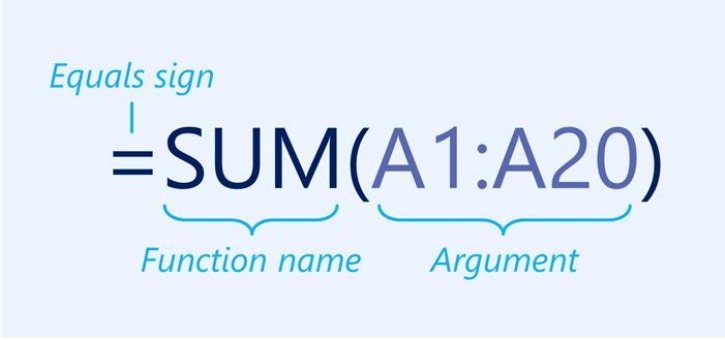
Function

1. Introduction

A **function** is a **predefined formula** that performs calculations using specific values in a particular order. Excel includes many common functions that can be used to quickly find the **sum**, **average**, **count**, **maximum value**, and **minimum value** for a range of cells. In order to use functions correctly, you'll need to understand the different **parts of a function** and how to create **arguments** to calculate values and cell references.

2. The parts of a function

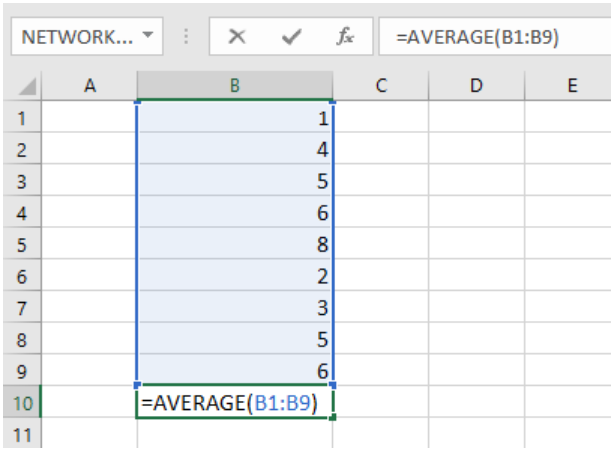
In order to work correctly, a function must be written a specific way, which is called the **syntax**. The basic syntax for a function is the **equals sign** (=), the **function name** (SUM, for example), and one or more **arguments**. Arguments contain the information you want to calculate. The function in the example below would add the values of the cell range A1:A20.



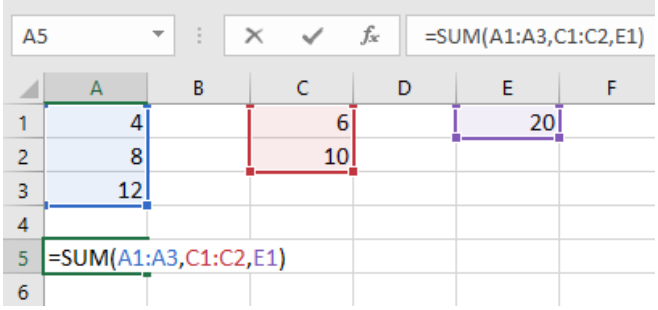
3. Working with arguments

Arguments can refer to both **individual cells** and **cell ranges** and must be enclosed within **parentheses**. You can include one argument or multiple arguments, depending on the syntax required for the function.

For example, the function **=AVERAGE(B1:B9)** would calculate the **average** of the values in the cell range B1:B9. This function contains only one argument.



Multiple arguments must be separated by a **comma**. For example, the function **=SUM(A1:A3, C1:C2, E1)** will **add** the values of all of the cells in the three arguments.



4. Creating a function

There are a variety of functions available in Excel. Here are some of the most common functions you'll use:

- **SUM**: This function **adds** all of the values of the cells in the argument.
- **AVERAGE**: This function determines the **average** of the values included in the argument. It calculates the sum of the cells and then divides that value by the number of cells in the argument.
- **COUNT**: This function **counts** the number of cells with numerical data in the argument. This function is useful for quickly counting items in a cell range.
- **MAX**: This function determines the **highest cell value** included in the argument.
- **MIN**: This function determines the **lowest cell value** included in the argument.

5. To create a function using the AutoSum command:

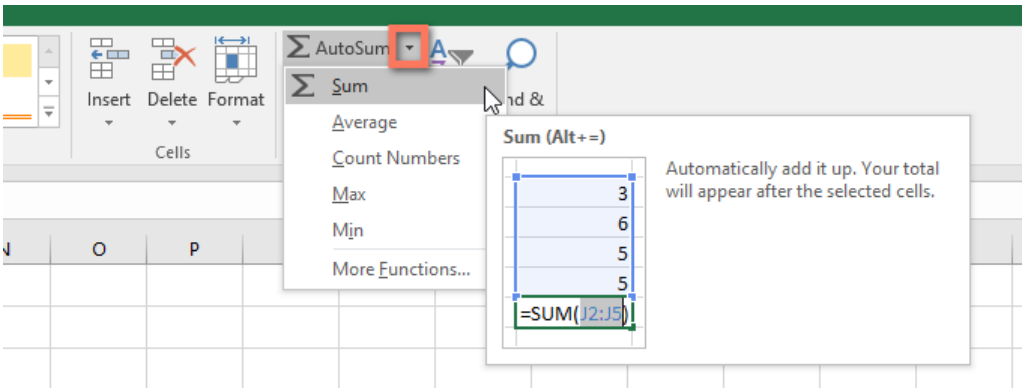
The **AutoSum** command allows you to automatically insert the most common functions into your formula, including SUM, AVERAGE, COUNT, MAX, and MIN. In the example below, we'll use the **SUM** function to calculate the **total cost** for a list of recently ordered items.

