

# Excel Introduction

Lecture 3 - DATA 301



# Why Spreadsheets and Microsoft Excel?

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**Spreadsheets** are the most common, general-purpose software for data analysis and reporting.

Microsoft Excel is the most popular spreadsheet program with hundreds of millions of installations.

- The spreadsheet concepts translate to other products.

Excel and spreadsheets are not always the best tool for data analysis, but they are great for quick analysis, reporting, and sharing.

# Spreadsheet Overview

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A **spreadsheet** organizes information into a two-dimensional array of cells (a *table*).

A **cell** has two components:

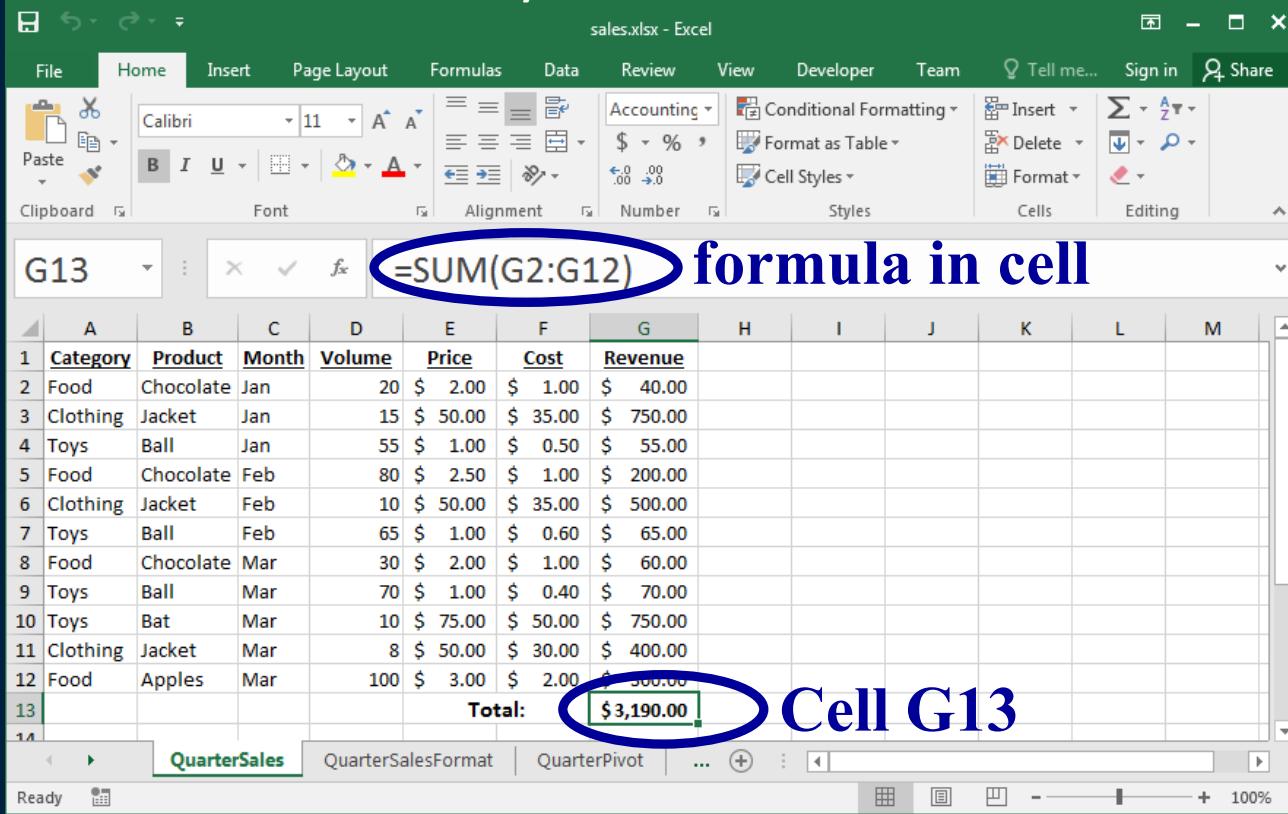
- an address - specified given a column letter and row number
- a location - that can store a number, text, or formula

The power of a spreadsheet is that we can write simple formulas (commands) to perform calculations and immediately see the results of those calculations.

Spreadsheets are very common in business and reporting applications.

# Spreadsheet Addressing

A **cell** is identified by a column letter and row number.



The screenshot shows a Microsoft Excel spreadsheet titled "sales.xlsx - Excel". The spreadsheet contains a dataset of quarter sales with columns for Category, Product, Month, Volume, Price, Cost, and Revenue. A formula, `=SUM(G2:G12)`, is entered into cell G13, which is highlighted with a blue oval. The result of the formula, `$3,190.00`, is displayed in cell G13 and is also highlighted with a green oval. A red curly brace on the left side of the table indicates the rows, and a yellow curly brace on the right side indicates the columns. The ribbon menu is visible at the top, showing tabs like File, Home, Insert, Page Layout, Formulas, Data, Review, View, Developer, Team, Tell me..., Sign in, and Share.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Category	Product	Month	Volume	Price	Cost	Revenue						
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00						
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00						
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00						
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00						
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00						
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00						
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00						
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00						
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00						
11	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00						
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00						
13					Total:		\$ 3,190.00						
14													

rows

Cell G13

} columns

# Spreadsheet Addressing

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The rows in a spreadsheet are numbered starting from 1.

The columns are represented by letters.

- A is column 1, B is column 2, ..., Z is column 26, AA is column 27, ...

A cell is identified by putting the column letter first then the row number.

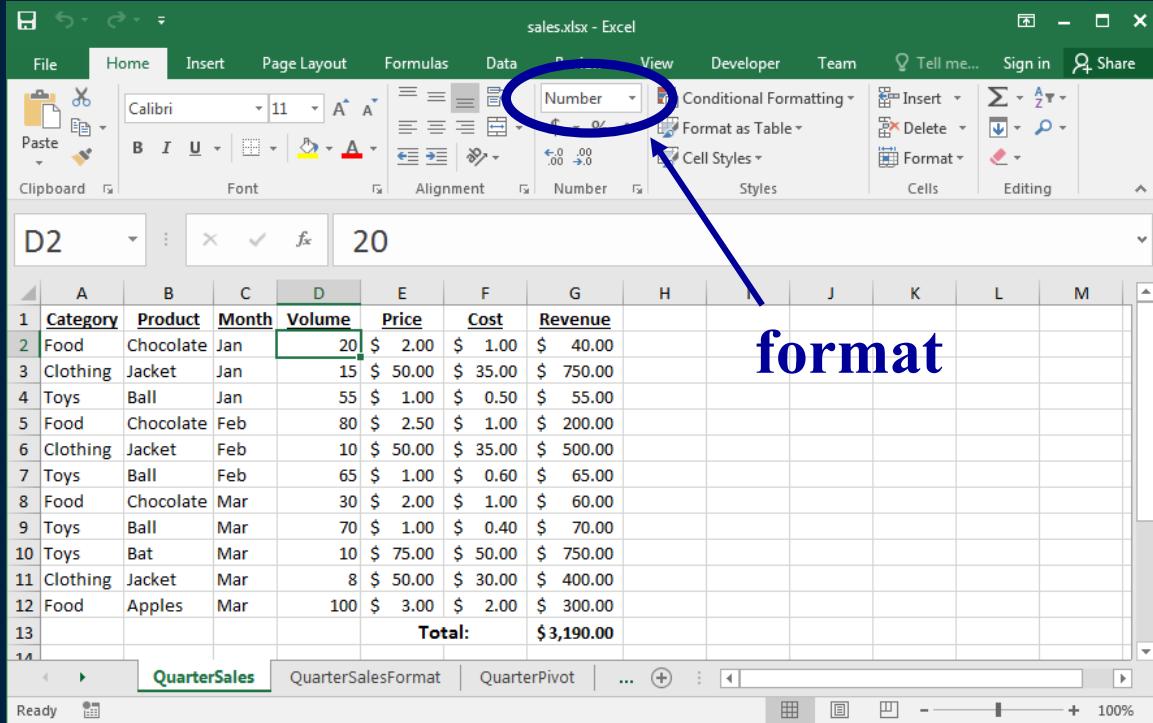
- e.g. B3 is the 2nd column and the 3rd row.

Question: What column number is AD? How about BAD?

# Spreadsheet Data Entry

An entry is added to a cell by clicking on it and typing in the data.

- The data may be a number, text, date, etc. Type and *format* are auto-detected.

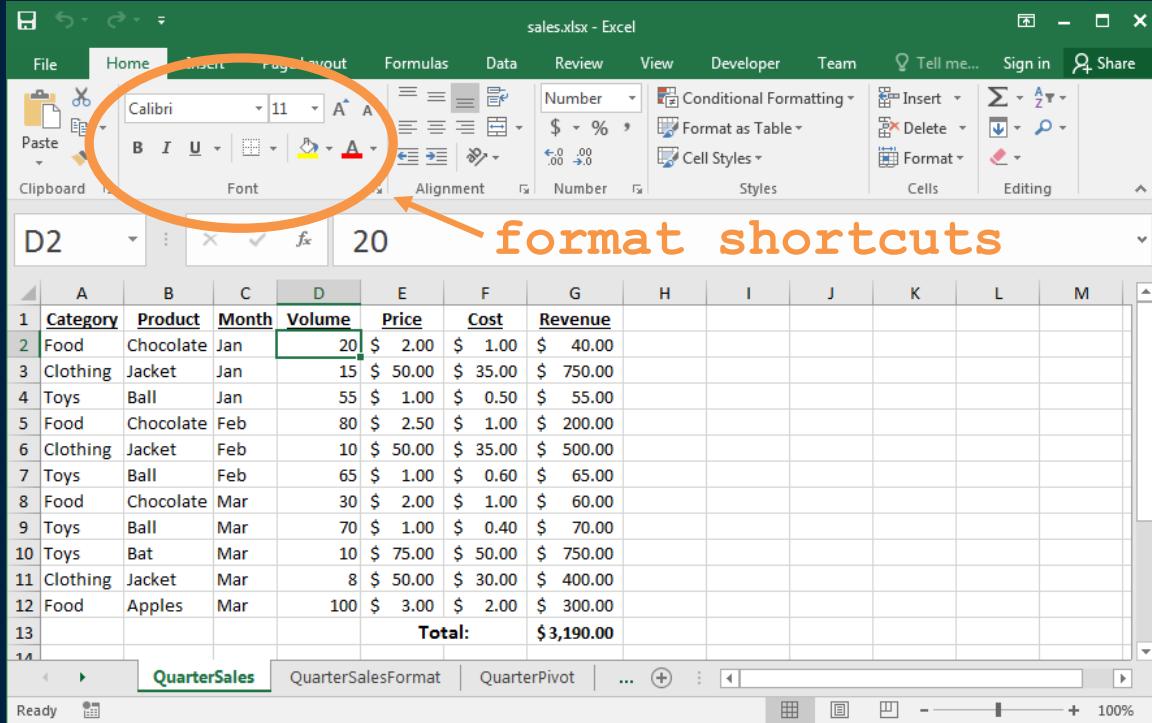


A screenshot of Microsoft Excel showing a spreadsheet titled "sales.xlsx". The spreadsheet contains data about product sales across three months (Jan, Feb, Mar) for categories like Food, Clothing, and Toys. The data includes columns for Category, Product, Month, Volume, Price, Cost, and Revenue. A blue arrow points from the word "format" to the "Number" dropdown in the Home tab ribbon, which is circled in blue. The cell D2, containing the value "20", is selected. The formula bar at the top also shows "20". The ribbon tabs visible are File, Home, Insert, Page Layout, Formulas, Data, Page Layout, Review, View, Developer, Team, Tell me..., Share, Insert, Delete, Format, Cells, and Editing.

