UNIT: 02

Performing Calculations

Learning Outcomes

By the end of this unit the learner will be able to:

- ✓ **Create formulas in a worksheet**
- ✓ **Insert functions in a worksheet**
- ✓ **Reuse formulas**

UNIT 02 PERFORMING CALCULATIONS

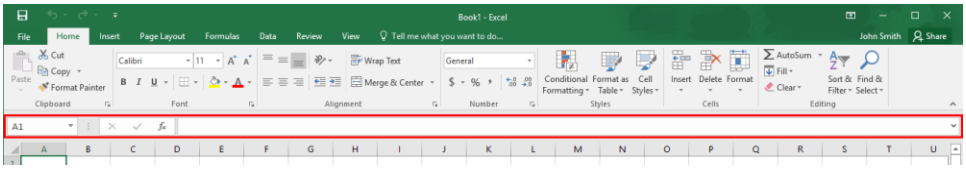
Create Formulas in a Worksheet

EXCEL FORMULAS

Formulas are mathematical expressions that operate on cell contents. When cells contain numerical data, you can perform multiple mathematical operations on the cell content as your worksheet requires. The results of these operations will be shown in the cell that contains the formula. Formulas can be simple, like adding two cell values, or quite complex, involving multiple mathematical operations.

THE FORMULA BAR

Located just below the ribbon, the Formula Bar is where you will type in functions for a selected cell:

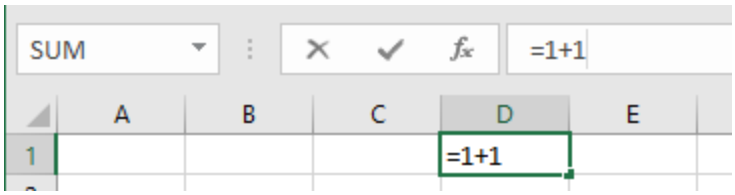


The Formula Bar is comprised of the **Name Box(1)**; the **Insert Function**,**Enter**, and **Cancel**buttons**(2)**;and the **Formula Bar** text box **(3)**:

The Formula Bar text box will display the contents of the selected cell and allow you to edit its contents. The Insert Function button allows you to insert functions that you type into the Formula Bar into the currently selected cell. The Enter button will enter any formula that appears in the bar into the current cell, while the Cancel button will cancel the process and clear the Formula Bar entirely.

ELEMENTS OF AN EXCEL FORMULA

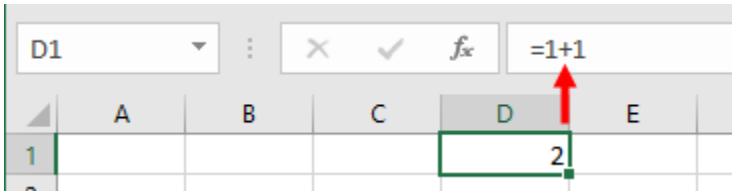
Formulae are always preceded by an equals sign (=). Formulae can contain cell references (like A1), numbers (like 23), or functions (like SUM(B2:B9)). Enter a formula by typing directly into a cell or into the Formula Bar:



=A1+23, = d2-c2, and =B10+b11/C6 are all valid formulae; cell references are not case-sensitive.

If you include a cell reference in a formula (like =B3*6), and that cell reference itself contains a second formula (like =B1+B2, stored in B3), that second formula (=B1+B2) will be evaluated first, and the result will be used in =B3*6.

You can tell if a cell contains a formula by making it active. If there is a formula in the active cell, it will be shown in the Formula Bar:



COMMON MATHEMATICAL OPERATORS

Excel uses eight basic mathematical operators:

Name	Symbol	Example
Exponent	^	10^2 = 100
Multiplication	*	10*2 = 20
Division	/	10/2 = 5

Addition	+	10+2 = 12
Subtraction	-	10-2 = 8
Equivalence	=	10 = 10
Greater Than	>	10>2
Less Than	<	2<10

THE ORDER OF OPERATIONS

The common mathematical operators shown above are listed from top to bottom in order of precedence. This means that Excel does not simply calculate expressions from left to right; certain operations are performed before others. Multiplication and division, addition and subtraction, and the greater than/less than operations each have equal precedence.

