  - iv. "Item # " will not change
- 4) Text String
  - i. "Text String" is the term used to describe words or text.
  - ii. Examples"
    1. "Excel" is a Text String
    2. "Product name is Quad" is a text string
    3. 100 is not a Text String because it is a number
- 5) Text Functions:
  - i. LEFT
    1. LEFT will extract from the left (start of text string) a specified number of characters in the text string.
    2. LEFT(text, [num\_chars])
      - i. **text** = The text string that contains the characters you want to extract.
      - ii. **num\_chars** = Specifies the number of characters you want extract from the left, where 1 is first character, 2 is second character and so on.
  - ii. RIGHT
    1. RIGHT will extract from the right (end of text string) a specified number of characters in the text string.
    2. RIGHT(text, [num\_chars])
      - i. **text** = The text string that contains the characters you want to extract.
      - ii. **num\_chars** = Specifies the number of characters you want extract from the right, where 1 is last character, 2 is second to last character and so on.

6) Math Operators

<b>Math Operators.</b>		
+	<b>Adding.</b>	<b>Remember Order of Operations in Math:</b> 1) Parentheses 2) Exponents 3) Multiply & Divide, Left to Right 4) Adding and Subtracting, Left to Right
-	<b>Subtracting or Negation.</b>	
*	<b>Multiplying.</b>	
/	<b>Dividing.</b>	
^	<b>Raising to an exponent.</b>	
( )	<b>Parentheses.</b>	

7) Math Order of Operations:

<b>Remember Order of Operations in Math:</b> 1) Parentheses 2) Exponents 3) Multiply & Divide, Left to Right 4) Adding and Subtracting, Left to Right
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8) Comparative Operators:

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

9) Excel's Formula Calculation Order:

1 <b>Parenthesis ( )</b>
2 <b>Reference Operators:</b> colon, comma Example of colon in range of cells: =SUM(A1:A4) Example of comma (union): =SUM(E10:G10,E14:G14)
3 <b>Negation (-)</b> Example: = -2^4 = 16 Example: = -(2^4) = -16
4 <b>Converts % (1% to .01)</b>
5 <b>Exponents (^)</b> Example: 3^2 = 9
6 <b>Multiplication (*) and Division (/), left to right</b>
7 <b>Adding (+) and Subtracting (-), left to right</b>
8 <b>Ampersand (&amp;)</b>
9 <b>Comparative symbols: =, &lt;&gt;, &gt;=, &lt;=, &lt;, &gt;</b>

10) Video examples:

	A	B	C	D
18	<b>Ex 1</b>	<b>Goal:</b> Add calls made a service center last week.		
19		<b>Type of Formula:</b> Number Formula.		
20		<b>Formula Elements:</b> Equal Sign, Built-in Function, Range of Cells		
21				
22				
23		<b>Day</b>	<b>Calls</b>	
24		Mon, 10/30/17	671	
25		Tue, 10/31/17	374	
26		Wed, 11/1/17	586	
27		Thu, 11/2/17	637	
28		Fri, 11/3/17	1007	
29		Sat, 11/4/17	549	
30		Sun, 11/5/17	556	
31		<b>Total</b>	<b>4,380</b>	=SUM(C24:C30)

	A	B	C	D	E	F
33	<b>Ex 2</b>	<b>Goal:</b> Calculate Monthly Insurance Expense.				
34		<b>Type of Formula:</b> Number Formula.				
35		<b>Formula Elements:</b> Equal Sign, Cell Reference, Math Operator, Number.				
36						
37						
38		<b>Annual Insurance</b>	\$13,500.00		** 12 months in year can not change	
39		<b>Monthly Allocation</b>	\$1,125.00	=C38/12	We are not violating Excel's Golden Rule	

	A	B	C	D	E	F	G
41	<b>Ex 3</b>	<b>Goal:</b> Calculate Deduction for Each Employee.					
42		<b>Type of Formula:</b> Number Formula.					
43		<b>Formula Elements:</b> Equal Sign, Built-In Function, Relative Cell Reference, Math Operator, Absolute Cell Reference, Number					
44							
45							
46		<b>Employee</b>	<b>Gross Pay</b>	<b>Deduction</b>		<b>Tax Rate</b>	
47		Sioux	2830.34	396.25	=ROUND(C47*\$F\$47,2)	0.14	
48		Chin	2239.93	313.59			
49		Tyrone	2953.98	413.56			** 2 for penny will not change
50		Gigi	2926.74	409.74			We are not violating Excel's Golden Rule