	A	B	C	D	E	F	G	H	J	K	L	M
1	Category	Product	Month	Volume	Price	Cost	Revenue					
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00					
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00					
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00					
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00					
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00					
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00					
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00					
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00					
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00					
11	Clothing	Jacket	Mar		8	\$ 50.00	\$ 30.00	\$ 400.00				
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00					
13					Total:		\$ 3,190.00					

# Spreadsheet Formatting

Formatting: bold, italics, underline, fonts, colors



The screenshot shows the Microsoft Excel interface with the 'sales.xlsx - Excel' file open. The 'Home' tab is selected in the ribbon. A large orange circle highlights the 'Font' section of the ribbon, which includes font name ('Calibri'), font size ('11'), and style buttons ('B', 'I', 'U'). An orange arrow points from the text 'format shortcuts' towards the 'Alignment' section of the ribbon, which contains buttons for horizontal alignment (left, center, right), vertical alignment (top, middle, bottom), and orientation (text wrap, rotate). The main worksheet displays a table of sales data with columns for Category, Product, Month, Volume, Price, Cost, and Revenue. Row 13 contains a formula cell with the text 'Total:' followed by the value '\$ 3,190.00'. The status bar at the bottom shows the sheet names 'QuarterSales', 'QuarterSalesFormat', and 'QuarterPivot'.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Category	Product	Month	Volume	Price	Cost	Revenue						
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00						
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00						
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00						
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00						
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00						
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00						
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00						
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00						
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00						
11	Clothing	Jacket	Mar		8	\$ 50.00	\$ 30.00	\$ 400.00					
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00						
13					Total:		\$ 3,190.00						

# Spreadsheet Selecting Cells

---

Multiple ways of selecting cells:

- 1) With the mouse, (left) click and drag mouse to select a rectangle region of cells.
- 2) With keyboard, hold SHIFT key and use arrow keys to select a rectangle region of cells.
- 3) With mouse and keyboard, while holding CTRL key, (left) click on individual cells to select non-contiguous cells.
- 4) Click on a row number to select a whole row.
- 5) Click on a column header to select a whole column.

# Range Selecting Cells Example

sales.xlsx - Excel

File Home Insert Page Layout Formulas Data Review View Developer Team Tell me... Sign in Share

Font Alignment Number Styles Cells Editing

A3 : Clothing

	Category	Product	Month	Volume	Price	Cost	Revenue
1	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00
2	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00
3	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00
4	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00
5	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00
6	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00
7	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00
8	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00
9	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00
10	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00
11	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00
12					Total:		\$ 3,190.00
13							
14							

QuarterSales QuarterSalesFormat QuarterPivot ... + : < >

Average: 115 Count: 28 Sum: 1840 100%

Ready

# Selecting Individual Cells Example

sales.xlsx - Excel

File Home Insert Page Layout Formulas Data Review View Developer Team Tell me... Sign in Share

G13 : =SUM(G2,G5,G8,G10,G12)

SUM(number1, [number2], [number3], [number4], [number5], [number6], ...)

	Category	Product	Month	Volume	Price	Cost	Revenue
1	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00
2	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00
3	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00
4	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00
5	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00
6	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00
7	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00
8	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00
9	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00
10	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00
11	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00
12					Total:	G10,G12	
13							
14							

QuarterSales QuarterSalesFormat QuarterPivot ...

Edit 100%

# Manipulating Cells

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Once you have selected one or more cells, there are several common actions you can perform:

## 1) DELETE

- delete the contents of all cells by pressing delete key
- delete the contents and the cell locations (then shift remaining) by selecting Edit menu, Delete... or Delete... from pop-up menu (brought up by right click).

## 2) Cut, Copy, Paste

- cut - copies selected cells to clipboard and removes from document
- copy - copies selected cells to clipboard
- paste - copies cells in clipboard to sheet starting at currently selected cell

## 3) Add selected cells to a formula (requires that you were previously constructing a formula before selecting the cells).

# Manipulating Cells - Filling

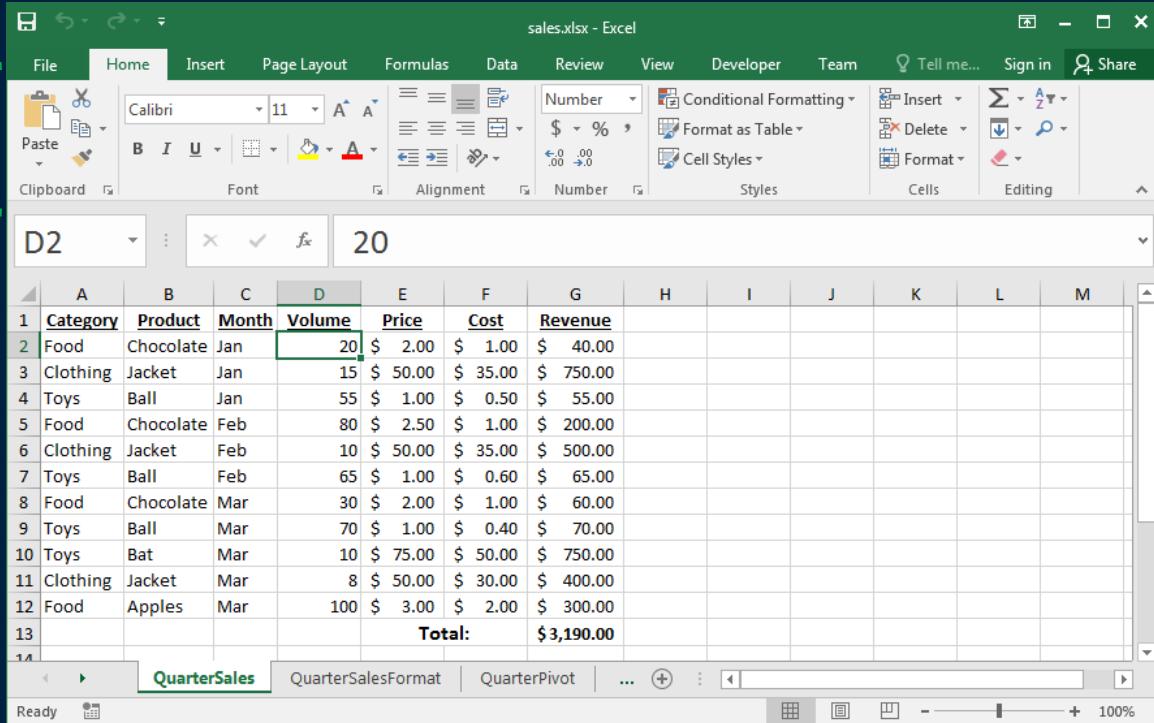
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**Filling** combines copy and paste.

There is a small box or tab beyond the cell's lower right corner (fill handle). Grab it with the cursor and pull to other cells.

# Cut, Copy, Paste

cut,  
copy,  
paste



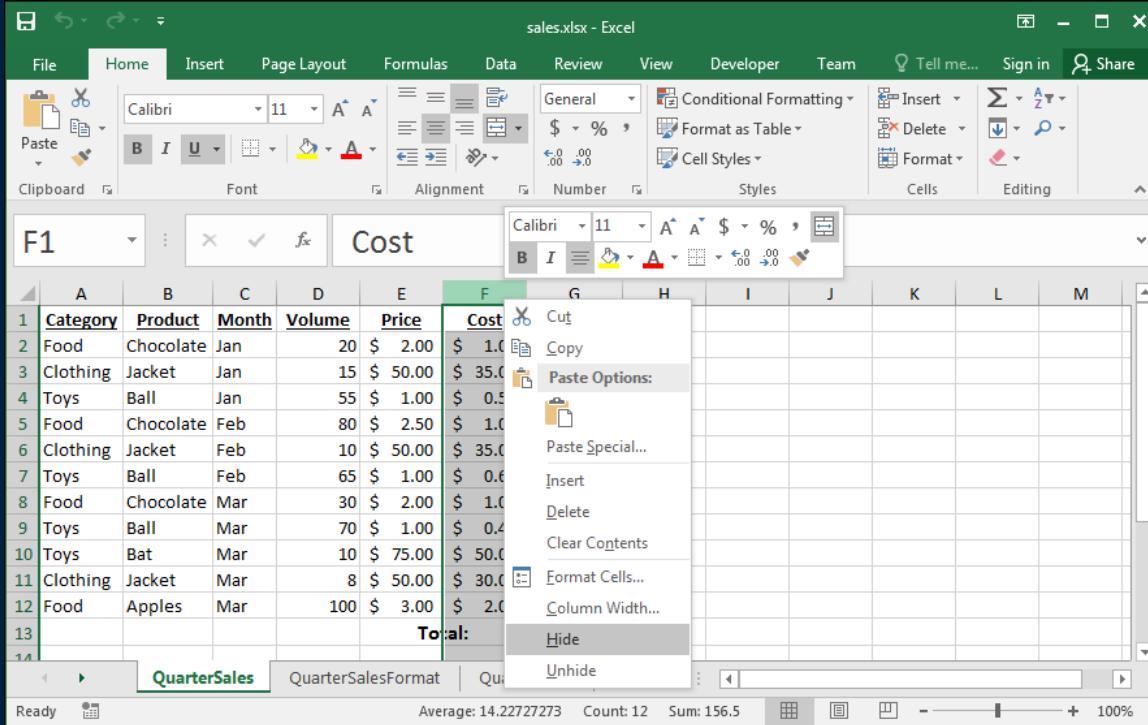
The screenshot shows a Microsoft Excel spreadsheet titled "sales.xlsx - Excel". The ribbon menu is visible at the top, and the "Home" tab is selected. A green curly brace is positioned to the left of the spreadsheet, grouping the "cut, copy, paste" text above with the action itself. The spreadsheet contains data from row 1 to 13, with columns labeled A through M. Row 1 is the header, and rows 2 through 12 represent individual sales entries. Row 13 is a summary row with the label "Total:" and the value "\$3,190.00". The "QuarterSales" tab is selected at the bottom.