You can impose your own order of operations by enclosing expressions in parentheses (). The operations inside the parentheses will be evaluated before the operations outside.

If you have parentheses within parentheses, such as ((2+3)*4), the expression in the inner parentheses, (2+3) =5, will be evaluated first, and the result will be used to evaluate the expression in the outer parentheses, (5*4) =20.

One easy way to remember precedence order is to remember the word "BEDMAS," which stands for Brackets (aka Parentheses), Exponents, Division, Multiplication, Addition, and Subtraction. Note that:

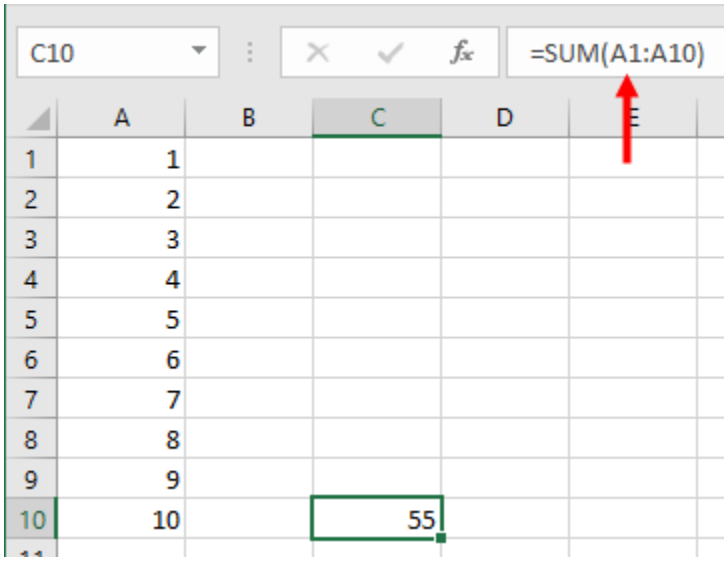
- Division and Multiplication have equal precedence, calculated from left to right.
- Addition and Subtraction have equal precedence, calculated from left to right.

Insert Functions in a Worksheet

FUNCTIONS

Functions are pre-made operations that are used to perform calculations. Excel features a number of functions relating to basic math, financial applications, logic, date and time, and more.

For example, if you want to add a column of ten numbers, you could type =A1+A2+A3+…etc., but that would quickly become tedious and would also make the spreadsheet harder to work with. A much more efficient way of performing this calculation is to use the SUM function:



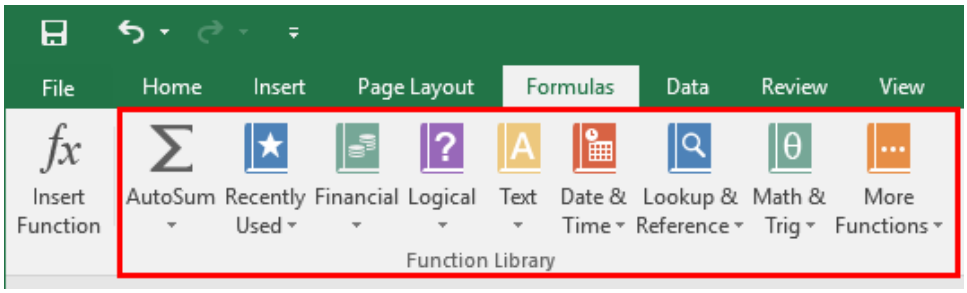
In this example, we typed "=SUM(" and then added the A1 to A10 cell range (A1:A10). Upon added a closing parenthesis and pressing Enter, the sum of all these numbers was calculated and displayed (55). That is much easier than typing out a very long formula and allows for more flexibility if additional rows are added within the defined range.

