



M 365 Excel Class Video 02:What Excel Does: Calculations & Data Analysis by excelisfun

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Calculations and Excel Worksheet Formulas

A	B	C	D	E	F	G	H	I	J	K	L	M	
2	Most important ways to make calculations in Excel:												
3	Worksheet Formulas						→	Calculations that usually work best with Worksheet Formulas:					
4	PivotTable							Math , like adding, subtracting, multiplying, dividing, etc.					
5	Power Query M Code Formulas							Academic Grading , like creating a gradebook					
6	DAX Formulas in Power Pivot and Power BI Desktop							Budgets , like projected sales for next year					
7								Accounting , like payroll calculations or inventory valuation					
8	Calculation =							Finance , like value of an investment					
9	Math, logical or data manipulation operation to create an answer.							Statistics , like mean, median, standard deviation and probability					
10								Regression , like creating a predictive model					
11	Excel Worksheet Formulas:							Analytics , like linear programming or simulation					
12	All formulas have an equal sign (=) as first character in cell												
13	Formulas can contains things such as						→	Formulas elements (things that can go into formulas):					
14								Equal sign as first character in cell to create formula					
15								Cell references and table references					
16	Examples of Calculations:							Math operators: + - * / ^ ()					
17								Numbers (if the number won't change like 12 for months in a year)					
18	Goal 1: Calculate the deduction amount							Built-in functions (like SUM, ROUND, AVERAGE, TEXTBEFORE)					
19								Comparative operators: > < >= <= <>					
20	Gross Pay	\$2,154.75					Join Symbol: & (Ampersand)						
21	Tax Rate	7.65%					Text in double quotes (like "Revenue" or ", ")						
22	Deduction	\$164.84	=ROUND(C20*C21,2)										
23								Number Formula = delivers a number answer. ** Notes for ROUND function are in next vid					
24	Goal 2: Extract First Name												
25													
26	Full Name	Chantel Mims					Entering References into formulas:						
27	First Name	Chantel	=TEXTBEFORE(C26," ",1)				When Reference is close use Arrow Keys						
28		Chantel	Text Formula = delivers a text answer.				When Reference is not close use Mouse						
29	Goal 3: Did Employee get bonus?												
30								Number Formatting is Façade					
31	Employee Sales	1999.99					Number Formatting displays numbers in a certain way without						
32	Bonus Hurdle	2000					changing the underlying number. Formulas do not act on						
33	Get Bonus?	FALSE	=C31>=C32				Number Formatting: they act on underlying value.						
34													
35								Logical (Boolean) Formula = delivers a TRUE or FALSE.					

Excel's Golden Rule and Worksheet Models

	A	B	C	D	E	F	G	H	I	J	K	L	M
36													
37		Goal 4: Check whether the e-mail statement made is accurate. Build a model and follow Excel's Golden Rule.											
38		<div style="background-color: #4F81BD; color: white; padding: 10px;"> E-mail read: 23 of the 30 students in the class passed the class with a 2.0 grade. This was more than the 80% who passed in the previous class. </div>											
39													
40													
41													
42													
43		Excel's Golden Rule: If an Excel solution input can change, put it into a cell, label it, and refer to it with a cell reference / table reference.											
44		Excel Model: An Excel solution built to solve a problem, make calculations or perform data analysis that can be used more than 1 time.											
45													
46		# Students Passed (>=2.0)	23				Dynamic Spilled Array Formula				<div style="background-color: #4F81BD; color: white; padding: 10px;"> New E-mail read: It was 25 of 30, not 23 of 30. </div>		
47		Total Students in Class	30										
48		% Passed in Last Class	80.00%										
49		% Passed This Class	76.67%	=C46/C47	=C46/C47			Number Formula					
50		% This Class > % Last Class	FALSE	=C49>C48	=C49>C48			Logical Formula					
51													
52													
53													
54													
55													
56		Why Excel's Golden Rule?											
57		1) It provides good documentation of the worksheet solution/model so it is easy to understand.											
58		2) It makes it easy to update the solution/model later.											
59		3) It reduces errors because you do not "Hard Coding" inputs into formulas.											
60		Research has shown that a common error in spreadsheets is "Hard Coding":											
61		http://www.strategy-at-risk.com/2009/03/03/the-risk-of-spreadsheet-errors/											

Define Data Analysis

1) Sales data in a table converted into a Monthly SalesRep Sales Report.