	Category	Product	Month	Volume	Price	Cost	Revenue
1	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00
2	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00
3	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00
4	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00
5	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00
6	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00
7	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00
8	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00
9	Food	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00
10	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00
11	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00
12					Total:		\$3,190.00
13							

# Hiding Columns and Rows

Right-clicking on the column or row header and selecting **Hide**.

- The column/row still exists but will not be displayed or printed unless unhidden.



A screenshot of Microsoft Excel showing a table of sales data. The table has columns labeled Category, Product, Month, Volume, Price, and Cost. The Cost column is currently selected, indicated by a green background. A context menu is open over the first cell of the Cost column (F1), with 'Hide' highlighted. The menu also includes options like Cut, Copy, Paste Options, Insert, Delete, Clear Contents, Format Cells, Column Width, and Unhide.

Category	Product	Month	Volume	Price	Cost
Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00
Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00
Toys	Ball	Jan	55	\$ 1.00	\$ 0.50
Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00
Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00
Toys	Ball	Feb	65	\$ 1.00	\$ 0.60
Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00
Toys	Ball	Mar	70	\$ 1.00	\$ 0.40
Toys	Bat	Mar	10	\$ 75.00	\$ 50.00
Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00
Food	Apples	Mar	100	\$ 3.00	\$ 2.00
				Total:	

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**Q5: Excel Trivia - Which method allows you to select non-contiguous cells in a spreadsheet?**

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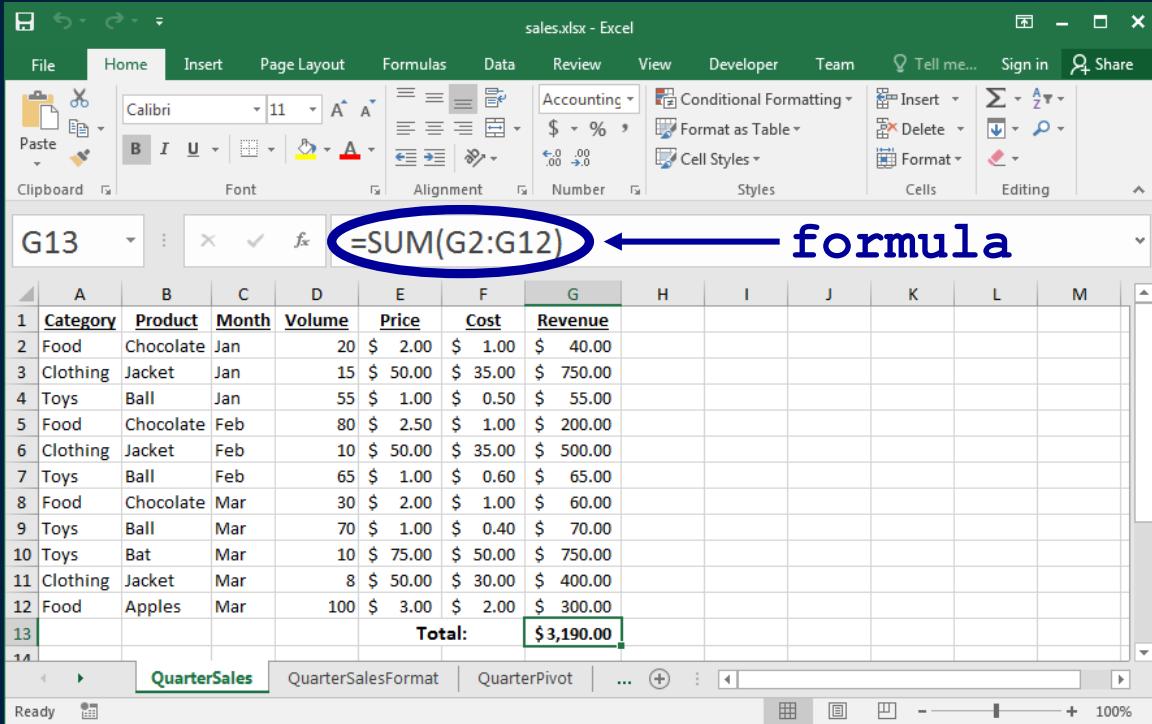
- Hold Command/Alt click on a cell and drag mouse
- With the mouse left click on a cell and drag mouse
- Hold CTRL key and use arrow keys
- Hold SHIFT key and use arrow keys
- Hold CTRL key and left click on cells



# Entering Formulas

A **formula** is any expression that begins with an equal sign ("=").

- The equal sign means that a calculation must be done to compute the cell value.



The screenshot shows a Microsoft Excel spreadsheet titled "sales.xlsx". The formula bar at the top contains the formula `=SUM(G2:G12)`. A blue oval highlights this formula, and a blue arrow points from it to the word "formula" written in blue text below the bar. The spreadsheet displays a data table with columns: Category, Product, Month, Volume, Price, Cost, and Revenue. Row 13 is highlighted in green and contains the text "Total:" followed by the value "\$ 3,190.00". The ribbon menu is visible at the top, showing tabs like Home, Insert, Page Layout, Formulas, Data, Review, View, Developer, Team, Tell me..., Sign in, and Share. The "Formulas" tab is selected. The status bar at the bottom right shows "100%".

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Category	Product	Month	Volume	Price	Cost	Revenue						
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00						
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00						
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00						
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00						
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00						
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00						
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00						
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00						
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00						
11	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00						
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00						
13					Total:		\$ 3,190.00						

# Formula Expressions

A **formula** expression can consist of literals (numbers, text strings), operators, functions, and cell references.

Simple mathematical expressions:

- = 1 + 5
- = 1.5 \* 3.14 + 42

Common functions:

- = ROUND(PI(), 2) // Result is 3.14
- = CONCATENATE("Hello", " World") // Hello World
- Other common functions for trigonometry, dates, and financial.

# Formula Expressions

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The power of formulas comes from using cell references (similar to variable names in programming).

Cell reference examples:

- = A1 + A2
- = B1 + A3 - A4

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**Q6: Excel Trivia - A cell contains the following: =2+4\*3 What is the value of the cell?**

000

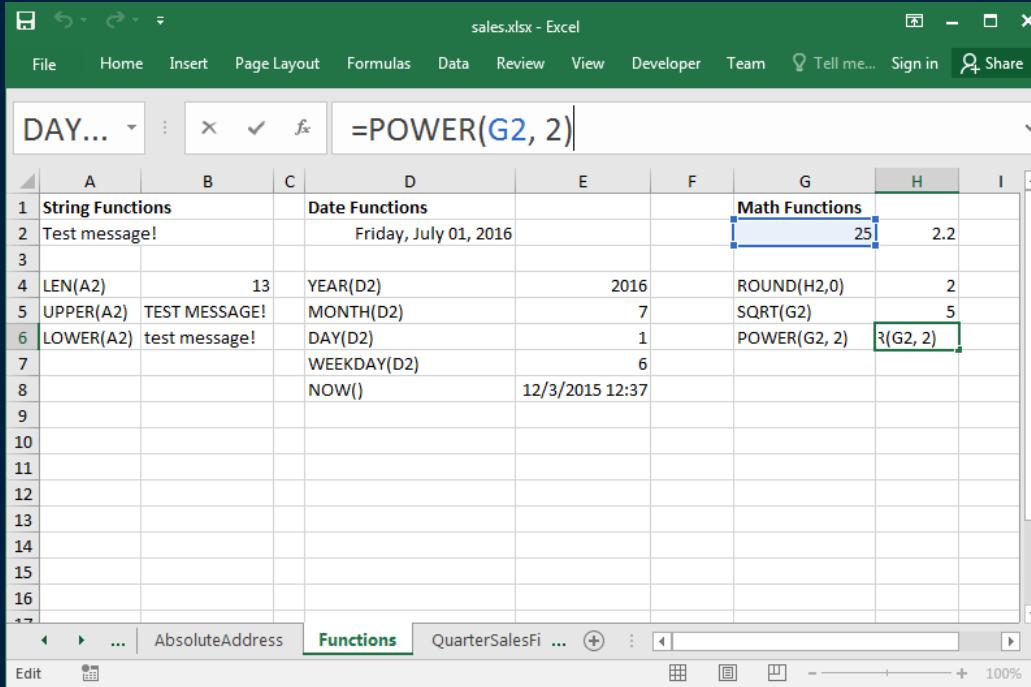
- 14
- 18
- =2+4\*3
- 24



# Using Excel Functions

Excel has a large number of built-in functions to use.

A ***function*** takes arguments as input and produces an output.



The screenshot shows a Microsoft Excel spreadsheet titled "sales.xlsx - Excel". The spreadsheet contains several columns of data and formulas:

	A	B	C	D	E	F	G	H	I
1	String Functions			Date Functions			Math Functions		
2	Test message!			Friday, July 01, 2016		25	2.2		
4	LEN(A2)	13		YEAR(D2)	2016	ROUND(H2,0)	2		
5	UPPER(A2)	TEST MESSAGE!		MONTH(D2)	7	SQRT(G2)	5		
6	LOWER(A2)	test message!		DAY(D2)	1	POWER(G2, 2)	R(G2, 2)		
7				WEEKDAY(D2)	6				
8				NOW()	12/3/2015 12:37				
9									
10									
11									
12									
13									
14									
15									
16									

The formula bar at the top shows the formula `=POWER(G2, 2)`. The status bar at the bottom right shows "100%". The ribbon tabs at the bottom include "Functions" which is currently selected.

