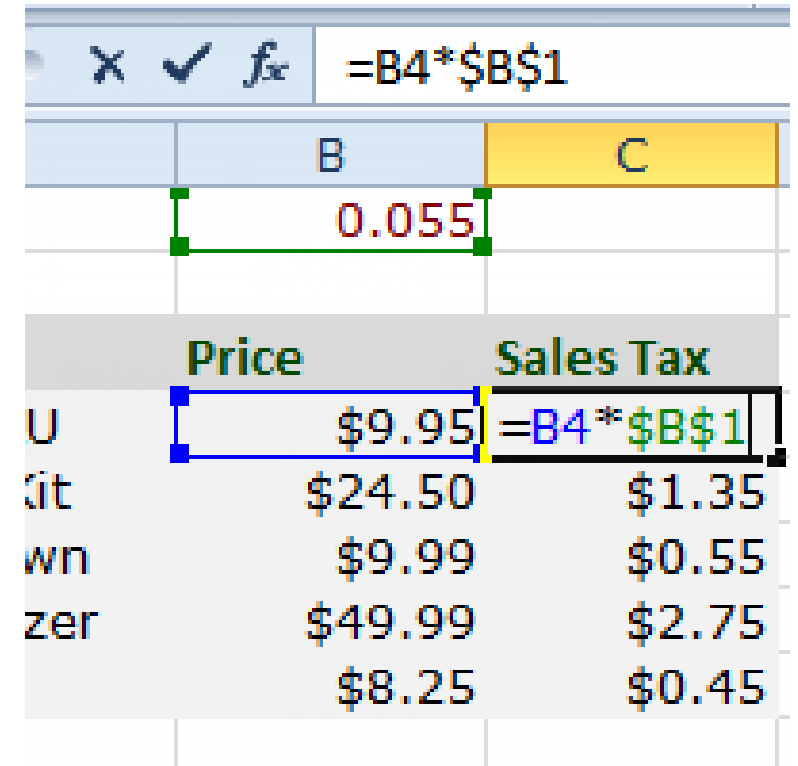


LECTURE 4

Creating complex formulas

- Excel is a spreadsheet application that can help you calculate and analyze numerical information for household budgets, company finances, inventory, and more. To do this, you need to understand **complex formulas**.
- In this lesson, you'll learn how to write complex formulas in Excel following the order of operations. You will also learn about **relative** and **absolute cell references**, as well as how to **copy** and **fill formulas** containing cell references.



The screenshot shows an Excel spreadsheet with a formula bar at the top displaying `=B4*B1`. Below the formula bar, a table is visible with columns for Price and Sales Tax. The Sales Tax column contains a formula `=B4*B1` in the first row, which is highlighted with a black border. The table data is as follows:

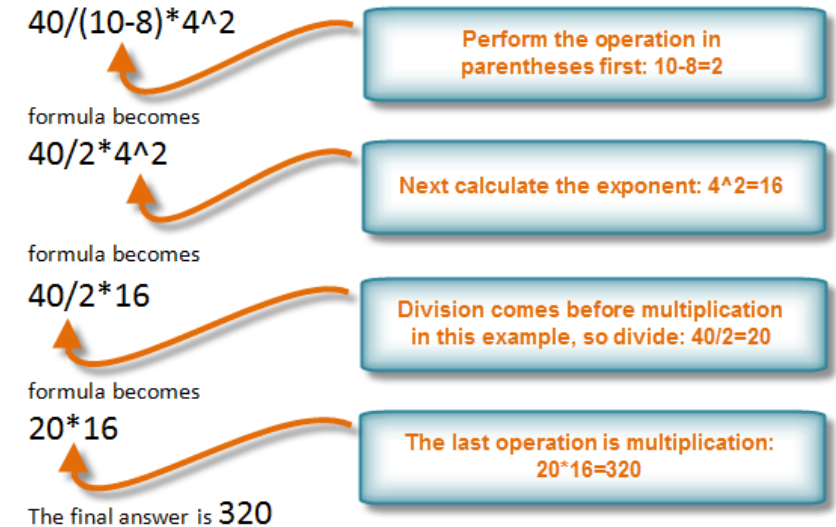
	Price	Sales Tax
U	\$9.95	<code>=B4*\$B\$1</code>
lit	\$24.50	\$1.35
wn	\$9.99	\$0.55
zer	\$49.99	\$2.75
	\$8.25	\$0.45