The Function Library

Functions have been a very important part of Excel right from the beginning because they make data computation and analysis very easy. In fact, Excel features over 300 built-in functions to calculate or provide information regarding:

- Databases
- Date and time
- Engineering
- Finance
- Worksheet metadata
- Logic
- Lookup and reference
- Math and trigonometry
- Statistical analysis
- Text strings

You can browse the nine categories available in the Formulas tab:



You will likely use many of the functions available under AutoSum, Financial, and Math & Trig. Remember to check the Recently Used menu to look at functions you have used in the past.

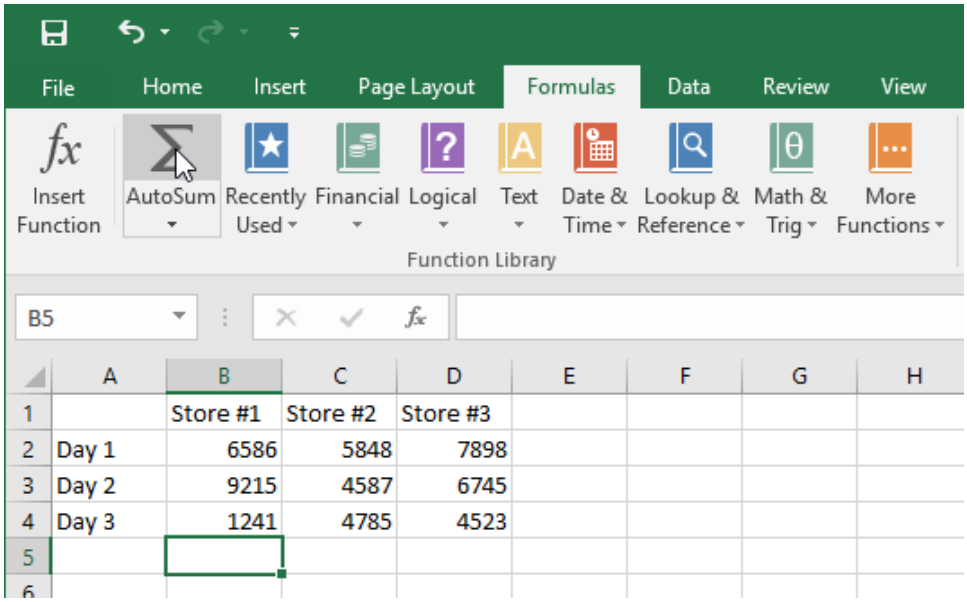
COMMON FUNCTIONS IN EXCEL

Using the AutoSum button, you can quickly insert some of the more commonly used functions into a worksheet. The followingbasic mathematical and statistical analysis functions are included:

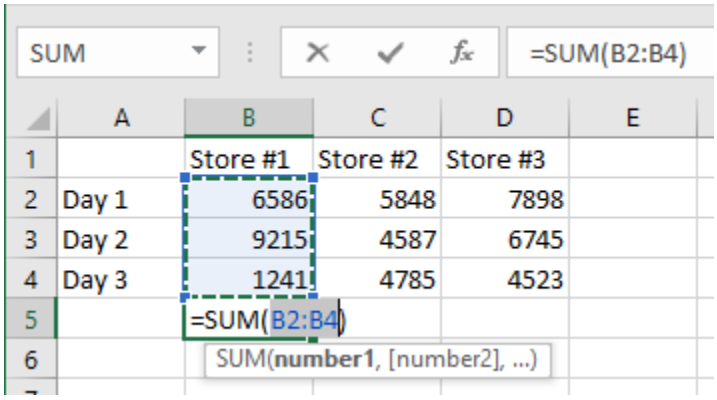
Name	Usage
Sum	Add values together in a specified range or argument.
Average	Determine the average value in an argument.
Count Numbers	Determine the number of cells that contain a specific value in a specified cell range.
Max	Find the highest of the values in an argument.
Min	Find the lowest of the values in an argument.