# Concatenation

**String concatenation** is when two or more strings are combined by appending them in order. Function in Excel is CONCATENATE () or &.

sales.xlsx - Excel

A3 : =CONCATENATE("Hello", " World")

A	B	C	D	E	F	G	H	I
1		More than						
2		one						
3	Hello World	string.						
4								
5		More than one string.						
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

Sheet14 Sheet13 QuarterSalesFormal ... + 100%

sales.xlsx - Excel

DAY... : =CONCATENATE(C1, C2, C3)

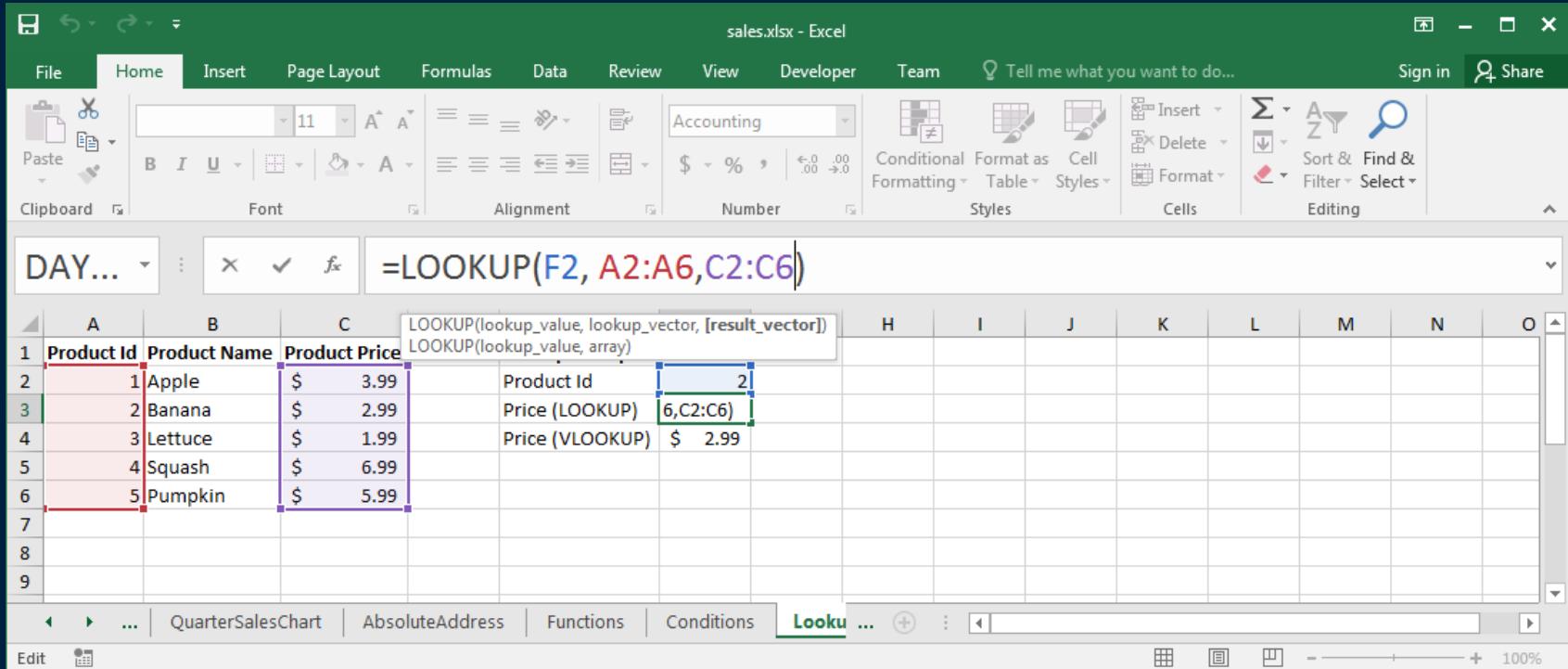
A	B	C	D	E	F	G	H	I
1		More than						
2		one						
3	Hello World	string.						
4								
5		JATE(C1, C2, C3)						
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

Sheet14 Sheet13 QuarterSalesFormal ... + 100%

# LOOKUP Function

The LOOKUP function searches for a value in a column.

- VLOOKUP searches a column in a table ; HLOOKUP searches a row in a table.



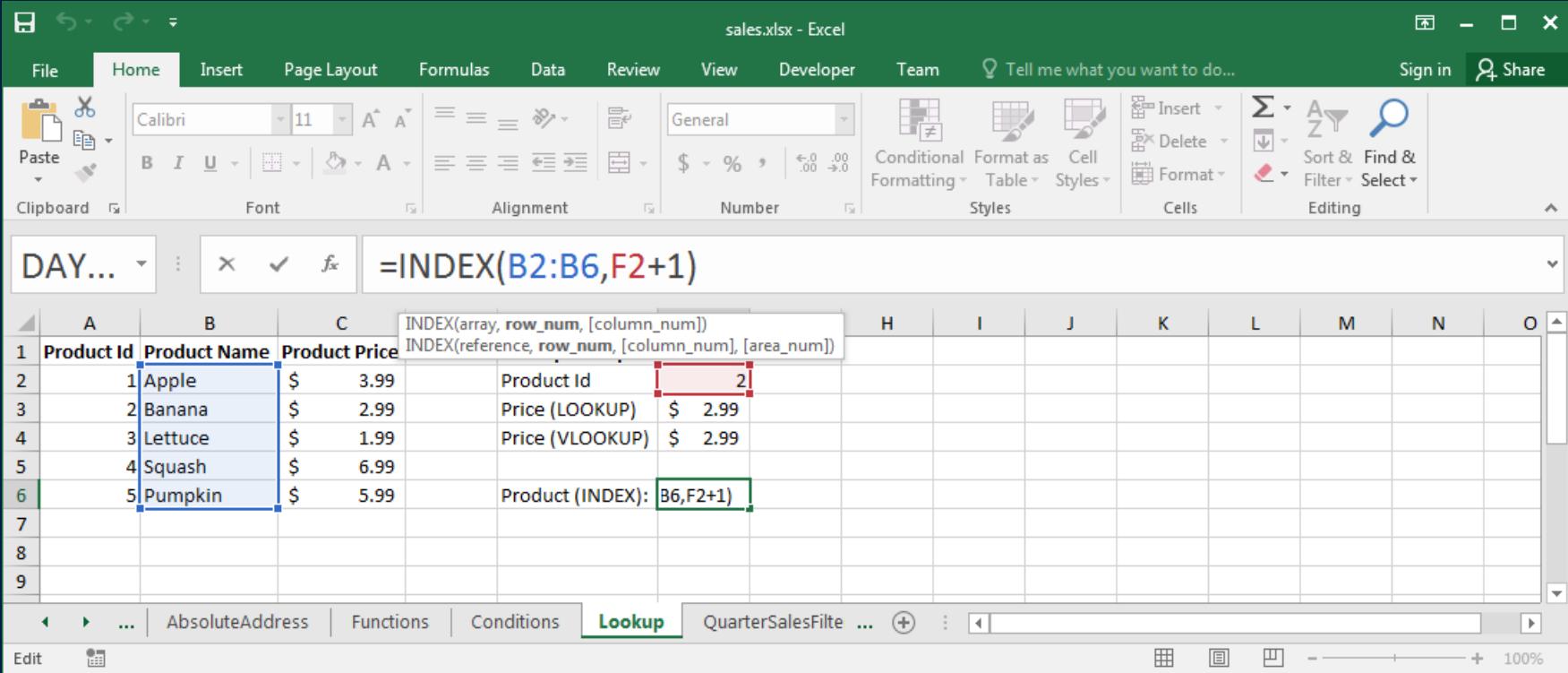
The screenshot shows an Excel spreadsheet titled "sales.xlsx - Excel". The formula bar displays the formula `=LOOKUP(F2, A2:A6,C2:C6)`. The spreadsheet contains two tables:

	A	B	C		H	I	J	K	L	M	N	O
1	Product Id	Product Name	Product Price	LOOKUP(lookup_value, lookup_vector, [result_vector]) LOOKUP(lookup_value, array)								
2	1	Apple	\$ 3.99		Product Id	2						
3	2	Banana	\$ 2.99		Price (LOOKUP)	6,C2:C6)						
4	3	Lettuce	\$ 1.99		Price (VLOOKUP)	\$ 2.99						
5	4	Squash	\$ 6.99									
6	5	Pumpkin	\$ 5.99									
7												
8												
9												

The formula `=LOOKUP(F2, A2:A6,C2:C6)` is highlighted in red, indicating it is the active cell. The cell reference `F2` is highlighted in blue, and the range `A2:A6` is highlighted in purple. The formula bar also shows the expanded form of the formula: `LOOKUP(lookup_value, lookup_vector, [result_vector])  
LOOKUP(lookup_value, array)`.

# INDEX Function

INDEX ( ) returns the value in the array of cells at the given index.



The screenshot shows a Microsoft Excel spreadsheet titled "sales.xlsx - Excel". The ribbon menu is visible with the "Home" tab selected. In the formula bar, the formula `=INDEX(B2:B6,F2+1)` is entered. The cell C2 contains the formula `INDEX(array, row_num, [column_num])` and the cell C6 contains the formula `INDEX(reference, row_num, [column_num], [area_num])`. The data table has columns for Product Id, Product Name, and Product Price. Row 2 shows the lookup value 1 and the result 2. Row 6 shows the formula `B6,F2+1` and the result 5. The status bar at the bottom shows the tabs "AbsoluteAddress", "Functions", "Conditions", "Lookup", "QuarterSalesFilte", and "...".