The order of operations

- Excel calculates formulas based on the following **order of operations**:
- Operations enclosed in **parentheses**
- **Exponential** calculations (to the power of)
- **Multiplication** and **division**, whichever comes first
- **Addition** and **subtraction**, whichever comes first

Examples

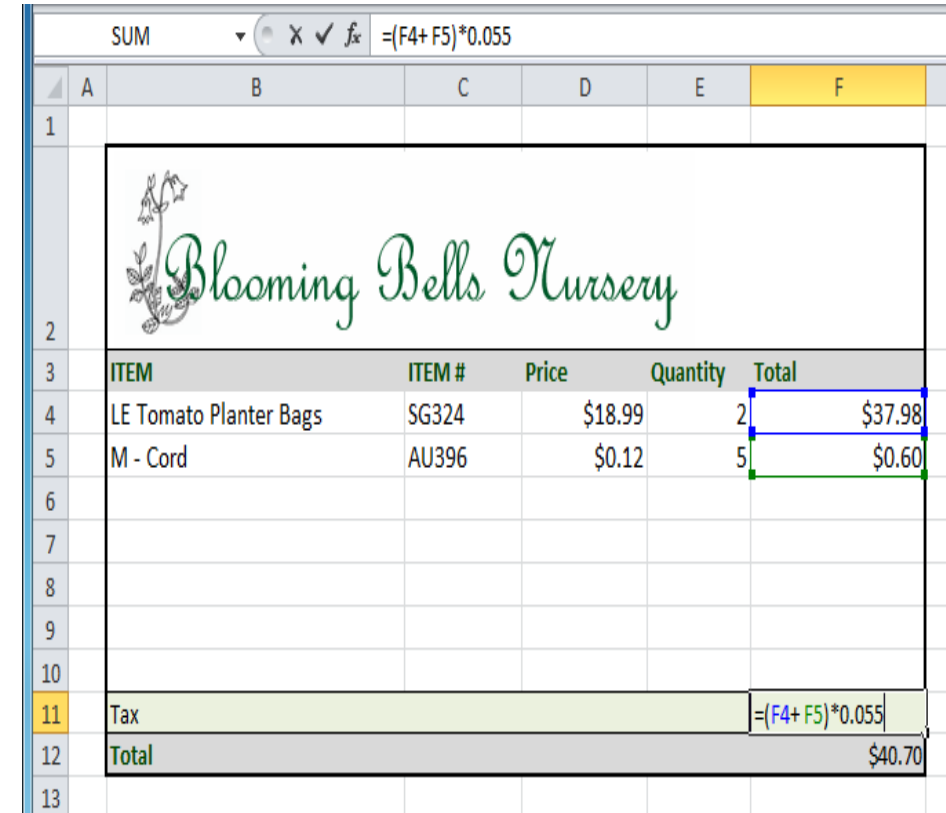
- Example 1
- The following example demonstrates how to use the order of operations to calculate a formula:
- Example 2
- First, Excel will calculate the amount sold in parentheses: **(19*1.99)=37.81** White Pete Lily seeds and **(33*1.99)=65.67** Total Pete Lily seeds.
- Second, it will divide the White Pete Lily seeds amount by the Total Pete Lily seeds amount: **37.81/65.67=.5758**.
- Last, it will multiply the result by 100 to obtain the value as a percent: **.5758*100=57.58**.