Q: If bonus given for 3 biggest monthly sales amounts, who gets bonus? A: Chantel, Jo, Tyrone.

Date	SalesRep	Sales (\$)
1/5/23	Jim	1,645
1/6/23	Jim	4,829
1/8/23	Chantel	3,635
1/11/23	Chantel	2,712
1/13/23	Jim	
1/13/23	Tyrone	
1/14/23	Tyrone	
1/14/23	Jo	
1/14/23	Tyrone	
1/15/23	Chantel	3,361
1/15/23	Jo	458
1/15/23	Chantel	2,140
1/17/23	Jim	3,882
1/21/23	Chantel	1,609
1/21/23	Tyrone	3,223
1/22/23	Tyrone	99
1/22/23	Jo	1,616
1/23/23	Chantel	2,897

SalesRep	Month	Total Sales (\$)
Chantel	Jan	18,037
	Feb	19,794
	Mar	10,318
Chantel Total		48,149
Jim	Jan	16,072
	Feb	13,145
	Mar	13,509
Jim Total		42,726
Jo	Jan	9,467
	Feb	21,874
	Mar	16,247
Jo Total		47,588
Tyrone	Jan	19,054
	Feb	13,256
	Mar	18,773
Tyrone Total		51,082
Grand Total		189,545

**Data Into Information
to make decisions**

2) Sales data in a Table converted into a Monthly sales Trends Chart. What is the trend?

Q: Was projected trend of slight increase each month obtained? A: Trend exceeded expectations.



**Data Into Information
to make decisions**

Define Table

Raw Data = data stored in its smallest form in a cell

Not Raw Data:

Date, Person, Sales
01/05/2023, Jim, \$1,645.01

Raw Data:

Date	Person	Sales
1/5/23	Jim	\$1,645.01

Proper Data Set = Data Set = Table

Table is made up of:

Field = column in table

Field Name = name at top of field that describes what data goes into field

Record = one row in table

Table requirements in Excel:

- 1) Field names in first row
- 2) Records of related data in subsequent rows
- 3) Empty cells or Excel Row/Column Headers, all the way around table

Date	Person	Sales		Survey Data	
1/5/23	Jim	1,645	← Fields	Yes	← Fields
1/6/23	Jim	4,829	← Records	Yes	← Records
1/8/23	Chantel	3,635	←	No	←
1/11/23	Chantel	2,713	.	Yes	.
1/13/23	Jim	679	.	No	.
1/13/23	Tyrone	1,527	.	No	.
1/14/23	Tyrone	3,152		No	
1/14/23	Jo	2,554		Somewhat	

Data Analysis Tools

Some of the Data Analysis Tools in Excel:

Excel Table feature = Convert proper data sets to a Table Object that can expand and contract and auto fill formulas.
Sort = Sort data A-Z (Ascending) or Z-A (Descending).
Filter = Show or extract records based on conditions, criteria and logical tests.
PivotTable = Drag and drop summary report tool that makes calculations based on conditions, criteria and logical tests.
Excel Charts = Visualize data with charts and graphs.
Conditional Formatting = Visualize data based on conditions, criteria and logical tests
Worksheet formulas = To create helper fields (like with XLOOKUP function) or make conditional calculations (like with SUMIFS or COUNTIFS functions) or create full reports (like with LET, SUMIFS, HSTACK or VSTACK functions).
Flash Fill = One-time data cleaning tool
Power Query = Import data into worksheet, PivotTable or Data Model. Clean & transform data, tables and other related data objects.
Relationships = Creates relationships between tables (Substitute for XLOOKUP). Method of creating related tables to make PivotTable reporting more efficient.
Power Pivot Data Model and Data Model PivotTable = Used when you need Excel worksheet reports and visualizations and you have large data (about 50,000 rows or more), calculations that are hard to do with a PivotTable, or you have related tables of data.
Power BI Desktop and Data Model Visualizations = Used when you need Power BI reports and visualizations (more varied than in Excel) or you want to publish and share data analysis results online.
Power BI Online = share data analysis results online.