A	B	C
Product Id	Product Name	Product Price
1	Apple	\$ 3.99
2	Banana	\$ 2.99
3	Lettuce	\$ 1.99
4	Squash	\$ 6.99
5	Pumpkin	\$ 5.99

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**Q7: Excel Trivia - A cell contains the following: 'ABC'+'DEF' What is the value of the cell?** 000

- ERROR
- ABCDEF
- 'ABC'+'DEF'

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000

**Q8: Excel Trivia - A cell contains the following: " 'ABC'+'DEF' " What is the value of the cell?**

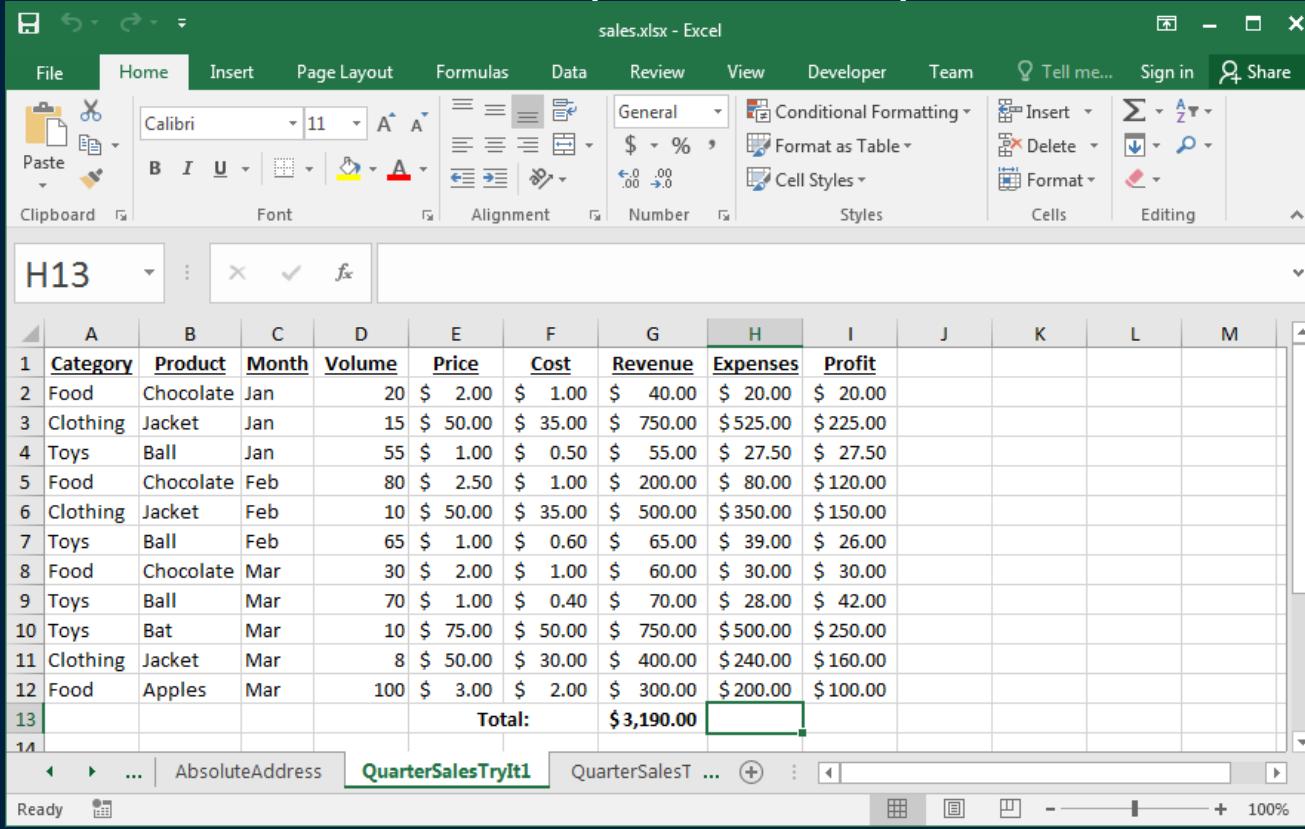
- ERROR
- ABCDEF
- 'ABC'+'DEF'

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# Try it: Entering Formulas

**Question:** Add a column for expenses and profit as below:



The screenshot shows an Excel spreadsheet titled "sales.xlsx - Excel". The ribbon menu is visible at the top, with the "Home" tab selected. The main area displays a data table with 13 rows and 9 columns. The columns are labeled A through I, and the rows are numbered 1 through 13. The data includes categories like Food, Clothing, and Toys, along with specific products like Chocolate, Jacket, Ball, and Apples. The "Revenue" column shows calculated values, while the "Expenses" and "Profit" columns are currently empty. In row 13, the "Revenue" cell (G13) contains the formula "=B13\*E13", and the "Total:" cell (H13) contains the formula "=SUM(G2:G12)". The status bar at the bottom indicates "AbsoluteAddress" and "QuarterSalesTryIt1".

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Category	Product	Month	Volume	Price	Cost	Revenue	Expenses	Profit				
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00	\$ 20.00	\$ 20.00				
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00	\$ 525.00	\$ 225.00				
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00	\$ 27.50	\$ 27.50				
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00	\$ 80.00	\$ 120.00				
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00	\$ 350.00	\$ 150.00				
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00	\$ 39.00	\$ 26.00				
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00	\$ 30.00	\$ 30.00				
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00	\$ 28.00	\$ 42.00				
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00	\$ 500.00	\$ 250.00				
11	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00	\$ 240.00	\$ 160.00				
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00	\$ 200.00	\$ 100.00				
13					Total:	\$ 3,190.00							
14													

≡ Active poll



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### Q9: Excel Trivia - Some Excel functions have 0 arguments. True or False?

- True
- False

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# Advanced Spreadsheet Addressing

The dollar sign "**\$**" is a symbol that indicates an ***absolute address***.

- By default, addresses are "relative" in the sense that if they are in a formula that is copied to another cell, they will be changed relative to where they were copied from their origin.

Example:

- Cell A1 has the formula =A2+B1
- Copy contents of cell A1 to cell C4.
- Formula changes to =C5+D4 because moved down three rows and over two columns.
- If cell A1 had the formula =**\$A\$2+\$B\$1**, then the same formula would be in cell C4.
- Question: What if formula was =**A2+B\$1**?

≡ Active poll



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**Q10: Excel Trivia - Cell A1 contains the following: =\$B2+D\$4. What is the formula if the cell is copied to cell D3?**

- Error
- =\$B2+D\$4
- =\$B4+F\$4
- =\$B4+G\$4

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10: Poll ▾



# Aggregate Functions

An **aggregate function** computes a summary function over a range of cells. The values can either be data values or cell locations.

Common functions are:

- MIN (<value list>) - returns minimum value in list
- MAX (<value list>) - returns maximum value in list
- SUM (<value list>) - returns sum of all values in list
- AVERAGE (<value list>) - returns average of values in list
- COUNT (<value list>) - returns count of values in list
- MEDIAN (<value list>) - returns median value of list

If specifying a cell rectangle, give the upper left and lower right corners, separated by a colon.

- e.g. =AVERAGE (A3 : E6) - rectangle of 4 rows and 5 columns

# Aggregate Functions Example

sales.xlsx - Excel

D2 : =max(D2:D12)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Category	Product	Month	Volume	Price	Cost	Revenue	Expenses	Profit				
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00	\$ 20.00	\$ 20.00				
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00	\$ 525.00	\$ 225.00				
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00	\$ 27.50	\$ 27.50				
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00	\$ 80.00	\$ 120.00				
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00	\$ 350.00	\$ 150.00				
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00	\$ 39.00	\$ 26.00				
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00	\$ 30.00	\$ 30.00				
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00	\$ 28.00	\$ 42.00				
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00	\$ 500.00	\$ 250.00				
11	Clothing	Jacket	Mar	81	\$ 50.00	\$ 30.00	\$ 400.00	\$ 240.00	\$ 160.00				
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00	\$ 200.00	\$ 100.00				
13				=max(D2:D12)	tal:		\$ 3,190.00						
14					MAX(number1, [number2], ...)								

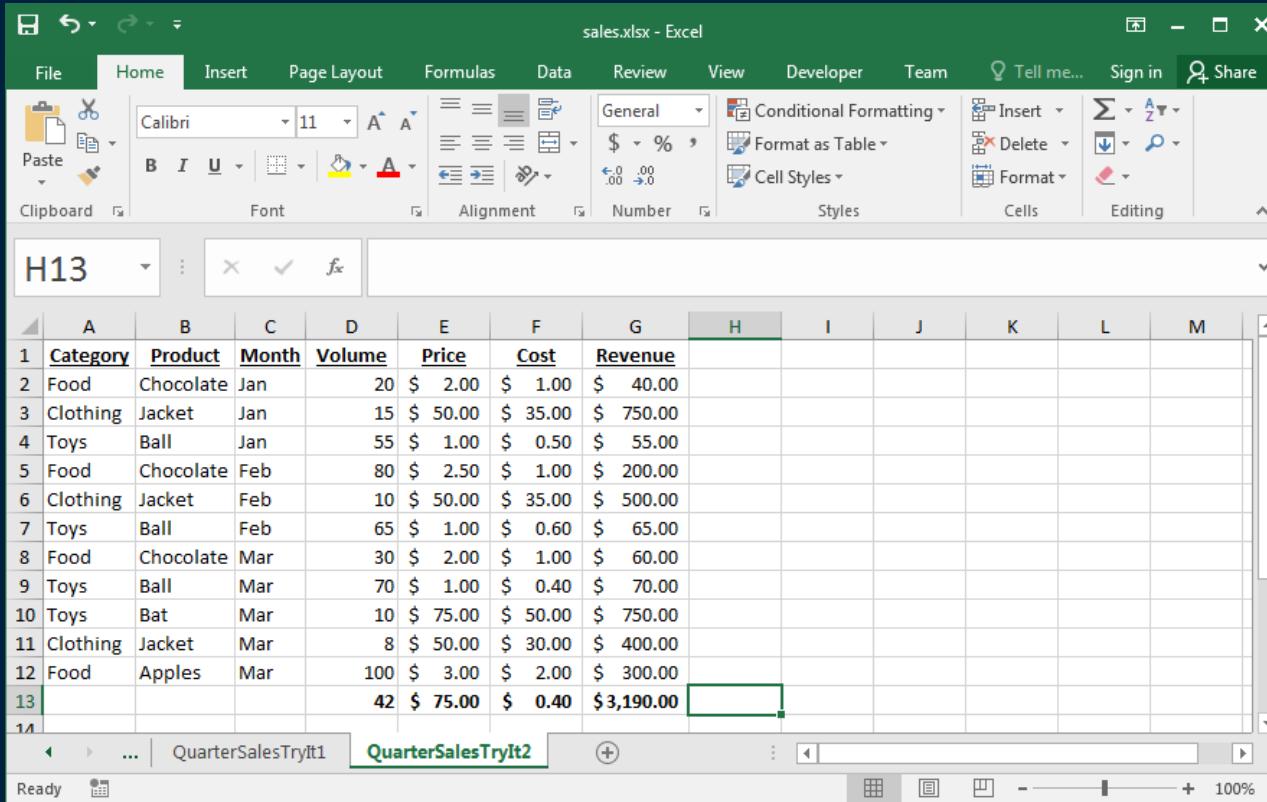
MAX(number1, [number2], ...)

QuarterSales QuarterSalesFormat QuarterPivot

Point 100%

# Try it: Aggregate Functions

**Question:** Create aggregate functions to match below:



The screenshot shows a Microsoft Excel spreadsheet titled "sales.xlsx - Excel". The formula bar at the top displays the cell reference "H13". The spreadsheet contains a table with the following data:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Category	Product	Month	Volume	Price	Cost	Revenue						
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00						
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00						
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00						
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00						
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00						
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00						
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00						
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00						
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00						
11	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00						
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00						
13					42	\$ 75.00	\$ 0.40	\$ 3,190.00					
14													

The formula bar shows the formula `=SUM(D2:D13)`. The status bar at the bottom right indicates "100%".