Seed Inventory	Packets Sold	Price	Percent of Total Sold
Pete Lily - Blue	14	\$1.99	42.42
Pete Lily - White	19	\$1.99	$=\frac{(19*1.99)}{(33*1.99)}*100$
Total Pete Lily	33	\$1.99	

To create a complex formula using the order of operations

1. Click the cell where you want the formula result to appear (**F11**, for example).
2. Type the **equals sign (=)**.
3. Type an **open parenthesis**, then click the cell that contains the first **value** you want in the formula (**F4**, for example).
4. Type the first **mathematical operator** (the addition sign, for example).
5. Click the cell that contains the second **value** you want in the formula (**F5**, for example), then type a **closed parenthesis**.
6. Type the next **mathematical operator** (the multiplication sign, for example).
7. Type the next **value** in the formula (**0.055** for **5.5% tax**, for example).
8. Click **Enter** to calculate your formula. The results show that \$2.12 is the tax for the nursery order.



The screenshot shows an Excel spreadsheet for 'Blooming Bells Nursery'. The formula bar at the top displays $= (F4 + F5) * 0.055$. The spreadsheet contains the following data:

ITEM	ITEM #	Price	Quantity	Total
LE Tomato Planter Bags	SG324	\$18.99	2	\$37.98
M - Cord	AU396	\$0.12	5	\$0.60
Tax				$= (F4 + F5) * 0.055$
Total				\$40.70

Working with cell references

- In order to maintain accurate formulas, it is necessary to understand how cell references respond when you copy or fill them to new cells in the worksheet.
- Excel will interpret cell references as either **relative** or **absolute**. By default, cell references are **relative references**. When copied or filled, they change based on the relative position of rows and columns. If you copy a formula ($=A1+B1$) into row 2, the formula will change to become ($=A2+B2$).
- **Absolute references**, on the other hand, do not change when they are copied or filled and are used when you want the values to stay the same.

Relative references

- Relative references can save you time when you're repeating the same type of calculation across multiple rows or columns.
- In the following example, we're creating a formula with cell references in row 4 to calculate the total cost of the electric bill and water bill for each month ($B4=B2+B3$). For the upcoming months, we want to use the same formula with relative references ($C2+C3$, $D2+D3$, $E2+E3$, etc.). For convenience, we can copy the formula in B4 into the rest of row 4, and Excel will calculate the value of the bills for these months using relative references.

To create and copy a formula using relative references

1. Select the first cell where you want to enter the formula (**B4**, for example).
2. Enter the formula to calculate the value you want (**B2+B3**, for example).
3. Press **Enter**.
4. Select the cell you want to copy (**B4**, for example), then click the **Copy** command from the **Home** tab.
5. Select the cells where you want to paste the formula, then click the **Paste** command from the **Home** tab. You can also drag the fill handle to fill cells
6. The formula will be calculated.
7. Your formula is copied to the selected cells as a relative reference (C4=C2+C3, D4=D2+D3, E4=E2+E3, etc.), and the values are calculated.

	A	B	C
1		JAN	FEB
2	Electric	\$ 116.45	\$ 125.15
3	Water	\$ 50.15	\$ 48.75
4	<u>Total</u>	=B2+B3	

Absolute references

- There may be times when you do not want a cell reference to change when copying or filling cells. You can use an **absolute reference** to keep a row and/or column constant in the formula.
- An absolute reference is designated in the formula by the addition of a **dollar sign (\$)**. It can precede the column reference, the row reference, or both.
- In the below example, we want to calculate the sales tax for a list of products with varying prices. We'll use an absolute reference for the sales tax (\$B\$1) because we do not want it to change as we are copying the formula down the column of varying prices.

\$A\$2:	The column and the row do not change when copied.
A\$2:	The row does not change when copied.
\$A2:	The column does not change when copied.