1. Select the **cell** that will contain the function. In our example, we'll select cell **D13**.

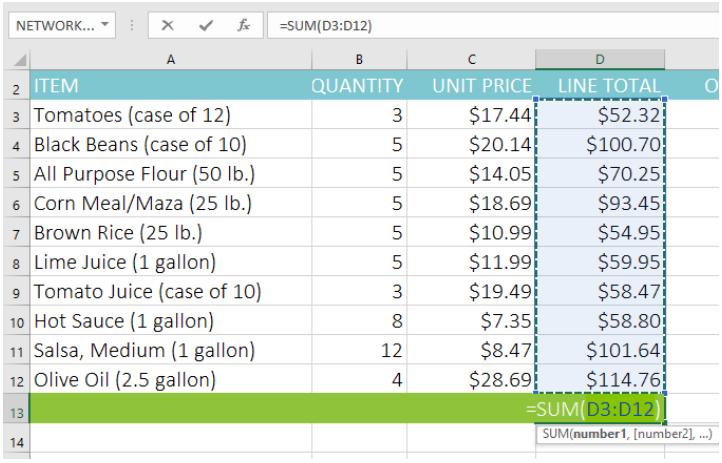
D13

	A	B	C	D
2	ITEM	QUANTITY	UNIT PRICE	LINE TOTAL
3	Tomatoes (case of 12)	3	$17.44	$52.32
4	Black Beans (case of 10)	5	$20.14	$100.70
5	All Purpose Flour (50 lb.)	5	$14.05	$70.25
6	Corn Meal/Maza (25 lb.)	5	$18.69	$93.45
7	Brown Rice (25 lb.)	5	$10.99	$54.95
8	Lime Juice (1 gallon)	5	$11.99	$59.95
9	Tomato Juice (case of 10)	3	$19.49	$58.47
10	Hot Sauce (1 gallon)	8	$7.35	$58.80
11	Salsa, Medium (1 gallon)	12	$8.47	$101.64
12	Olive Oil (2.5 gallon)	4	$28.69	$114.76
13			TOTAL	
14				

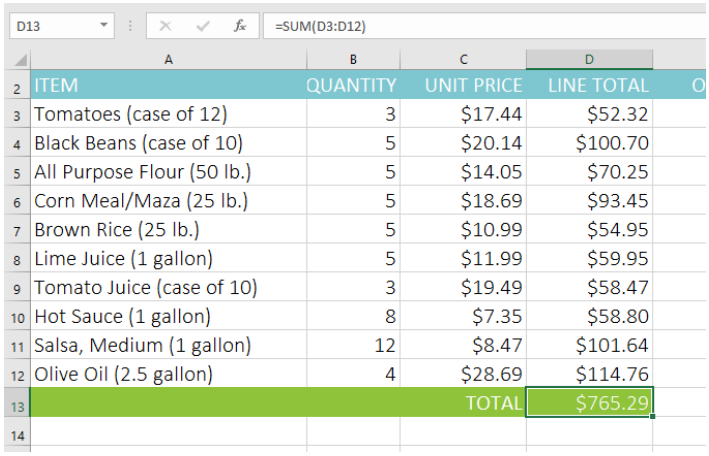
2. In the **Editing** group on the **Home** tab, click the **arrow** next to the **AutoSum** command. Next, choose the **desired function** from the drop-down menu. In our example, we'll select **Sum**.



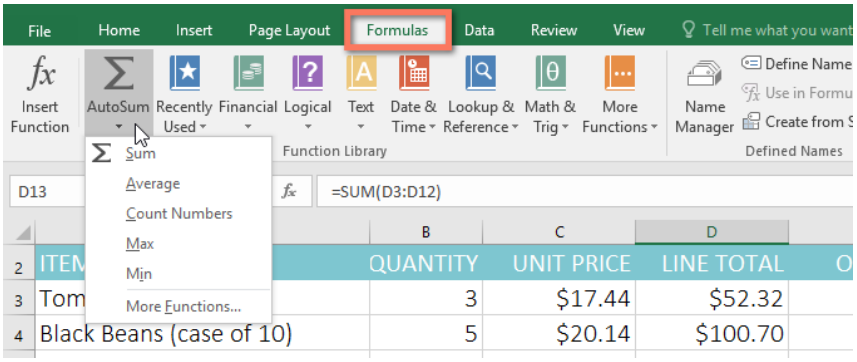
3. Excel will place the **function** in the cell and automatically select a **cell range** for the argument. In our example, cells **D3:D12** were selected automatically; their values will be **added** to calculate the total cost. If Excel selects the wrong cell range, you can manually enter the desired cells into the argument.



4. Press **Enter** on your keyboard. The function will be **calculated**, and the **result** will appear in the cell. In our example, the sum of D3:D12 is **$765.29**.



The **AutoSum** command can also be accessed from the **Formulas** tab on the **Ribbon**.