# Aggregate Functions Question

**Question:** Assume the cells in the range A1 : C4 each contain a number that is equal to their row number (e.g. B3 contains 3). How many of the following statements are **TRUE**?

- 1) The number of cells in the range is 12.
  - 2) The value of  $\text{SUM}(\text{A1 : C4})$  is 20.
  - 3) The value of  $\text{COUNTIF}(\text{A1 : B4}, ">2")$  is 4.
  - 4)  $\text{AVERAGE}(\text{A1 : C4}) > \text{MAX}(\text{C2 : C3})$
- A) 0      B) 1      C) 2      D) 3      E) 4

≡ Active poll



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**Q11: Excel Trivia - Assume the cells in the range A1:C4 each contain a number that is equal to their row number (e.g. B3 contains 3). Which of the following statements are TRUE?**

- The number of cells in the range is 12.
- The value of  $\text{SUM}(A1:C4)$  is 20.
- The value of  $\text{COUNTIF}(A1:B4,>2")$  is 4.
- $\text{AVERAGE}(A1:C4) > \text{MAX}(C2:C3)$

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11: Poll ▾

≡ Active poll



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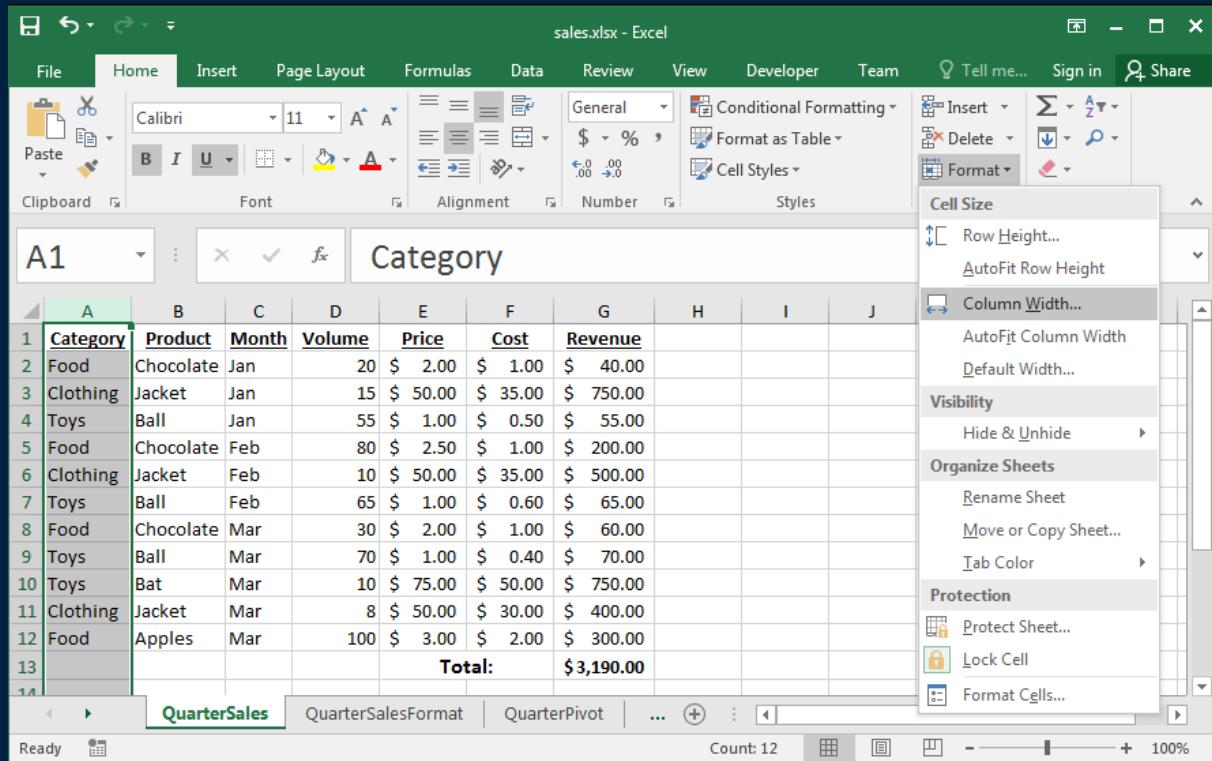
**Q12: Excel Trivia - Assume the three cells in the range A1:C1 contain numbers. Which of these formula output results is ALWAYS the largest?**

- MAX(A1:C1)
- MIN(A1:C1)
- COUNT(A1:C1)
- SUM(A1:C1)
- None of the above are always guaranteed to be the largest

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# Other Formatting: Column Width



The screenshot shows a Microsoft Excel spreadsheet titled "sales.xlsx - Excel". The spreadsheet contains a table with columns for Category, Product, Month, Volume, Price, Cost, and Revenue. The "Format" context menu is open from the "Format" button in the ribbon, and the "Column Width..." option is selected.

	A	B	C	D	E	F	G	H	I	J
1	Category	Product	Month	Volume	Price	Cost	Revenue			
2	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00			
3	Clothing	Jacket	Jan	15	\$ 50.00	\$ 35.00	\$ 750.00			
4	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00			
5	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00			
6	Clothing	Jacket	Feb	10	\$ 50.00	\$ 35.00	\$ 500.00			
7	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00			
8	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00			
9	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00			
10	Toys	Bat	Mar	10	\$ 75.00	\$ 50.00	\$ 750.00			
11	Clothing	Jacket	Mar	8	\$ 50.00	\$ 30.00	\$ 400.00			
12	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00			
13					Total:		\$ 3,190.00			

Resizing columns/rows:

Auto-resize by double clicking on border between columns or using the Format option.

Drag row/column border for manual resize.

# Conditions and Decisions

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A **condition** is an expression that is either TRUE or FALSE.

Conditions are used to make decisions and perform different actions depending on the condition value.

Excel condition and decision functions:

- FALSE () – returns FALSE
- TRUE () – returns TRUE
- AND (cond1, cond2) – returns TRUE if both cond1 and cond2 are true
- OR (cond1, cond2) – returns TRUE if either or both of cond1 and cond2 are true
- NOT (cond) – returns TRUE if cond is FALSE

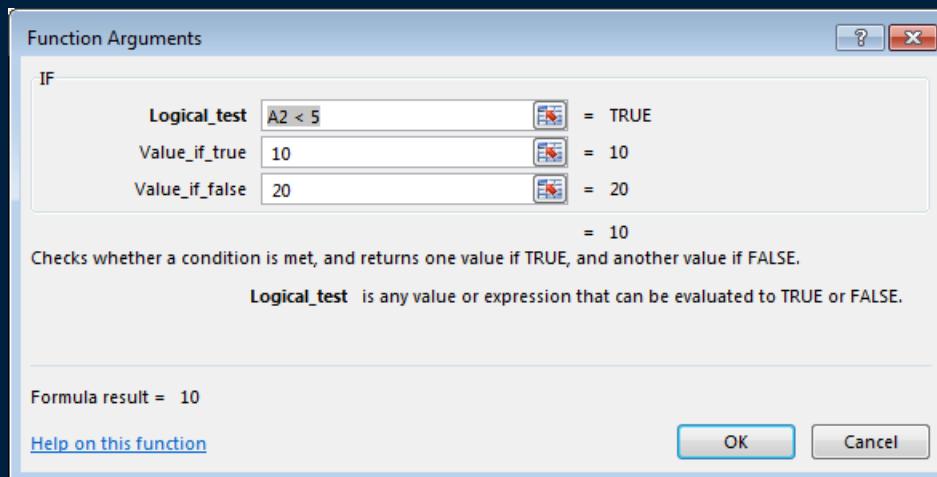
# Decisions using IF ()

The IF () function is used to make a decision based on a condition.

- IF(condition, value\_if\_true, value\_if\_false)

Example: If cell A2 is less than 5, return 10 otherwise return 20.

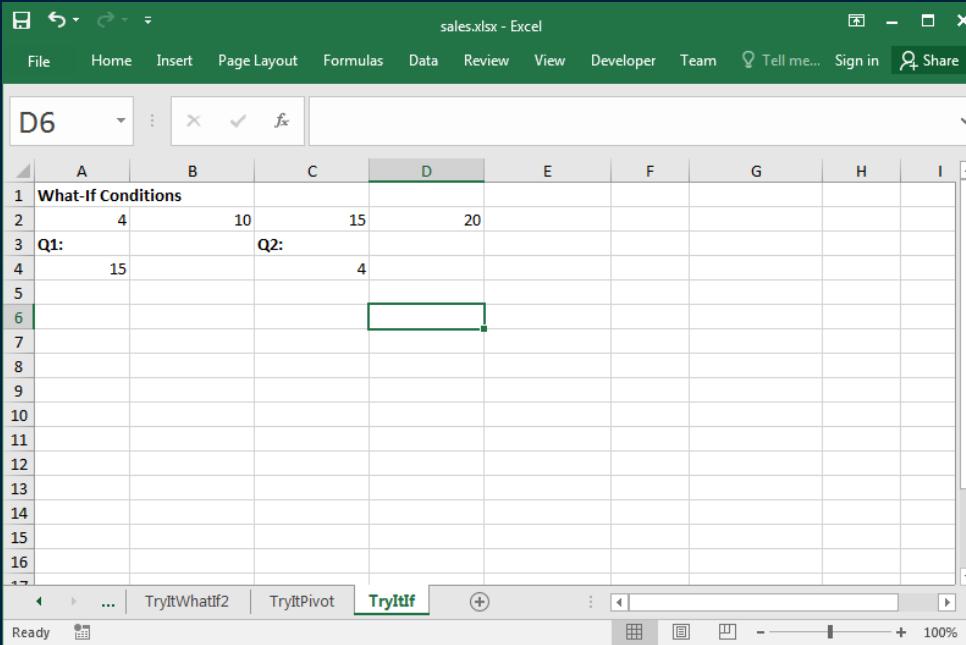
= IF (A2 < 5, 10, 20)



# Try it: Conditions and IF()

**Question:** Create two conditions:

- 1) If cell B2  $\geq$  10, then show C2, otherwise D2.
- 2) If cell B2  $<$  15 and C2  $>$  20, return B2\*C2, otherwise if D2  $<$  10, return 1, else 4.