	A	B	C	D	E	F	G	
52	<b>Ex 4</b>	<b>Goal:</b> Calculate Cost of Goods Sold (COGS) in Accounting						
53		<b>Type of Formula:</b> Number Formula.						
54		<b>Formula Elements:</b> Equal Sign, Parenthesis, Relative Cell Reference, Math Operator,						
55		Relative Cell Reference, Parenthesis, Match Operator, Relative Cell Reference						
56								
57		<b>Product</b>	<b>Beginning Quantity</b>	<b>End Quantity</b>	<b>Value Each</b>	<b>COGS</b>		
58		Aspen	114	45	10	690	= $(C58-D58)*E58$	
59		Quad	146	117	20	580		
60		Carlota	108	102	15	90		
61		Bellen	61	47	10	140		
62		Sunset	54	51	12	36		

	A	B	C	D	E
64	<b>Ex 5</b>	<b>Goal:</b> Join "Text " and an Item Number into One Cell.			
65		<b>Type of Formula:</b> Text Formula.			
66		<b>Formula Elements:</b> Equal Sign, Text in Double Quotes,			
67		Join Operator (&), Relative Cell Reference			
68					
69		<b>Product</b>	<b>Item Number</b>	<b>Item # &amp; Number</b>	
70		Aspen	517231	Item # 517231	= $"Item # "&C70$
71		Quad	469890	Item # 469890	
72		Carlota	162451	Item # 162451	
73		Bellen	114541	Item # 114541	
74		Sunset	832593	Item # 832593	

	A	B	C	D	E	F
76	<b>Ex 6</b>	<b>Goal:</b> Join First & Last Names into One Cell.				
77		<b>Type of Formula:</b> Text Formula.				
78		<b>Formula Elements:</b> Equal Sign, Relative Cell Reference				
79		Join Operator, Text In Double Quotes, Join Operator, Relative Cell Reference				
80						
81		<b>First</b>	<b>Last</b>	<b>Join</b>	<b>Last, First</b>	
82		Jimmy	Garza	Jimmy Garza	Garza, Jimmy	= $C82\&","&B82$
83		Emma	Petrov	Emma Petrov	Petrov, Emma	
84		Rolando	Robbins	Rolando Robbins	Robbins, Rolando	
85		Abdi	Amari	Abdi Amari	Amari, Abdi	
86		ShelaDown	Cohen	ShelaDown Cohen	Cohen, ShelaDown	
87		Sioux	Radcoolinator	Sioux Radcoolinator	Radcoolinator, Sioux	
88		Miki	Ito	Miki Ito	Ito, Miki	

	A	B	C	D	E	F
90	<b>Ex 7</b>	<b>Goal:</b> Extract State Abbreviation using the RIGHT Function				
91		<b>Type of Formula:</b> Text Formula.				
92		<b>Formula Elements:</b> Equal Sign, Built-in Function,				
93		Relative Cell Reference, Number				
94						
95		<b>Product Code</b>	<b>State Abbreviation</b>		** 2 for sate abbreviation length will not change	
96		517231 Aspen, CO	CO	=RIGHT(B96,2)	We are not violating Excel's Golden Rule	
97		469890 Quad, CA	CA			
98		162451 Carlota, WA	WA			
99		114541 Bellen, CA	CA			
100		832593 Sunset, CO	CO			

	A	B	C	D	E	F
102	<b>Ex8</b>	<b>Goal:</b> Extract State Abbreviation using the LEFT Function				
103		<b>Type of Formula:</b> Text Formula.				
104		<b>Formula Elements:</b> Equal Sign, Built-in Function,				
105		Relative Cell Reference, Number				
106						
107		<b>Product Code</b>	<b>State Abbreviation</b>			
108		517231, Aspen	517231	=LEFT(B108,6)	** 6 for product code length will not change	
109		469890, Quad	469890		We are not violating Excel's Golden Rule	
110		162451, Carlota	162451			
111		114541, Bellen	114541			
112		832593, Sunset	832593			