The AutoSum Button

To use the AutoSum command, click the cell immediately below (if summing a column of data) or to the immediate right (if summing a row of data) of the data you want to sum.Next, click Formulas →AutoSum:



(Additional functions are available by clicking the drop-down arrow.) Excel will scan the data in the column/row. The column or row of data to be summed will be highlighted by an animated border:

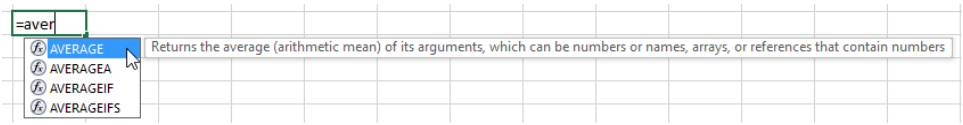


Press Enter to complete the AutoSum command:

	A	B	C	D
1		Store #1	Store #2	Store #3
2	Day 1	6586	5848	7898
3	Day 2	9215	4587	6745
4	Day 3	1241	4785	4523
5		17042		
6				

The Formula AutoComplete Feature

The Formula AutoComplete feature allows you to type function names directly into cells. While typing the formula name, the matching functions will filter themselves based on what you have entered. Click a function to use it:



Once you have decided on a function to use, Excel will prompt you to enter each argument as necessary. Add the closing parenthesis, press Enter, and Excel will calculate the value:

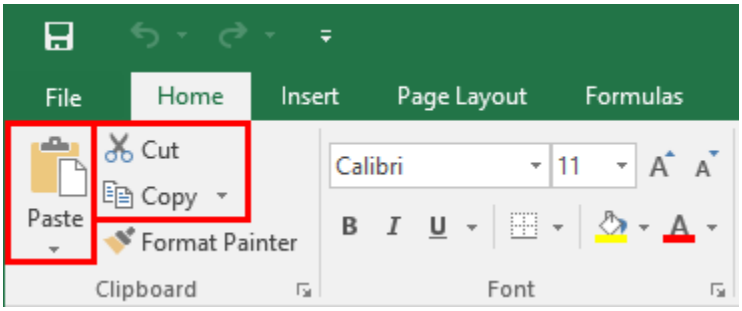
	A	B	C	D	E	F	G
1		Store #1	Store #2	Store #3			
2	Day 1	6586	5848	7898		=AVERAGE(B2:D4)	
3	Day 2	9215	4587	6745			
4	Day 3	1241	4785	4523			
5		17042					

Reuse Formulas

The Cut, Copy, and Paste Commands

Just like many applications that you work with, Excel allows you to move and/or copy cells and their contents to other areas of workbook or even other applications. You can move a cell or its

contents using the Cut and Paste commands. If you wanted to copy a cell and its contents instead, you could use the Copy and Paste commands. You can find all of these commands in the Clipboard group of the Home tab:



These commands are also available on the right-click menu.

Keyboard Shortcuts

In addition to the commands in the Clipboard group of the Home tab, you can also perform the Cut, Copy, and Paste commands using keyboard shortcuts. To use the **Cut** command, press Ctrl + X. **Copy** is performed by pressing Ctrl + C, and **Paste** is performed by pressing Ctrl + V.