To create and copy a formula using an absolute reference

1. Select the first cell where you want to enter the formula (**C4**, for example).
2. Type an equals sign, and then click the cell that contains the first **value** you want in the formula (**B4**, for example).
3. Type the first **mathematical operator** (the multiplication sign, for example).
4. Type the **dollar sign (\$)**, then enter the **column letter** of the cell you are making an absolute reference to (**B**, for example).
5. Type the **dollar sign (\$)**, then enter the **row number** of the same cell you are making an absolute reference to (**1**, for example).
6. Press **Enter** to calculate the formula.
7. Select the cell you want to copy (**C4**, for example), then click the **Copy** command from the **Home** tab.
8. Select the cells where you want to paste the formula, then click the **Paste** command from the **Home** tab. You can also drag the fill handle to fill cells.

Working with basic functions

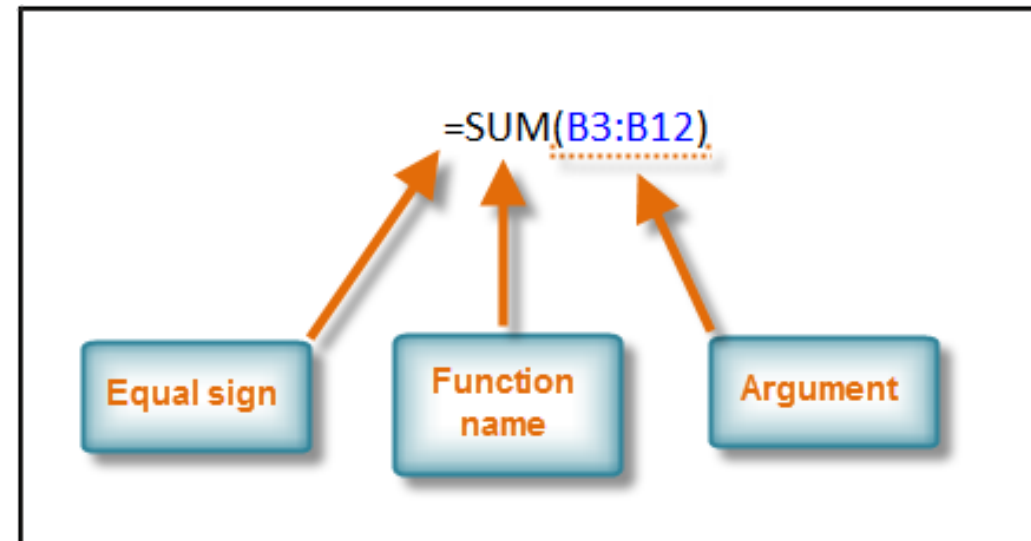
- Figuring out formulas for calculations you want to make in Excel can be tedious and complicated. Fortunately, Excel has an entire library of **functions**—or **predefined formulas**—you can take advantage of. You may be familiar with common functions like **sum**, **average**, **product**, and **count**, but there are hundreds of functions in Excel, even for things like formatting text, referencing cells, calculating financial rates, and analyzing statistics.
- In this lesson, you'll learn the basics of inserting common functions into your worksheet by utilizing the **AutoSum** and **Insert Functions** commands. You will also become familiar with how to **search** and **find various functions**, including exploring Excel's **Functions Library**.

Basic functions

A **function** is a **predefined formula** that performs calculations using specific values in a particular order. One of the key benefits of functions is that they can save you time because you do not have to write the formula yourself. Excel has hundreds of functions to assist with your calculations.

The parts of a function

- The order in which you insert a function is important. Each function has a specific order—called **syntax**—which must be followed in order for the function to work correctly. The basic syntax to create a formula with a function is to insert an **equals sign (=)**, **function name** (SUM, for example, is the function name for addition), and **argument**. Arguments contain the information you want the formula to calculate, such as a range of cell references.



Working with arguments

Arguments must be enclosed in **parentheses**. Individual values or cell references inside the parentheses are separated by either **colons** or **commas**.

- **Colons** create a reference to a range of cells.