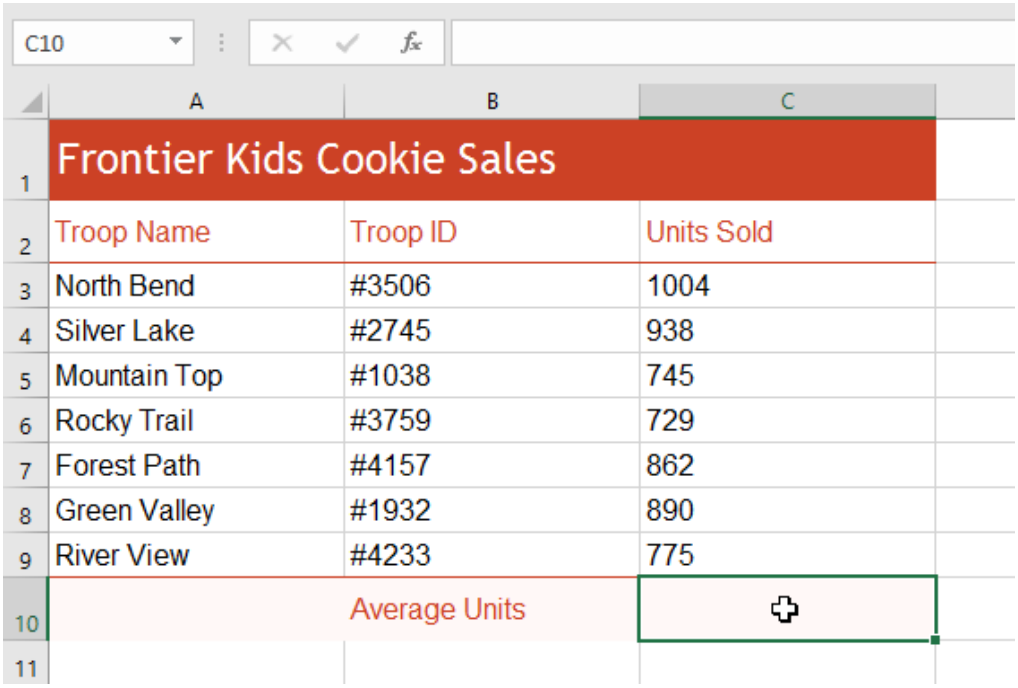


You can also use the **Alt+=** keyboard shortcut instead of the AutoSum command. To use this shortcut, hold down the **Alt** key and then press the **equals sign**.

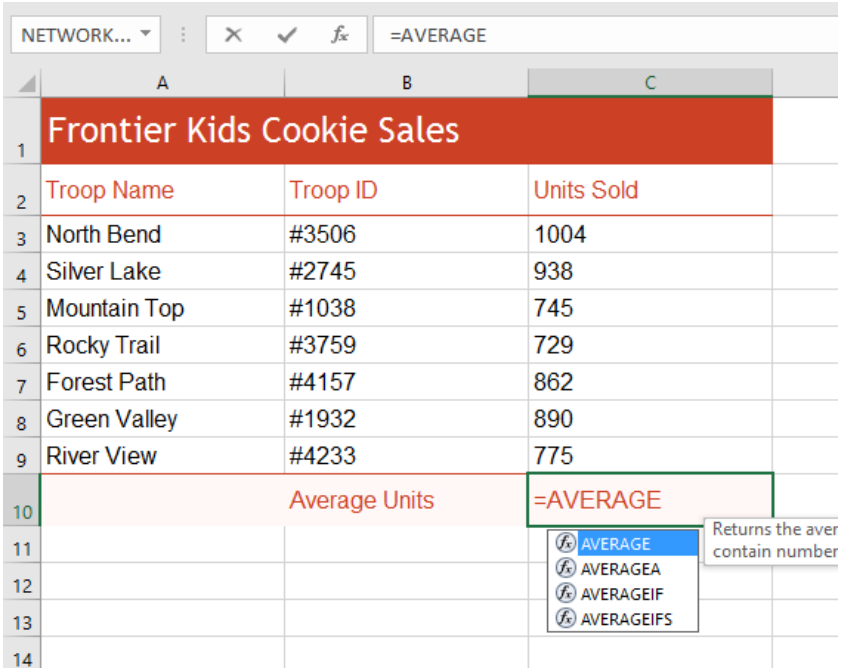
6. To enter a function manually:

If you already know the function name, you can easily type it yourself. In the example below (a tally of cookie sales), we'll use the **AVERAGE** function to calculate the **average number of units sold** by each troop.

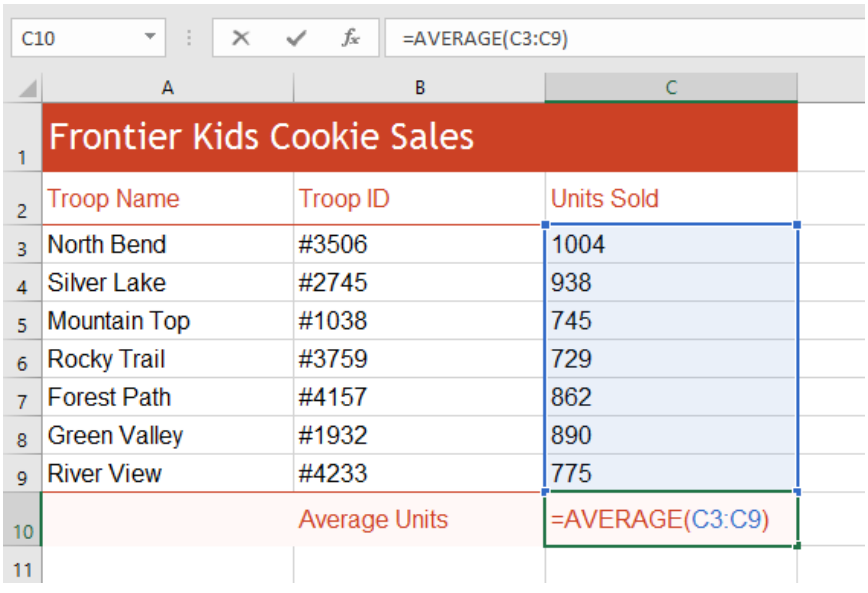
1. Select the **cell** that will contain the function. In our example, we'll select cell **C10**.