	A	B	C	D	E	F
115	<b>Ex 9</b>	<b>Goal:</b> Determine If Debits = Credits				
116		<b>Type of Formula:</b> Logical Formula.				
117		<b>Formula Elements:</b> Equal sign, Cell Reference,				
118		Equal sign (as Comparative Operator), Cell Reference				
119						
120		<b>Debit (DR)</b>	<b>Credit (CR)</b>			
121		35.74	35.74			
122		73.61	73.61			
123		113.08	113.08			
124		100.49	100.5			
125		17.7	17.7			
126		107.38	107.38		<b>In Balance?</b>	
127		448	448		FALSE	=B127=C127

	A	B	C	D	E	F
129	<b>Ex10</b>	<b>Goal:</b> Determine If Employee Gets a Bonus				
130		<b>Type of Formula:</b> Logical Formula.				
131		<b>Formula Elements:</b> Equal sign, Relative Cell Reference,				
132		Comparative Operator, Absolute Cell Reference				
133						
134		<b>Employee</b>	<b>Sales</b>	<b>Do they Get Bonus?</b>		<b>Hurdle to Get Bonus</b>
135		Emma Petrov	\$55,000.00	TRUE	=C135>=\$F\$135	\$55,000.00
136		Rolando Robbins	\$41,197.98	FALSE		
137		Abdi Amari	\$74,558.65	TRUE		
138		ShelaDown Cohen	\$53,741.33	FALSE		
139		Sioux Radcoolinator	\$37,251.06	FALSE		
140		Miki Ito	\$54,999.99	FALSE		


	A	B	C	D	E	F
142	<b>Ex11</b>	<b>Goal:</b> Count how many of each product we sold				
143		<b>Type of Formula:</b> Number Formula.				
144		<b>Formula Elements:</b> Equal Sign, Built-in Function, Absolute Range of Cells,				
145		Relative Cell Reference				
146						
147		<b>Product</b>	<b>Sales</b>			
148		Quad	\$43.00			
149		Sunset	\$23.00			
150		Sunset	\$23.00			
151		Quad	\$43.00			
152		Aspen	\$19.95			
153		Quad	\$43.00			
154						
155		<b>Product</b>	<b>Count</b>			
156		Aspen	1	=COUNTIFS(\$B\$148:\$B\$153,B156)		
157		Quad	3			
158		Sunset	2			

	A	B	C	D	E	F
160	<b>Ex12</b>	<b>Goal:</b> Formula to determine whether we need to reorder?				
161		<b>Type of Formula:</b> Logical Formula.				
162		<b>Formula Elements:</b> Equal Sign, Built-in Function, Absolute Range of Cells,				
163		Relative Cell Reference				
164						
165		<b>Beginning Quantity</b>	<b>Units Sold</b>	<b>On Hand Units</b>	<b>Do we need to Re-order?</b>	
166		114	45	69	FALSE	=D\$173>B166-C166
167		146	121	25	FALSE	
168		108	102	6	TRUE	
169		61	21	40	FALSE	
170		54	51	3	TRUE	
171						
172				<b>Reorder Hurdle</b>		
173				25		
174				** If we have 25 or more, we do not need to re-order.		


	A	B	C	D
176	<b>Ex13</b>	<b>Goal:</b> Calculate Net Income		
177		<b>Type of Formula:</b> Number Formula.		
178		<b>Formula Elements:</b> Equal Sign, Cell Reference, Built-in Function,		
179		Range of Cells		
180				
181		Revenue	\$125,700	
182		Rent Expense	\$12,500	
183		Wage Expense	\$22,000	
184		Operation Expense	\$11,500	
185		COGS	\$69,570	
186		Net Income	\$10,130	=C181-SUM(C182:C185)

11) Don't forget Excel's Golden Rule:


# Excel's Golden Rule:



If a formula input can change, put it into a cell and refer to it in the formula with a cell reference.