PASTE SPECIALOPTIONS

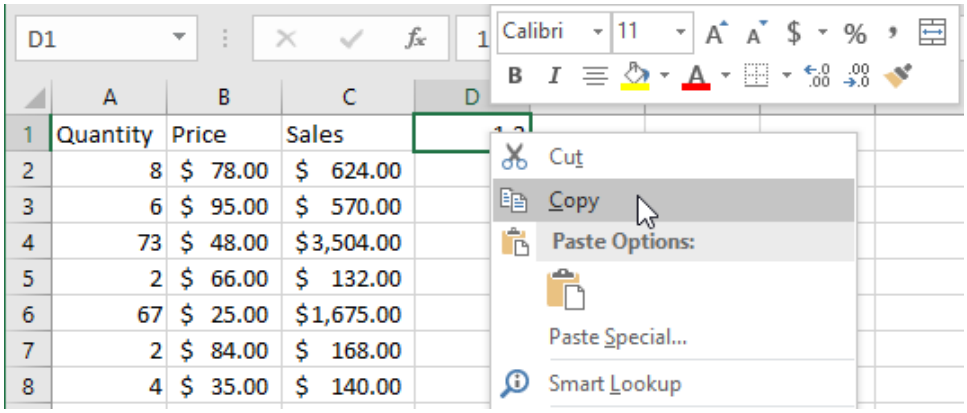
Paste Specialcan be a very useful Excel feature when trying to move data and objects around in your workbooks, as well as move them to and from other applications. Paste Special's options can be used to perform a lot of operations that might be tedious to perform using other Excel tools.Paste Special does indeed paste data, but it also allows you to perform operations on the destination cells using the pasted data.

Consider the following worksheet. It lists quantities in column A, prices in column B, and sales (A*B) in column C:

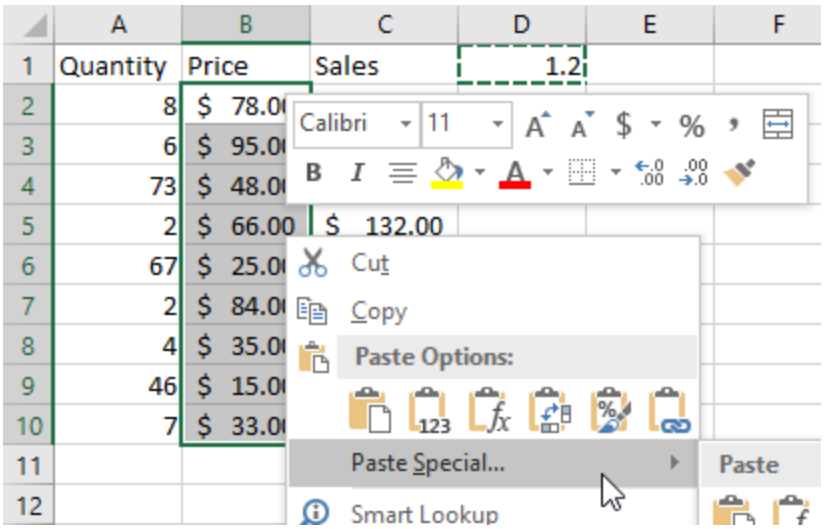
	A	B	C
1	Quantity	Price	Sales
2	8	$ 78.00	$ 624.00
3	6	$ 95.00	$ 570.00
4	73	$ 48.00	$3,504.00
5	2	$ 66.00	$ 132.00
6	67	$ 25.00	$1,675.00
7	2	$ 84.00	$ 168.00
8	4	$ 35.00	$ 140.00
9	46	$ 15.00	$ 690.00
10	7	$ 33.00	$ 231.00

Suppose that all prices are to be raised by 20%. You can manually enter the new prices, use a formula in a new column to calculate the prices, or you can use Paste Special.