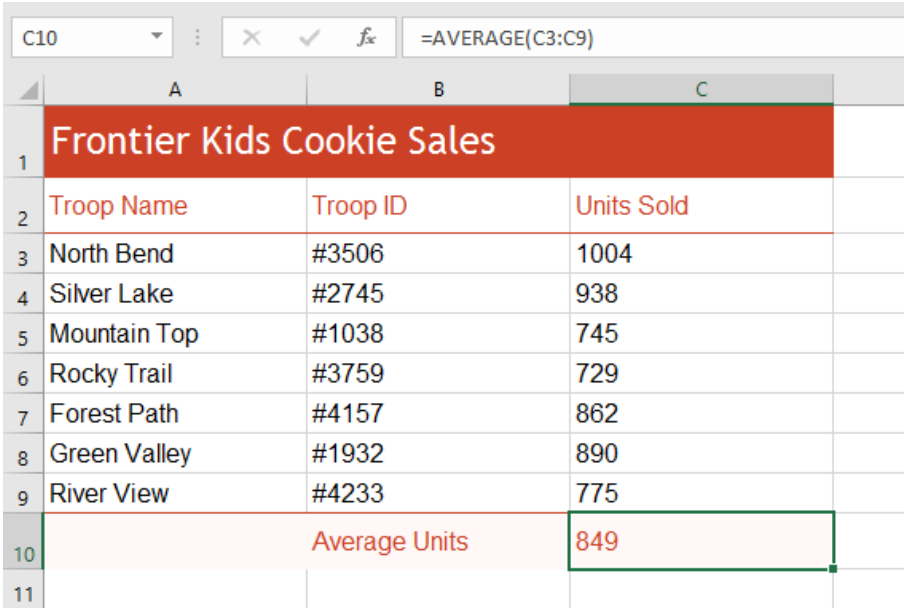
2. Type the **equals sign (=)**, then enter the desired **function name**. You can also select the desired function from the list of **suggested functions** that appears below the cell as you type. In our example, we'll type **=AVERAGE**.



3. Enter the **cell range** for the argument inside **parentheses**. In our example, we'll type **(C3:C9)**. This formula will add the values of cells C3:C9, then divide that value by the total number of values in the range.



4. Press **Enter** on your keyboard. The function will be calculated, and the **result** will appear in the cell. In our example, the average number of units sold by each troop is **849**.



C10 =AVERAGE(C3:C9)

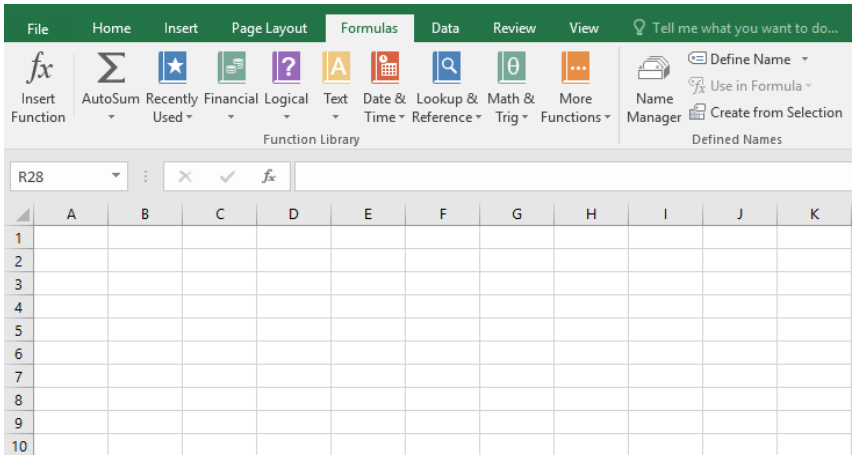
	A	B	C
1	Frontier Kids Cookie Sales		
2	Troop Name	Troop ID	Units Sold
3	North Bend	#3506	1004
4	Silver Lake	#2745	938
5	Mountain Top	#1038	745
6	Rocky Trail	#3759	729
7	Forest Path	#4157	862
8	Green Valley	#1932	890
9	River View	#4233	775
10		Average Units	849
11			

7. The Function Library

While there are hundreds of functions in Excel, the ones you'll use the most will depend on the **type of data** your workbooks contain. There's no need to learn every single function, but exploring some of the different **types** of functions will help as you create new projects. You can even use the **Function Library** on the **Formulas** tab to browse functions by category, including **Financial**, **Logical**, **Text**, and **Date & Time**.

To access the **Function Library**, select the **Formulas** tab on the **Ribbon**. Look for the **Function Library** group.

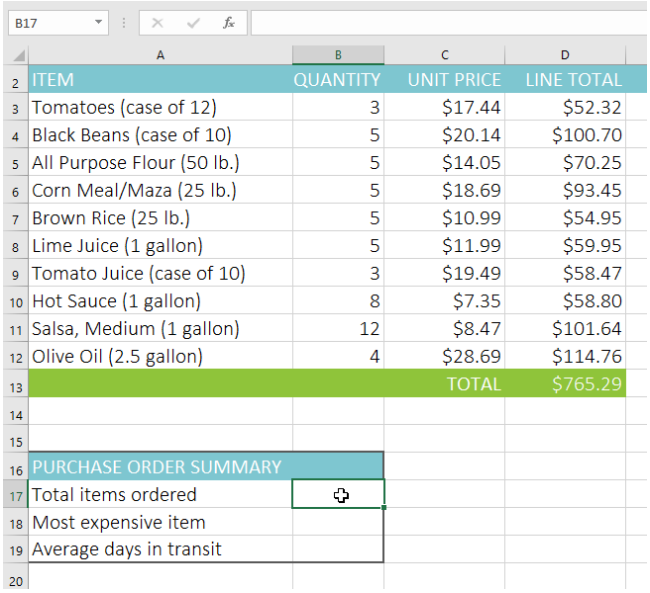
Click the buttons in the interactive below to learn more about the different types of functions in Excel.