The screenshot shows an Excel spreadsheet titled "sales.xlsx - Excel". The table has the following data:

	A	B	C	D	E	F	G	H	I
1	What-If Conditions								
2		4	10	15	20				
3	Q1:		Q2:						
4		15		4					
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

≡ Active poll



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### Q13: Excel Trivia - Which of these statements are TRUE when A1=40 and A2=10

- =AND(FALSE(), TRUE())
- =OR(FALSE(), NOT(TRUE()))
- =IF(A1=40, 5, 10) returns 10.
- =IF(OR(A1=40,A2>10),1, 2) returns 2.
- =IF(A2=10,IF(A1=40,FALSE(),TRUE()))

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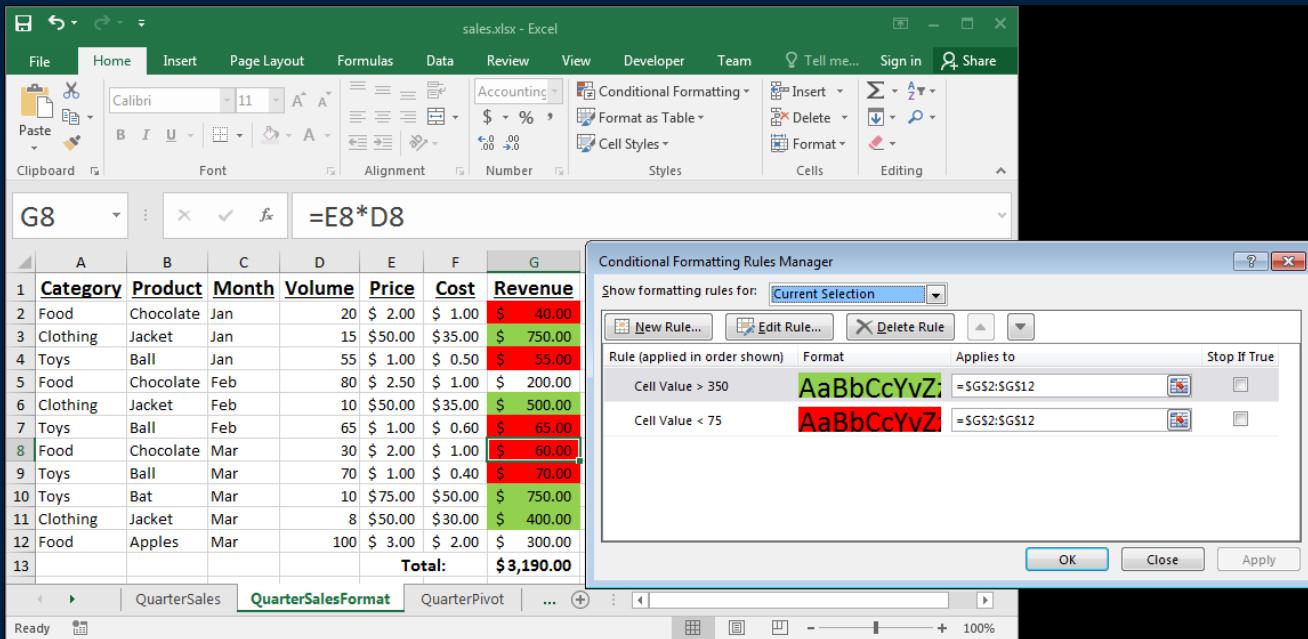


13: Poll ▾

# Conditional Formatting

**Conditional formatting** allows you to change the cell format based on data values. This is accessible under **Styles**.

- Other options: data bars, color scales



The screenshot shows an Excel spreadsheet titled "sales.xlsx - Excel". The spreadsheet contains a table of sales data with columns: Category, Product, Month, Volume, Price, Cost, and Revenue. The "Revenue" column is highlighted in green. The formula bar shows =E8\*D8. The ribbon is visible with the "Home" tab selected. A "Conditional Formatting" dropdown menu is open, and a "Conditional Formatting Rules Manager" dialog box is displayed in the foreground. The dialog box shows two rules applied to the range \$G\$2:\$G\$12:

Rule (applied in order shown)	Format	Applies to	Stop If True
Cell Value > 350	AaBbCcYvZ: (green font, yellow background)	=\$G\$2:\$G\$12	<input type="checkbox"/>
Cell Value < 75	AaBbCcYvZ: (red font, red background)	=\$G\$2:\$G\$12	<input type="checkbox"/>

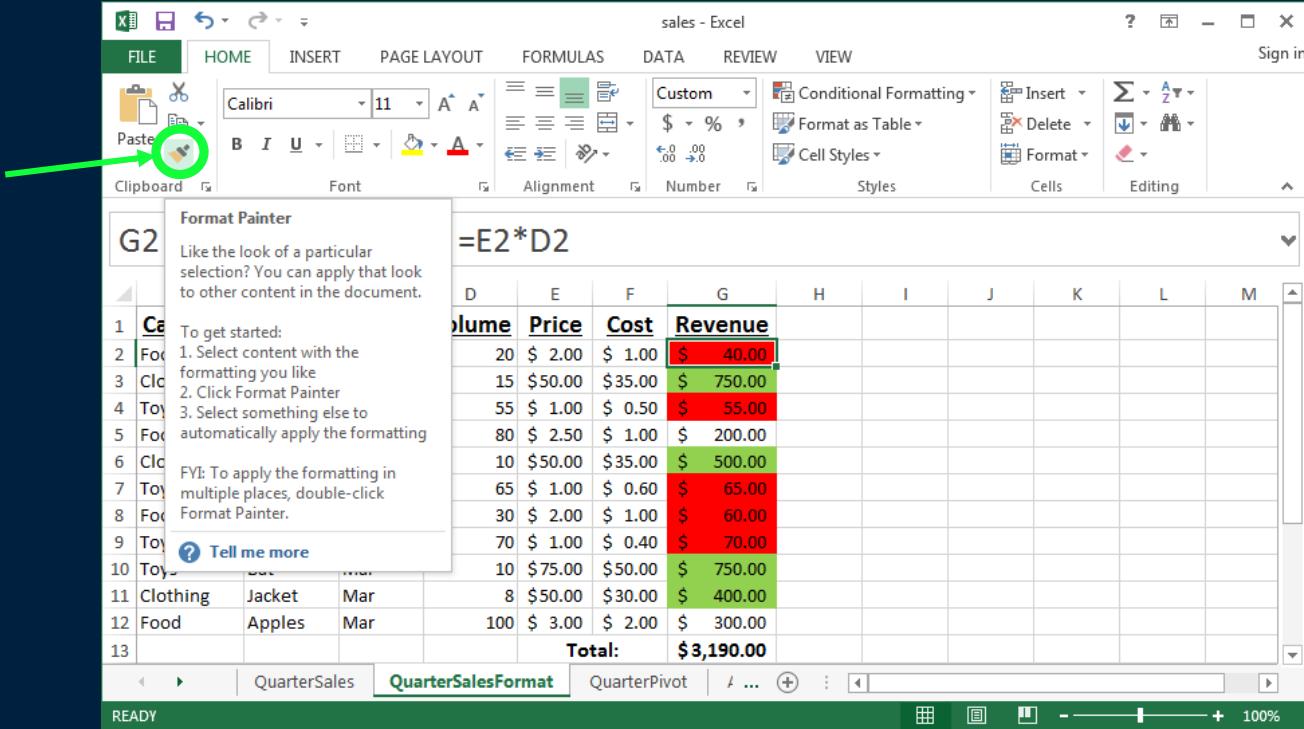
Buttons at the bottom of the dialog box include OK, Close, and Apply.

Category	Product	Month	Volume	Price	Cost	Revenue
Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00
Clothing	Jacket	Jan	15	\$50.00	\$35.00	\$ 750.00
Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00
Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00
Clothing	Jacket	Feb	10	\$50.00	\$35.00	\$ 500.00
Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00
Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00
Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00
Toys	Bat	Mar	10	\$75.00	\$50.00	\$ 750.00
Clothing	Jacket	Mar	8	\$50.00	\$30.00	\$ 400.00
Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00
				Total:		\$ 3,190.00

# Conditional Formatting Result

The format painter button allows you to copy formatting to many cells. Select the cell, click paint button, then highlight cells to have identical formatting.

format  
painter  
button

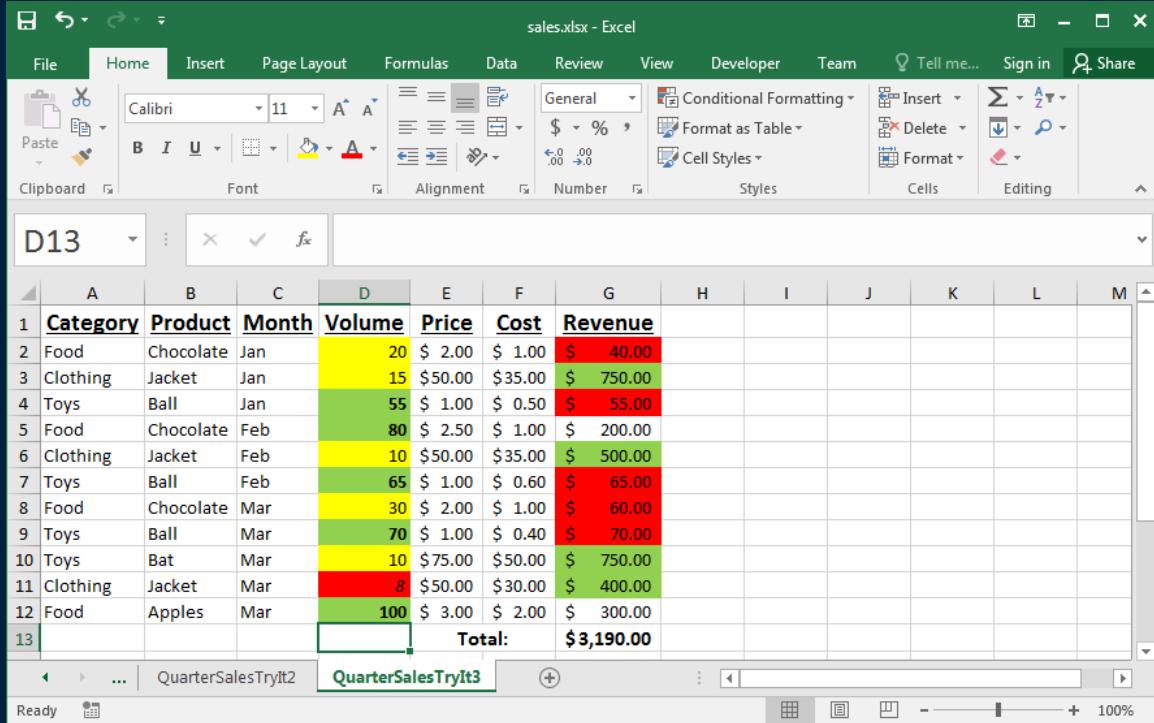


A screenshot of Microsoft Excel showing the 'Format Painter' feature in use. The ribbon at the top shows tabs like FILE, HOME, INSERT, PAGE LAYOUT, FORMULAS, DATA, REVIEW, and VIEW. The 'HOME' tab is selected. In the 'Clipboard' section of the ribbon, there is a small icon of a paintbrush with a green circle around it, which is the 'Format Painter' button. A green arrow points from the text 'format painter button' to this icon. The main area of the screen shows a table with columns labeled 'Volume', 'Price', 'Cost', and 'Revenue'. Row G2 has a red background color. The formula bar shows '=E2\*D2'. The bottom status bar says 'QuarterSalesFormat'.