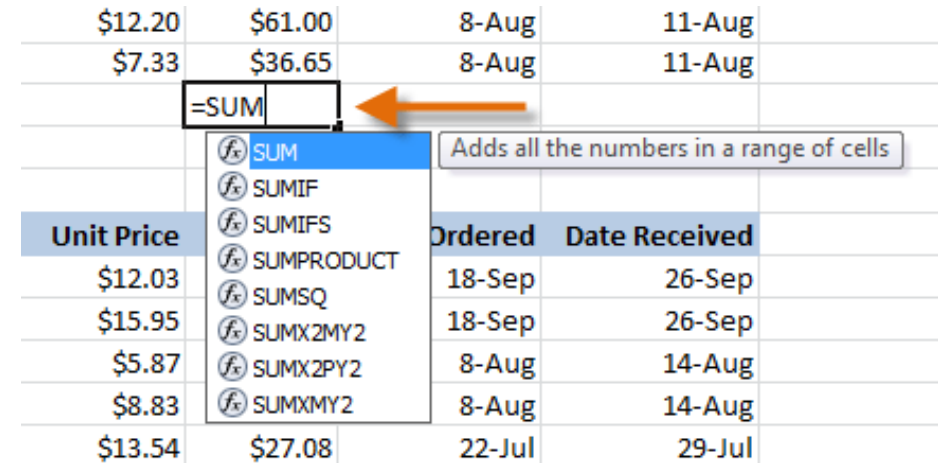
For example, **=AVERAGE(E19:E23)** would calculate the **average** of the cell range E19 through E23.

- **Commas** separate individual values, cell references, and cell ranges in parentheses. If there is more than one argument, you must separate each argument by a comma.

For example, **=COUNT(C6:C14,C19:C23,C28)** will **count** all the cells in the three arguments that are included in parentheses.

To create a basic function in Excel

1. Select the cell where the answer will appear (F15, for example).
2. Type the **equals sign (=)**, then enter the **function name (SUM,** for example).
3. Enter the cells for the **argument** inside the parentheses.
4. Press **Enter**, and the result will appear.