8. To insert a function from the Function Library:

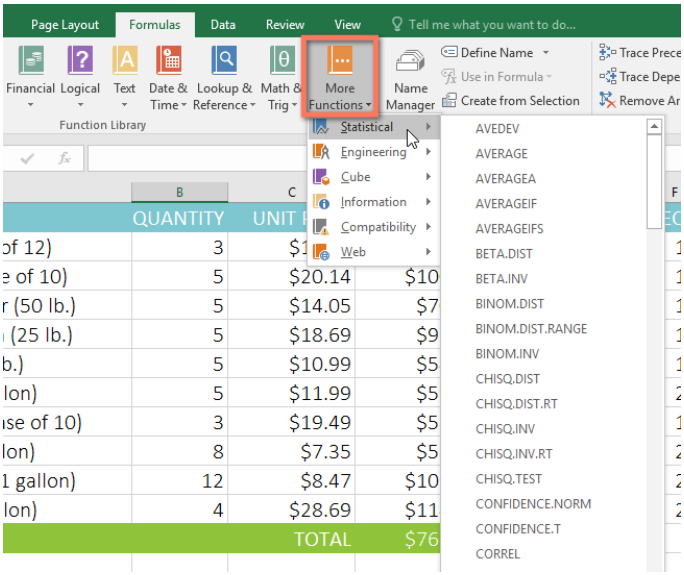
In the example below, we'll use the COUNTA function to count the total number of items in the **Items** column. Unlike COUNT, **COUNTA** can be used to tally cells that contain data of any kind, not just numerical data.

1. Select the **cell** that will contain the function. In our example, we'll select cell **B17**.

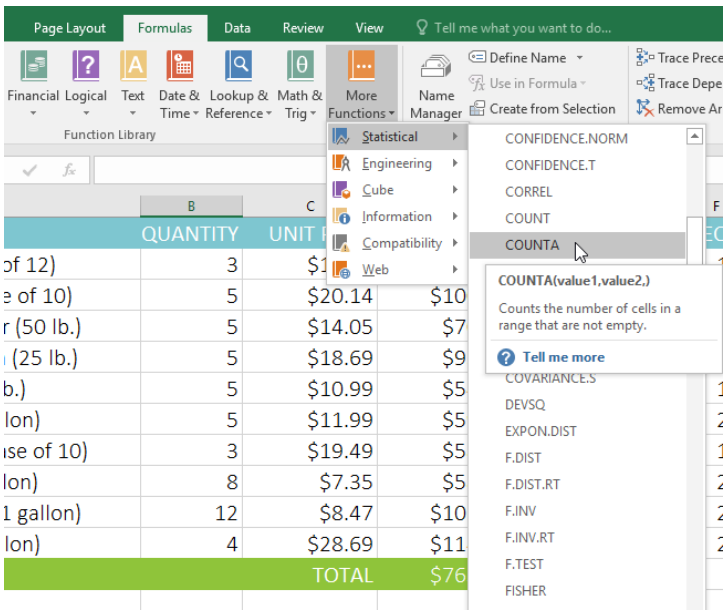


2. Click the **Formulas** tab on the **Ribbon** to access the **Function Library**.

3. From the **Function Library** group, select the desired **function category**. In our example, we'll choose **More Functions**, then hover the mouse over **Statistical**.

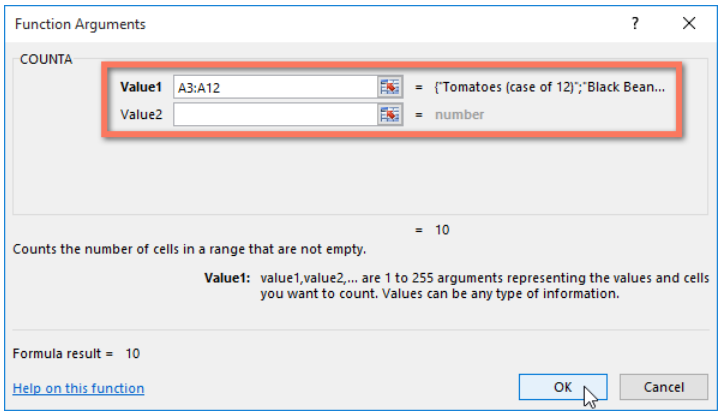


4. Select the **desired function** from the drop-down menu. In our example, we'll select the **COUNTA** function, which will count the number of cells in the **Items** column that are not empty.

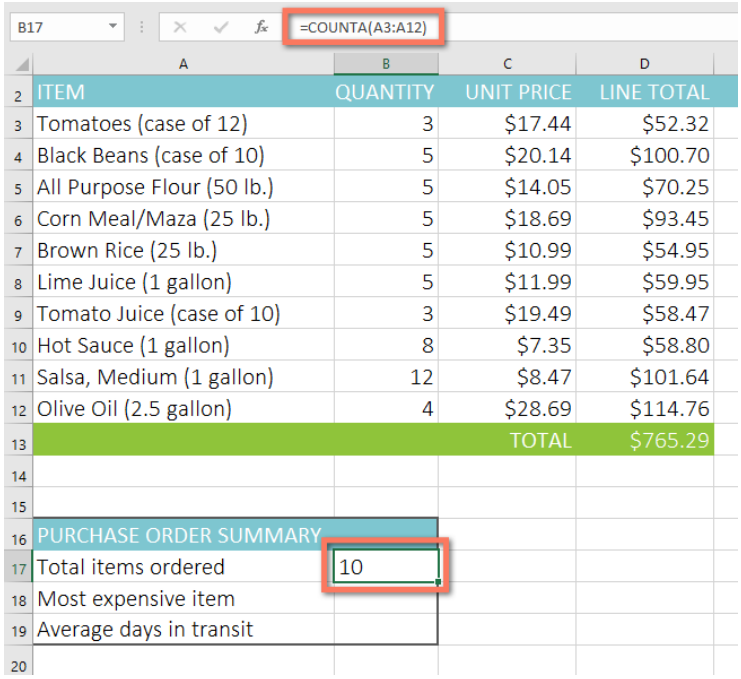


5. The **Function Arguments** dialog box will appear. Select the **Value1** field, then enter or select the desired cells. In our example, we'll enter the cell range **A3:A12**. You can continue to add arguments in the **Value2** field, but in this case we only want to count the number of cells in the cell range **A3:A12**.