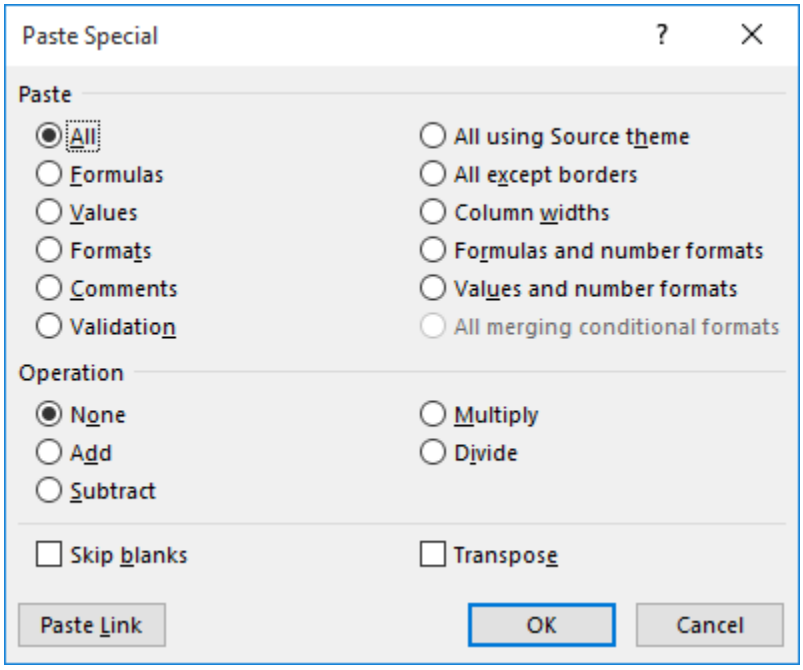
To use Paste Specialin this situation, enter the value 1.2 (the numerical equivalent of 120%) in cell D1. Then, right-click D1 and click Copy:



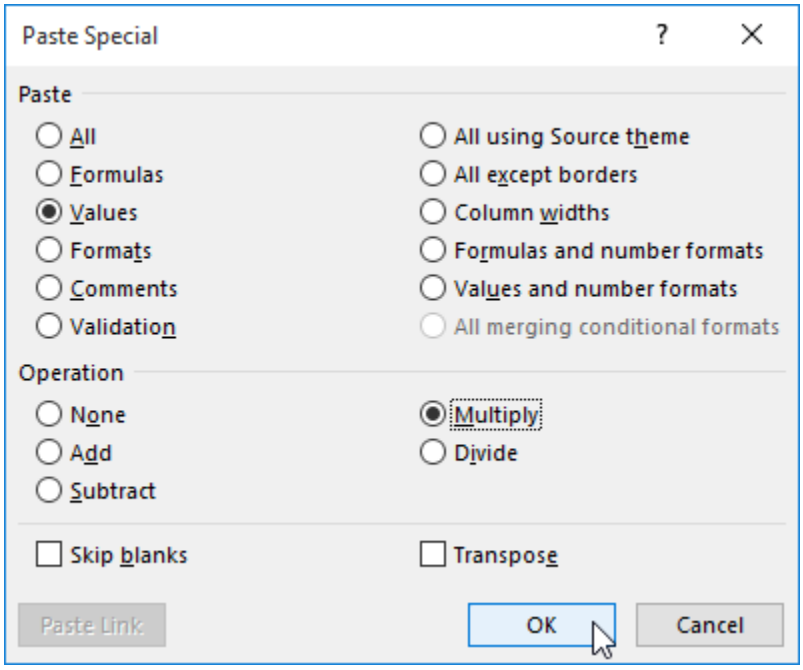
Next, select the prices in column B.Right-click on the selected area and clickPaste Special:



This will display the Paste Specialdialog box:



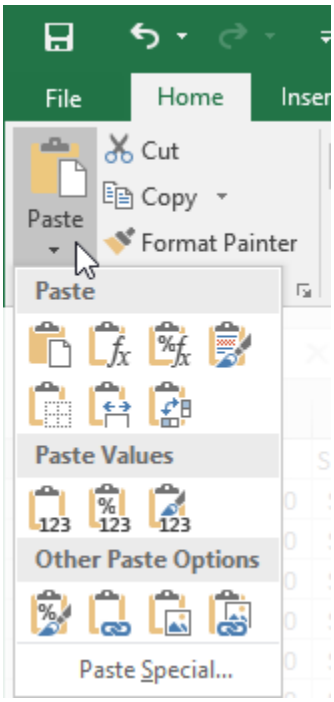
There are a number of options In the Paste Specialdialog box that you can choose from. To increase the prices in the selected range by 20%, we want to multiply each price in the selected range by 1.2. Therefore, select the Values and Multiply radio buttons and then click OK:



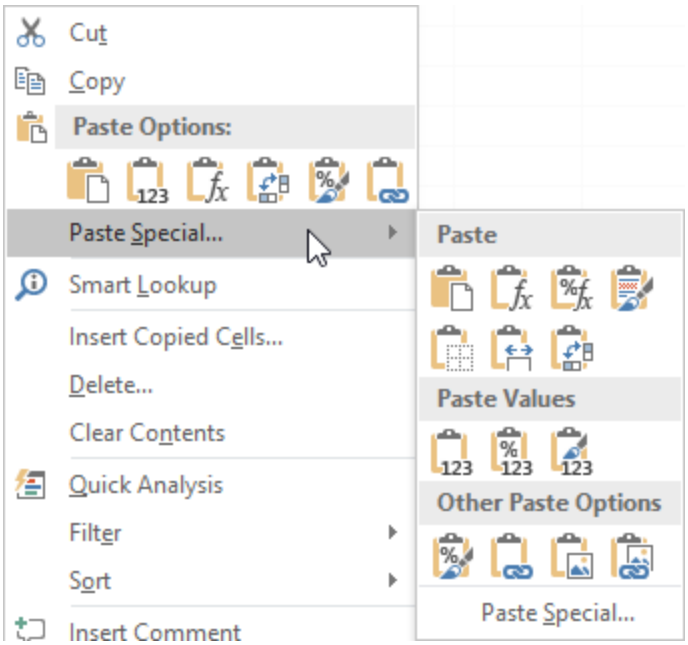
Returning to the worksheet, you will see that the prices have now been increased by 20%, and Sales have increased as well, taking the new prices into account. The currency formatting applied to column B also remains:

	A	B	C	D
1	Quantity	Price	Sales	1.2
2	8	$ 93.60	$ 624.00	
3	6	$ 114.00	$ 570.00	
4	73	$ 57.60	$ 3,504.00	
5	2	$ 79.20	$ 132.00	
6	67	$ 30.00	$ 1,675.00	
7	2	$ 100.80	$ 168.00	
8	4	$ 42.00	$ 140.00	
9	46	$ 18.00	$ 690.00	
10	7	$ 39.60	$ 231.00	
11				

Note that you can access some additional paste options by clicking the Home → Paste drop-down menu:



Or, by right-clicking a destination on the worksheet and moving your cursor over the Paste Special sub-menu:



Relative References

Worksheets are composed of rows (horizontal, referenced with numbers) and columns (vertical, referenced with letters). The intersection of each row with a column forms a cell, and each cell is given a name in the "ColumnRow" format. These are called **relative references**and are typically the most commonly used type of reference in Excel**.** Such references are flexible in that they change depending upon the position of the formula.

Absolute References

While relative references are fine for many, if not most situations,if data moved around or copied using AutoFill, relative cell references can create incorrect and confusing results. To avoid this, **absolute cell references**are used. These references use dollar signs ($) to make sure a formula always references the same location, no matter where it is moved.

You can assign absolute cell references in three ways:

- $Column$Row: Both the row and column designation won't change (A1).
- $ColumnRow: The column designation won't change, but the row can ($A1).
- Column$Row: The row designation won't change, but the column can (A$1).

Mixed References

Mixed references are cell references that include a mix of absolute and relative references. For example, $ColumnRow ($A1) is a mixed reference because while the column designation is an absolute reference, the row designation is relative. Additionally, Column$Row (A$1) is also a mixed reference because the row designation is an absolute reference, while the column designation is a relative reference.