Excel Table Feature

1) Excel Table Feature

- i. If you have a proper data set, you can convert your proper data set to an Excel Table by selecting one cell in the proper data set, click on the Table button in Table group in Insert Ribbon Tab, or just use keyboard: Ctrl + T.
- ii. The advantage to using the Excel Table feature is that when new rows or columns are added to the Excel Table, all objects, such as PivotTable, Charts, Formulas, or other features can be refreshed, and the new data will be incorporated into the object.
- iii. You can name your Excel Table: select one cell in Excel Table, click the Table Design Ribbon Tab, Properties group. You can NOT use spaces in the Table Name.

2) Add new records to Excel Table by typing or pasting new data in the first row below the Excel Table.

3) If new rows and columns are not added to Excel Table, you will need to change option settings for Excel Tables: File menu, Options button, Proofing tab on left, "AutoCorrect Options" button, check "Include new rows and columns in table".

Standard PivotTable Notes

- 1) What PivotTables do:
 - i. Create Summary Reports that contain calculations with Conditions or Criteria.
- 2) Summary of how to create PivotTable:
 - i. Click in one cell in Proper Data Set
 - ii. Insert Ribbon Tab, Tables group, PivotTable button.
 1. Keyboard = Alt, N, V, T.
 - iii. From Field List, drag field name to Rows area or Columns area or Filter area. These are the conditions/criteria for the calculation in the Values area of the PivotTable.
 1. Fields in the Rows area add a condition/criterion to the row
 2. Fields in the Columns area add a condition/criterion to the column
 3. Fields in the Filter area add a condition/criterion to the entire PivotTable.
 - iv. From Field List drag the field you would like to make a calculation on to values area.
 1. Number fields default to a SUM calculation (add numbers)
 2. Text fields default to a COUNTA calculation (count non-empty cells)
 - v. With a cell selected in the PivotTable, click on PivotTable Tools Design Ribbon Tab, go to the Layout group, click drop-down for Report Layout and then click on “Show in Tabular Form” or “Show in Outline Form”. These Layouts shows the Field Names in your Report. To set the layout default for all PivotTable, click on File menu, Options button, in the Excel Options dialog box, click the Data tab on the left, click the Edit Default Layout button, then in Report Layout check box, select “Show in Tabular Form” or “Show in Outline Form”.
 - vi. To add Number Formatting to the Values area of the PivotTable, click in one cell in the Values area of the PivotTable, Right-click the cell and click on “Number Format...”, then in the Number Formatting dialog box select the Number Formatting that you would like and then click OK.
 - vii. Slicers can be added to the PivotTable to add a condition/criterion to the entire PivotTable, similar to a field in the Filter area. To insert a Slicer into a PivotTable, click in one cell in the PivotTable Report, then go to the PivotTable Tools Analyze Ribbon Tab, then in the Filter Group, click the Insert Slicer button
 - viii. If you want to change the summary calculation in the Values area, right-click the Values area in the PivotTable Report, point to one of these two options:

1. "Summarize Values By" and then select an aggregate calculation such as "Average", or "Max", or "More Options".
 2. "Show Values As" and then select a calculation such as "% of Column Total", "Running Total", "Difference From" or other calculations.
- ix. Standard PivotTable vs. Data Model PivotTable.
1. A Standard PivotTable stores its data in the PivotTable cache. A Standard PivotTable is best when data is stored in one small table (less than about 50,000 rows of data) and you want simple calculations such as sum, averages, % of column totals or % of grand total.
 2. A Data Model PivotTable stores its data in the Power Pivot Data Model Columnar Database. A Data Model PivotTable is best when you have a large amount of data, you have multiple related tables, or you want to make calculations that a Standard PivotTable cannot easily make.
 - 3.
- x. Standard PivotTable Cached Data
1. When you create a Standard PivotTable, Excel creates a copy of the source data and stores it in the Pivot Cache.
 2. The Pivot Cache is stored in Excel's memory.
 3. This is why the PivotTable does not update when source data changes.
 4. If source data changes, you can right-click the PivotTable and click Refresh, or use the Refresh button in the Data Ribbon Tab.
 5. You can't see Cached PivotTable Data, but that's the data the PivotTable references when you build your PivotTable or change a Slicer selection or move rows/columns around.
 6. When we group dates in a PivotTable, the Pivot Cache is where this action takes place. The Pivot Cache save the action of grouping by dates so that when we use the date column in other places, the date column will remain grouped.
 7. When we use a Slicer or change the conditions and criteria in the PivotTable, these actions are interacting with the Pivot Cache of data, not the original source data.

Visualization with Excel Charts and Conditional Formatting Notes:

- 1) What do Charts do?
 - i. Visually portray quantitative data (number data).
 - ii. Give a quick impression of the number data.
 - iii. Create a picture that can communicate more quickly than just the numbers alone.
 - iv. Charts allow you to see patterns or trends that you may not be able to see if you are looking at just the number data.
 - v. Allows you to make relative comparisons more quickly than if you are using a table
- 2) Types of Charts
 - i. **Column:** Use to compare differences across categories. Height of column conveys number.
 - ii. **Bar:** Use to compare differences across categories. Length of bar conveys number.
 - iii. **Stacked Column/Bar:** Good for displaying crosstabulation, emphasis on horizontal axis categories.
 - iv. **Clustered Column/Bar:** Good for displaying crosstabulation, emphasis on legend categories.
 - v. **Line:** Use to show trend for a number variable over a category such as time.
 - vi. **X-Y Scatter:** Used to show relationship between two number variables (x and y variables).
- 3) Rules for Charts:
 - i. No Chart Junk.
 - ii. Eliminate all chart elements that do not help to communicate the message.
- 4) Formatting Charts:
 - i. You can add and remove chart elements by using the **Green +** on the right side of chart.
 - ii. To format a chart element, select element and use the keyboard Ctrl + 1 to open the Format Chart Element task pane.
- 5) Link Labels to Cells
 - i. Click on Chart Title, type an equal sign, click on cell with title, hit Enter.
- 6) Built-in Conditional Formatting
 - i. Select cells and apply a conditional format from the Styles group in the Home Ribbon
 - ii. Each cell is evaluated to TRUE or FALSE. TRUE = Formatting applied. FALSE = Formatting not applied.
 - iii. To edit rule, go to Manage Rules