6. When you're satisfied, click **OK**.



7. The function will be **calculated**, and the **result** will appear in the cell. In our example, the result shows that **10 items** were ordered.



	A	B	C	D
2	ITEM	QUANTITY	UNIT PRICE	LINE TOTAL
3	Tomatoes (case of 12)	3	$17.44	$52.32
4	Black Beans (case of 10)	5	$20.14	$100.70
5	All Purpose Flour (50 lb.)	5	$14.05	$70.25
6	Corn Meal/Maza (25 lb.)	5	$18.69	$93.45
7	Brown Rice (25 lb.)	5	$10.99	$54.95
8	Lime Juice (1 gallon)	5	$11.99	$59.95
9	Tomato Juice (case of 10)	3	$19.49	$58.47
10	Hot Sauce (1 gallon)	8	$7.35	$58.80
11	Salsa, Medium (1 gallon)	12	$8.47	$101.64
12	Olive Oil (2.5 gallon)	4	$28.69	$114.76
13			TOTAL	$765.29
14				
15				
16	PURCHASE ORDER SUMMARY			
17	Total items ordered	10		
18	Most expensive item			
19	Average days in transit			
20				

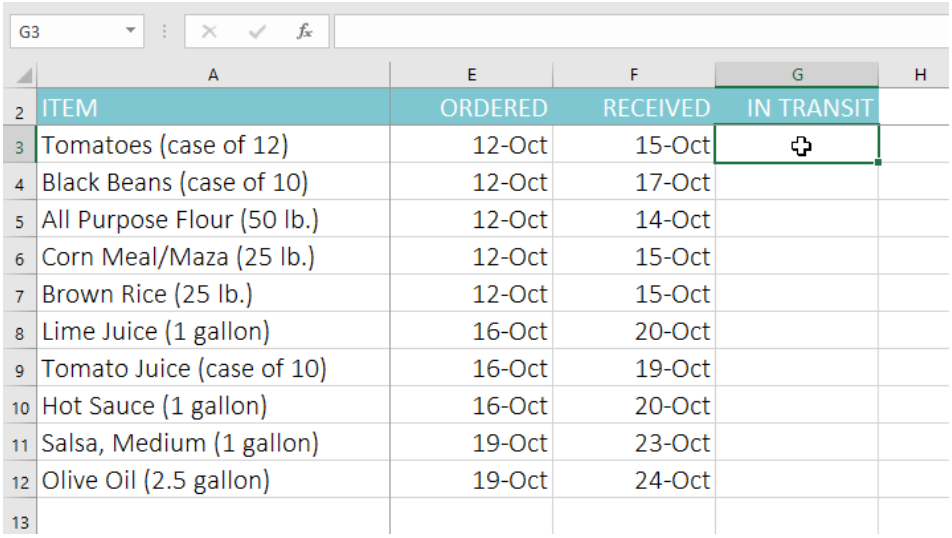
9. The Insert Function command

While the Function Library is a great place to browse for functions, sometimes you may prefer to **search** for one instead. You can do so using the **Insert Function** command. It may take some trial and error depending on the type of function you're looking for, but with practice the Insert Function command can be a powerful way to find a function quickly.

10. To use the Insert Function command:

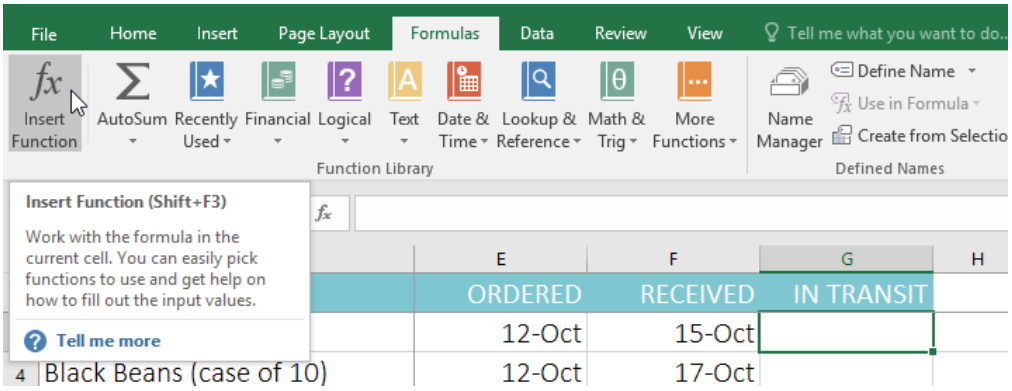
In the example below, we want to find a function that will calculate the **number of business days** it took to receive items after they were ordered. We'll use the dates in columns **E** and **F** to calculate the delivery time in column **G**.