Volume	Price	Cost	Revenue
20	\$ 2.00	\$ 1.00	\$ 40.00
15	\$50.00	\$35.00	\$ 750.00
55	\$ 1.00	\$ 0.50	\$ 55.00
80	\$ 2.50	\$ 1.00	\$ 200.00
10	\$50.00	\$35.00	\$ 500.00
65	\$ 1.00	\$ 0.60	\$ 65.00
30	\$ 2.00	\$ 1.00	\$ 60.00
70	\$ 1.00	\$ 0.40	\$ 70.00
10	\$75.00	\$50.00	\$ 750.00
8	\$50.00	\$30.00	\$ 400.00
100	\$ 3.00	\$ 2.00	\$ 300.00
13			Total: \$ 3,190.00

# Try it: Conditional Formatting

**Question:** Format rows so: 1) bold/green if volume > 50, 2) italics/red if volume < 10, 3) yellow background otherwise as below:



The screenshot shows an Excel spreadsheet titled "sales.xlsx - Excel". The ribbon is visible at the top with tabs for File, Home, Insert, Page Layout, Formulas, Data, Review, View, Developer, Team, Tell me..., Sign in, and Share. The Home tab is selected. The font size is set to 11pt Calibri. The Conditional Formatting button is highlighted in the ribbon's Styles group.

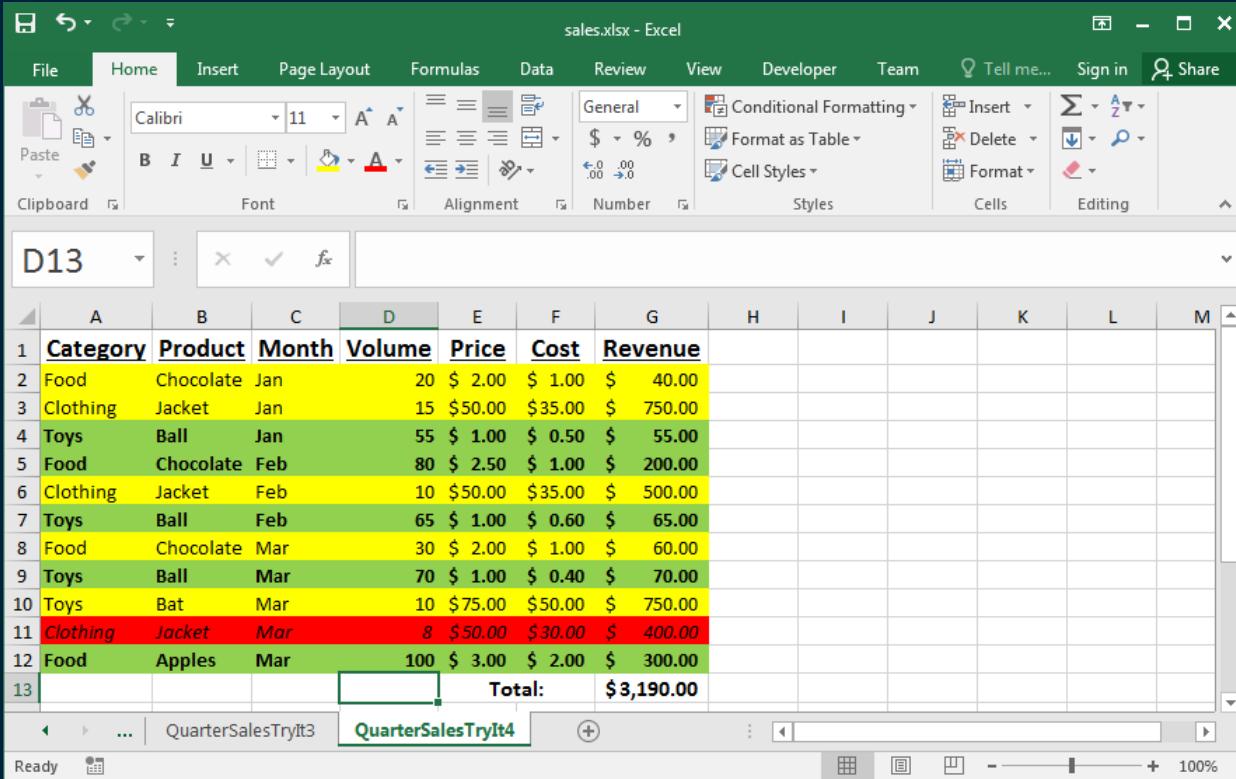
The spreadsheet contains a table with columns: Category, Product, Month, Volume, Price, Cost, and Revenue. The Volume column is the focus of the conditional formatting. The data is as follows:

	Category	Product	Month	Volume	Price	Cost	Revenue
1	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00
2	Clothing	Jacket	Jan	15	\$50.00	\$35.00	\$ 750.00
3	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00
4	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00
5	Clothing	Jacket	Feb	10	\$50.00	\$35.00	\$ 500.00
6	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00
7	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00
8	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00
9	Food	Bat	Mar	10	\$75.00	\$50.00	\$ 750.00
10	Clothing	Jacket	Mar	8	\$50.00	\$30.00	\$ 400.00
11	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00
12					Total:		\$ 3,190.00
13							

The Volume column uses conditional formatting: cells with values > 50 are bolded and green, cells with values < 10 are italicized and red, and all other cells have a yellow background.

# Try it: Conditional Formatting Challenge

**Question:** Take the previous formatting and apply it to whole row:



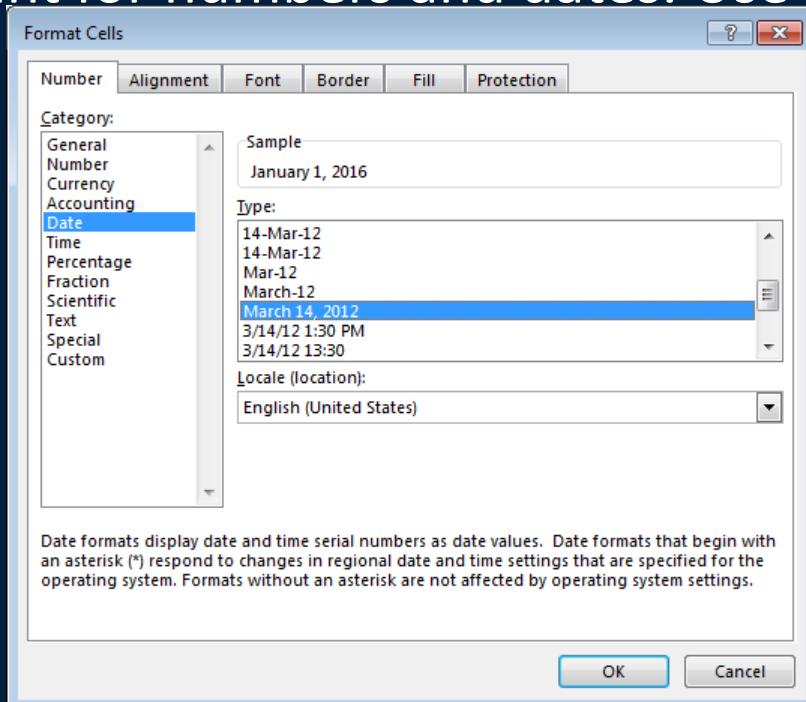
The screenshot shows an Excel spreadsheet titled "sales.xlsx" with the following data:

	Category	Product	Month	Volume	Price	Cost	Revenue
1	Food	Chocolate	Jan	20	\$ 2.00	\$ 1.00	\$ 40.00
2	Clothing	Jacket	Jan	15	\$50.00	\$35.00	\$ 750.00
3	Toys	Ball	Jan	55	\$ 1.00	\$ 0.50	\$ 55.00
4	Food	Chocolate	Feb	80	\$ 2.50	\$ 1.00	\$ 200.00
5	Clothing	Jacket	Feb	10	\$50.00	\$35.00	\$ 500.00
6	Toys	Ball	Feb	65	\$ 1.00	\$ 0.60	\$ 65.00
7	Food	Chocolate	Mar	30	\$ 2.00	\$ 1.00	\$ 60.00
8	Toys	Ball	Mar	70	\$ 1.00	\$ 0.40	\$ 70.00
9	Toys	Bat	Mar	10	\$75.00	\$50.00	\$ 750.00
10	Clothing	Jacket	Mar	8	\$50.00	\$30.00	\$ 400.00
11	Food	Apples	Mar	100	\$ 3.00	\$ 2.00	\$ 300.00
12					Total:		\$ 3,190.00
13							

The rows are color-coded based on the "Category" column: Food (light green), Clothing (yellow), Toys (light blue), and a total row (light orange). The "Revenue" column uses a custom formula-based conditional formatting rule where values greater than \$1000 are displayed in red.

# Date and Type Formats

Formatting data helps users read and understand data and is especially important for numbers and dates. Use built-in or custom formats.



# Conclusion

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**Spreadsheets** are general purpose tools for data analysis that consist of a table of cells which contain data and formulas.

Formulas contain data values, cell references, and functions.

- Aggregate functions summarize multiple data values into a single value.
- Functions exist for statistics, string manipulation, lookup/indexing, and decisions.
- Absolute addresses use a \$ in front of column and/or row so that address does not change when copying formula.

Conditions are used for making decisions with IF ( ) and for conditional formatting.

# Objectives

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- Explain what a spreadsheet is.
- Explain how cells are addressed in a spreadsheet.
- List some of the ways to select cells in a spreadsheet.
- Define and explain: formula, function, argument, concatenation
- Use these functions: concatenate, lookup, index
- Explain the difference between an absolute and relative address.
- Explain how an aggregate function works. List some examples.
- Evaluate and create conditions. Use IF() to make decisions.
- Explain how to use conditional formatting.
- Be able to apply date and type formats.



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