Data Analysis Example

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2		Goal 1: Create monthly sales rep report												
3		Goal 2: Visualize trends in month sales												
4						Creating a monthly report with an Excel PivotTable:								
5														
6		Date	SalesRep	Sales (\$)		SalesRep	Month	Total Sales (\$)		Month	Total Sales (\$)			
7		1/5/23	Jim	1,645		Chantel	Jan	18,037		Jan	62,630			
8		1/6/23	Jim	4,829			Feb	19,794		Feb	68,069			
9		1/8/23	Chantel	3,635			Mar	10,318		Mar	58,847			
10		1/11/23	Chantel	2,713			Apr	39,530		Apr	112,048			
11		1/13/23	Jim	679			May	20,023		May	111,955			
12		1/13/23	Tyrone	1,527			Jun	42,592		Jun	186,719			
13		1/14/23	Tyrone	3,152		Chantel Total		150,294		Grand Total	600,267			
14		1/14/23	Jo	3,554		Jim	Jan	16,072						
15		1/14/23	Tyrone	3,410			Feb	13,145						
16		1/15/23	Chantel	3,361			Mar	13,509						
17		1/15/23	Jo	458			Apr	22,758						
18		1/15/23	Chantel	2,140			May	24,567						
19		1/17/23	Jim	3,882			Jun	51,211						
20		1/21/23	Chantel	1,609		Jim Total		141,262						
21		1/21/23	Tyrone	3,223		Jo	Jan	9,467						
22		1/22/23	Tyrone	99			Feb	21,874						
23		1/22/23	Jo	1,616			Mar	16,247						
24		1/23/23	Chantel	2,907			Apr	25,026						
25		1/25/23	Tyrone	2,385			May	38,758						
26		1/25/23	Jim	4,326			Jun	33,446						
27		1/25/23	Jim	555		Jo Total		144,818						
28		1/26/23	Tyrone	1,905		Tyrone	Jan	19,054						
29		1/26/23	Jim	156			Feb	13,256						
30		1/27/23	Chantel	883			Mar	18,773						
31		1/29/23	Jo	3,839			Apr	24,733						
32		1/30/23	Chantel	788			May	28,607						
33		1/30/23	Tyrone	3,354			Jun	59,469						
34		2/1/23	Jo	4,467		Tyrone Total		163,893						
35		2/1/23	Jim	4,434		Grand Total		600,267						
36		2/2/23	Jim	1,070										

Visualizing trends in sales data with an Excel Chart:



Next Video: Three Ways to Copy or Spill Formulas

	A	B	C	D	E	F	G	H	I	J	K	L
55	Goal 5: Three ways to copy or spill formulas. Calculate tax for each sales amount, then add.											
56												
57	1) Single Input-Output Formulas			2) Dynamic Spilled Array Formulas			3) Excel Table Formulas					
58												
59	Tax Rate		0.0975	Tax Rate		0.0975	Tax Rate		0.0975			
60												
61	Sales		Tax Amount	Sales		Tax Amount	Sales		Tax Amo			
62	4.49		0.44	4.49		0.44	4.49		0.44			
63	3.43		0.33	3.43		0.33	3.43		0.33			
64	4.98		0.49	4.98		0.49	4.98		0.49			
65	4.49		0.44	4.49		0.44	4.49		0.44			
66	3.44		0.34	3.44		0.34	3.44		0.34			
67	Total		2.04	Total		2.04	Total		2.04			
68												
69	C62: =ROUND(B62*\$C\$59,2)			F62: =ROUND(E62:E66*F59,2)			J62: =ROUND([@Sales]*\$J\$59,2)					
70	C67: =SUM(C62:C66)			F67: =SUM(F62#)			J67: =SUBTOTAL(109,[Tax Amount])					
71												
72	Relative Cell Reference will move throughout copy action.											
73	Absolute (Locked) Cell Reference does not move throughout copy action.											
74	F4 key will toggle between different types of cell references.											
75	Copy Formulas using the Fill Handle and your Cross Hair (Angry Rabbit) Cursor.											
76												
77	Dynamic Spilled Array Formulas are array formulas that deliver a spilled array to the worksheet as the final answer.											
78	Dynamic Spilled Array formulas spill from the top cell and only live in the top cell.											
79	If you spill a formula from cell F62, you refer to the spilled array with the spilled range operator #,											
80	as in SUM(#F62) when you want to add the values.											
81												
82	Excel Table Formulas are formulas that use the table formula nomenclature, rather than cell references.											
83	Excel Tables are dynamic because if you add rows or columns, anything pointing to table will update with new data.											
84	Table formula nomenclature (References to Excel Table objects):											
85	TaxTable = Excel Table Name											
86	TaxTable[Tax Amount] = Field Name in an Excel Table											
87	[@Tax Amount] = Relative Cell Reference											