1. Select the **cell** that will contain the function. In our example, we'll select cell **G3**.



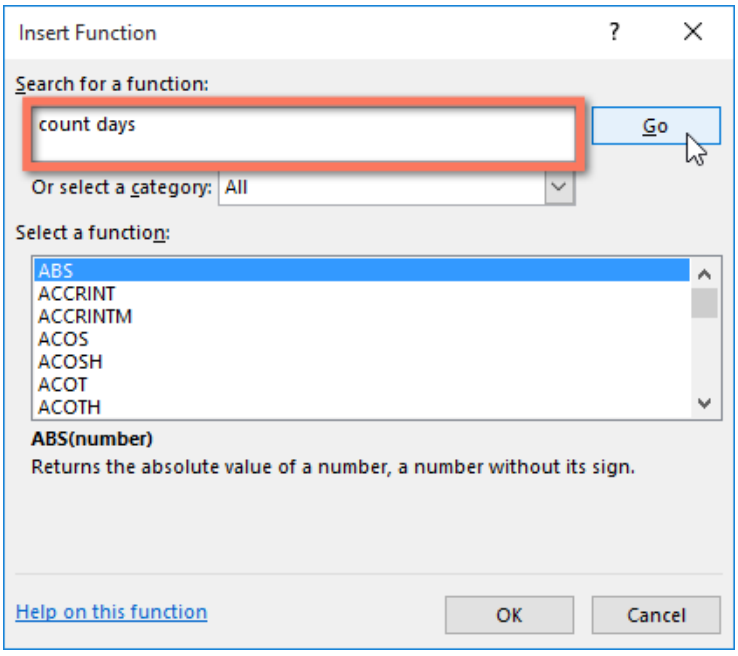
	A	E	F	G	H
2	ITEM	ORDERED	RECEIVED	IN TRANSIT	
3	Tomatoes (case of 12)	12-Oct	15-Oct		
4	Black Beans (case of 10)	12-Oct	17-Oct		
5	All Purpose Flour (50 lb.)	12-Oct	14-Oct		
6	Corn Meal/Maza (25 lb.)	12-Oct	15-Oct		
7	Brown Rice (25 lb.)	12-Oct	15-Oct		
8	Lime Juice (1 gallon)	16-Oct	20-Oct		
9	Tomato Juice (case of 10)	16-Oct	19-Oct		
10	Hot Sauce (1 gallon)	16-Oct	20-Oct		
11	Salsa, Medium (1 gallon)	19-Oct	23-Oct		
12	Olive Oil (2.5 gallon)	19-Oct	24-Oct		
13					

2. Click the **Formulas** tab on the **Ribbon**, then click the **Insert Function** command.

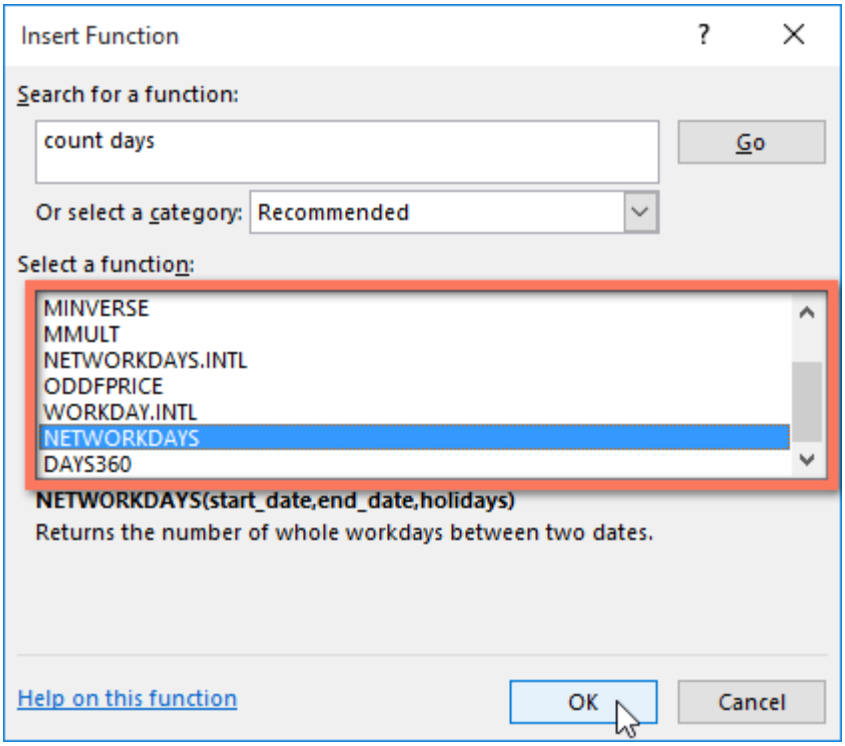


3. The **Insert Function** dialog box will appear.

4. Type a few **keywords** describing the calculation you want the function to perform, then click **Go**. In our example, we'll type **count days**, but you can also search by selecting a **category** from the drop-down list.

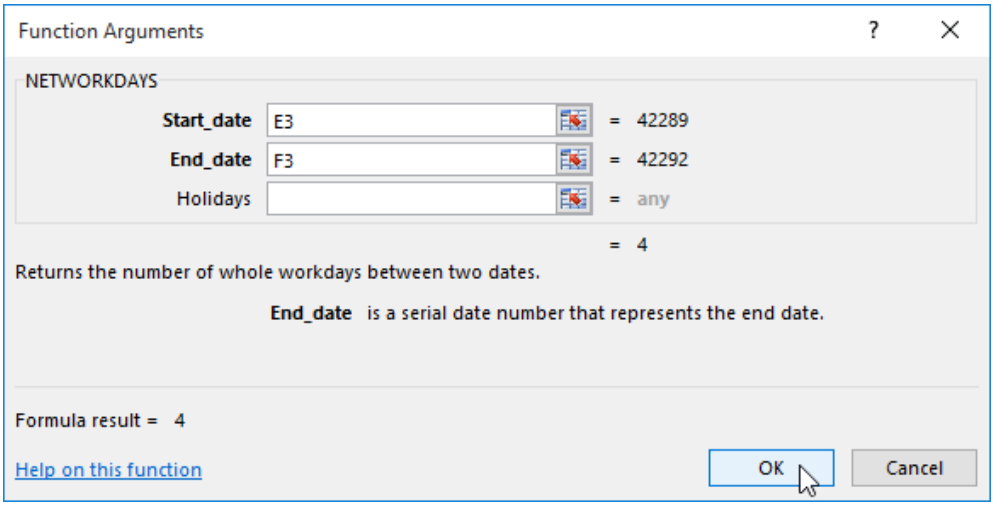


5. Review the **results** to find the desired function, then click **OK**. In our example, we'll choose **NETWORKDAYS**, which will count the number of business days between the ordered date and received date.