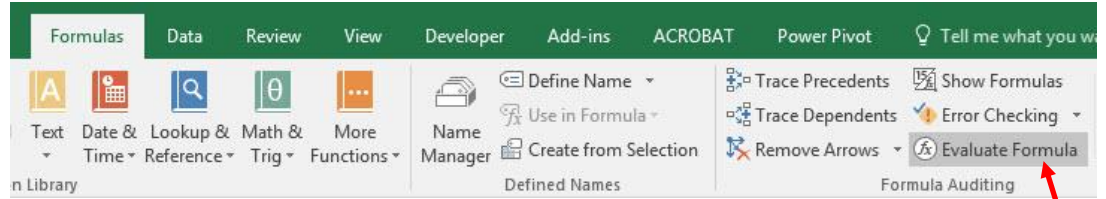
If a formula input will not change, you can type it into a formula (like 12 months in a year or 7 days in a week).



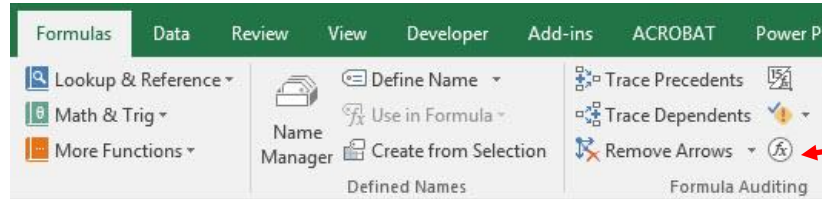
Always label your formula inputs so that the formula input can be clearly understood by any user of the spreadsheet solution; by doing this we properly "document the spreadsheet solution (model).

12) Formula Evaluator (Evaluate Formula feature) to see how formula is calculated by Excel

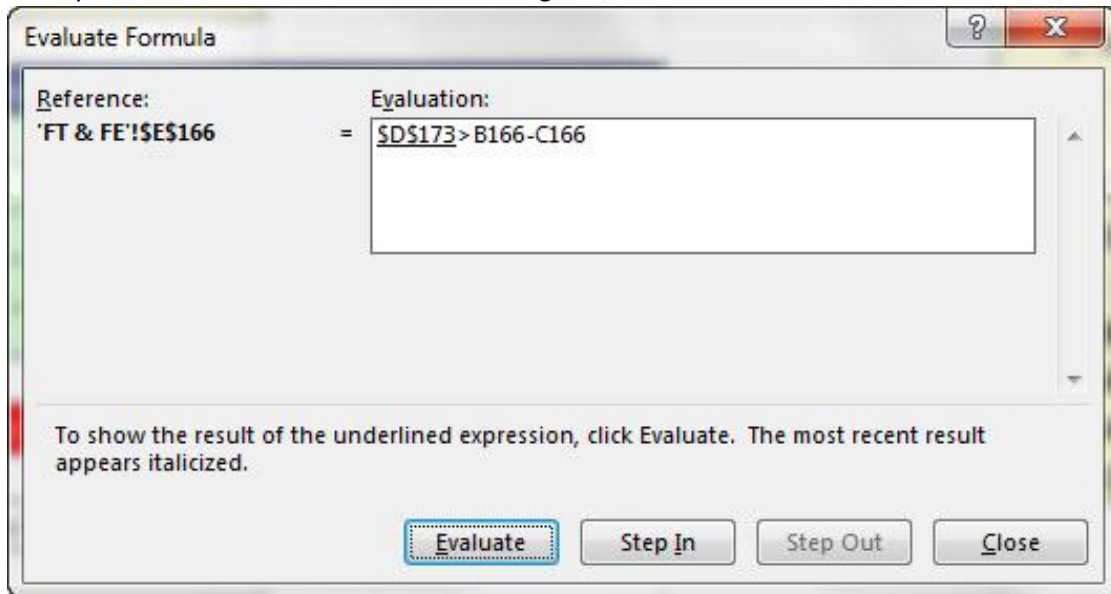
- i. Click in cell with formula.
- ii. In Formula Ribbon Tab, in the Formula Auditing Group, click the Evaluate Formula button.
  - 1. The button may look like this large button (Your screen is wide, or your screen resolution is high):



- 2. The button may look like this small button (Your screen is narrow, or your screen resolution is low):



- iii. Then you will see the Evaluate Formula dialog box, like this:



- iv. Click Evaluate button or use Enter to watch each step that Excel uses to evaluate or calculate your formula!
- v. In this example we can see that the Math Operator, Subtraction, will be calculated BEFORE the Comparative Operator, "Greater Than".