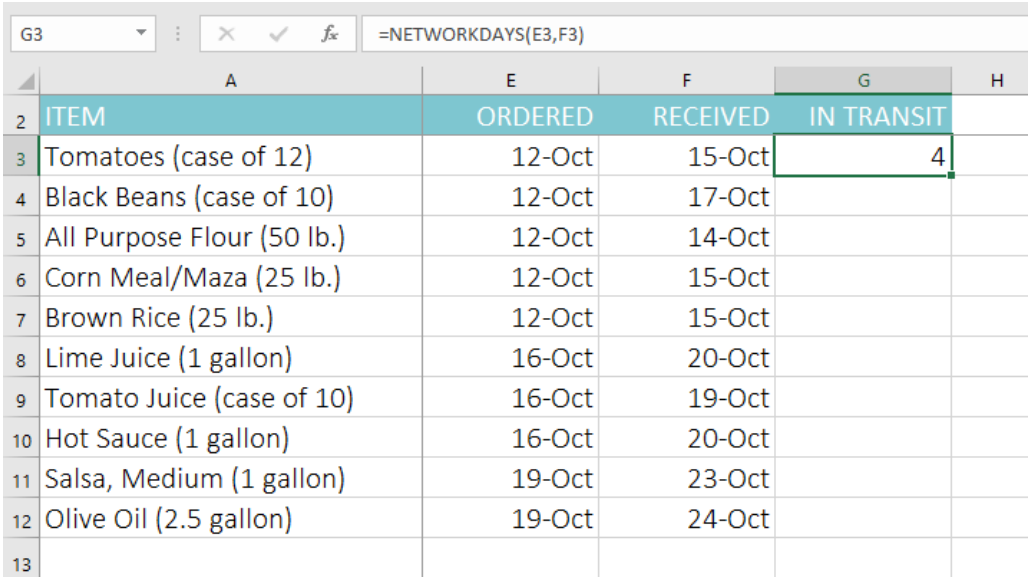


6. The **Function Arguments** dialog box will appear. From here, you'll be able to enter or select the cells that will make up the arguments in the function. In our example, we'll enter **E3** in the **Start_date** field and **F3** in the **End_date** field.

7. When you're satisfied, click **OK**.

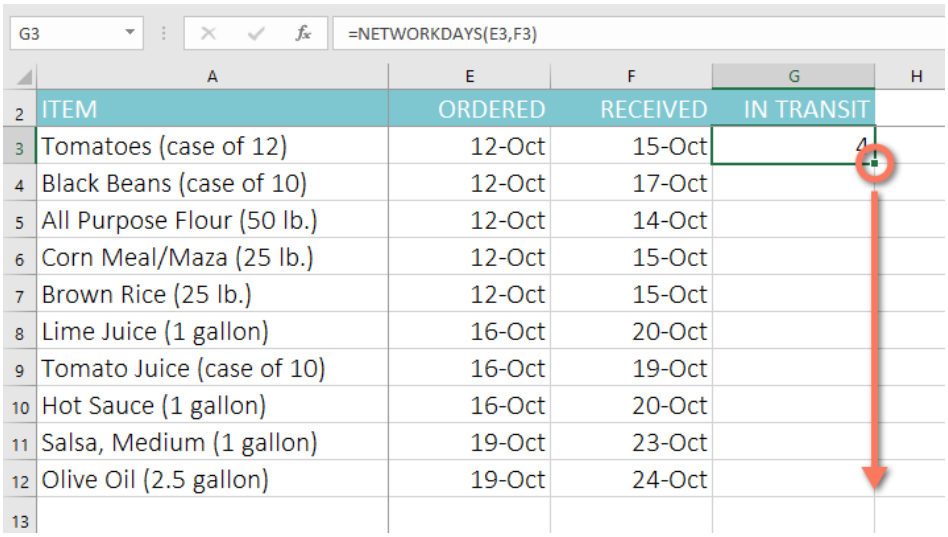


8. The function will be **calculated**, and the **result** will appear in the cell. In our example, the result shows that it took **four business days** to receive the order.



	A	E	F	G	H
2	ITEM	ORDERED	RECEIVED	IN TRANSIT	
3	Tomatoes (case of 12)	12-Oct	15-Oct	4	
4	Black Beans (case of 10)	12-Oct	17-Oct		
5	All Purpose Flour (50 lb.)	12-Oct	14-Oct		
6	Corn Meal/Maza (25 lb.)	12-Oct	15-Oct		
7	Brown Rice (25 lb.)	12-Oct	15-Oct		
8	Lime Juice (1 gallon)	16-Oct	20-Oct		
9	Tomato Juice (case of 10)	16-Oct	19-Oct		
10	Hot Sauce (1 gallon)	16-Oct	20-Oct		
11	Salsa, Medium (1 gallon)	19-Oct	23-Oct		
12	Olive Oil (2.5 gallon)	19-Oct	24-Oct		
13					

Like formulas, functions can be copied to adjacent cells. Simply select the **cell** that contains the function, then click and drag the **fill handle** over the cells you want to fill. The function will be copied, and values for those cells will be calculated relative to their rows or columns.



	A	E	F	G	H
2	ITEM	ORDERED	RECEIVED	IN TRANSIT	
3	Tomatoes (case of 12)	12-Oct	15-Oct	4	
4	Black Beans (case of 10)	12-Oct	17-Oct		
5	All Purpose Flour (50 lb.)	12-Oct	14-Oct		
6	Corn Meal/Maza (25 lb.)	12-Oct	15-Oct		
7	Brown Rice (25 lb.)	12-Oct	15-Oct		
8	Lime Juice (1 gallon)	16-Oct	20-Oct		
9	Tomato Juice (case of 10)	16-Oct	19-Oct		
10	Hot Sauce (1 gallon)	16-Oct	20-Oct		
11	Salsa, Medium (1 gallon)	19-Oct	23-Oct		
12	Olive Oil (2.5 gallon)	19-Oct	24-Oct		
13					