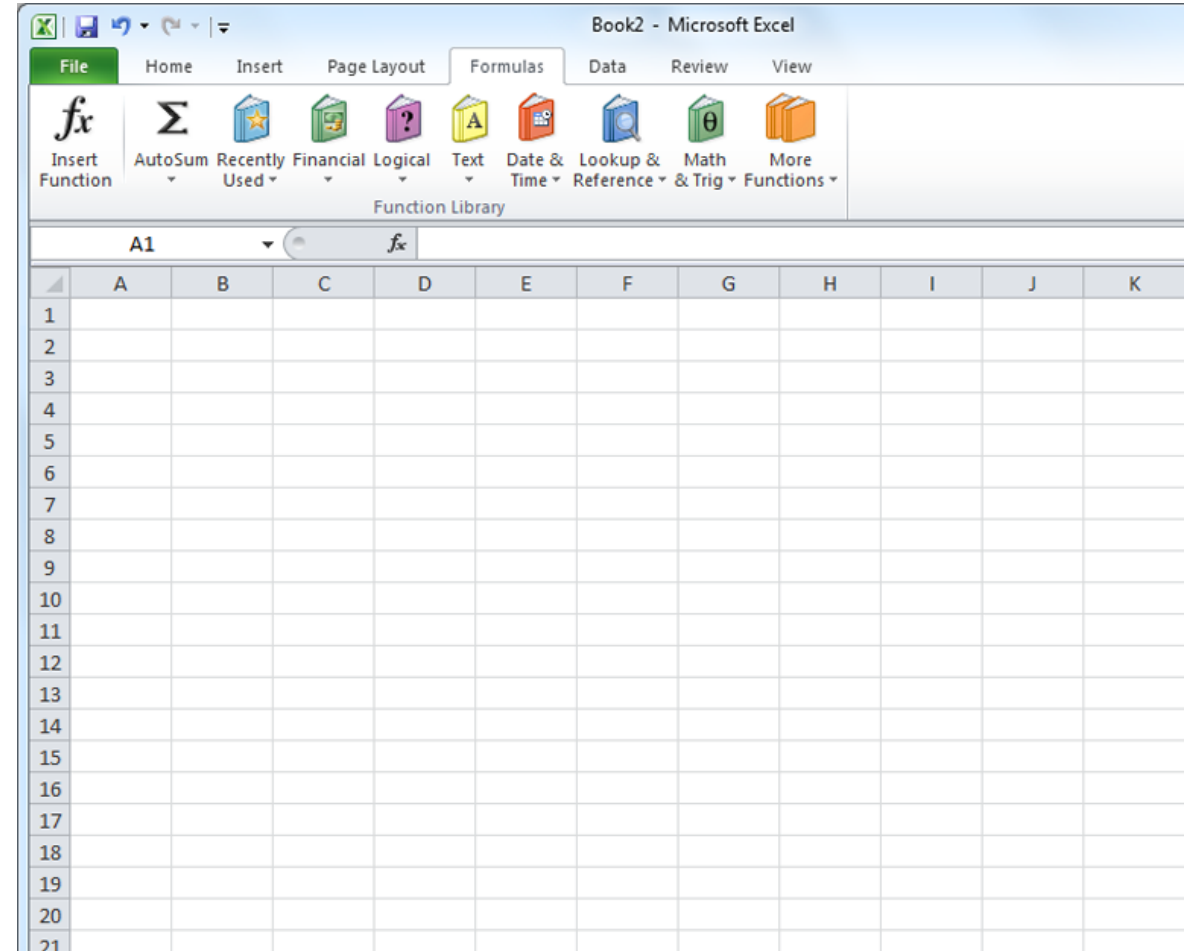


\$12.20	\$61.00	8-Aug	11-Aug
\$7.33	\$36.65	8-Aug	11-Aug
=SUM			
Unit Price		Ordered	Date Received
\$12.03		18-Sep	26-Sep
\$15.95		18-Sep	26-Sep
\$5.87		8-Aug	14-Aug
\$8.83		8-Aug	14-Aug
\$13.54	\$27.08	22-Jul	29-Jul

Unit Price	Subtotal	Date Ordered	Date Received
\$5.86	\$58.60	12-Sep	17-Sep
\$40.26	\$80.52	12-Sep	17-Sep
\$4.20	\$42.00	6-Sep	12-Sep
\$6.19	\$74.28	6-Sep	12-Sep
\$3.20	\$48.00	6-Sep	12-Sep
\$3.40	\$17.00	6-Sep	12-Sep
\$4.10	\$32.80	6-Sep	12-Sep
\$12.20	\$61.00	8-Aug	11-Aug
\$7.33	\$36.65	8-Aug	11-Aug
	=SUM(F6:F14)		

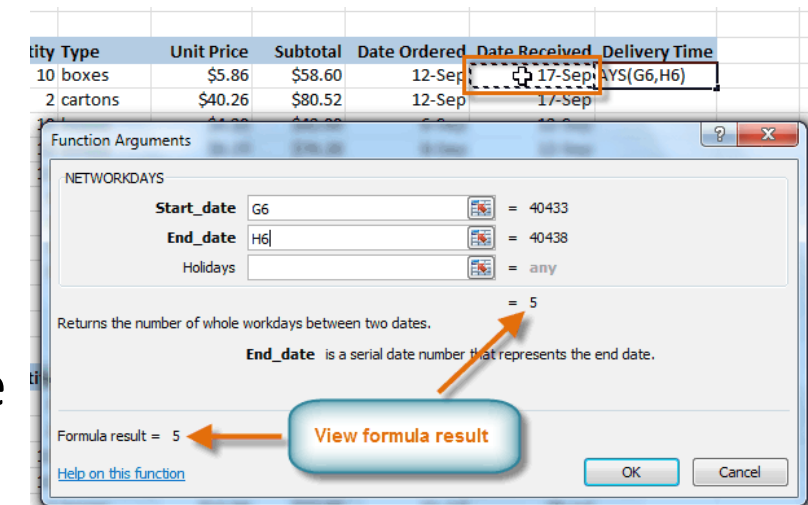
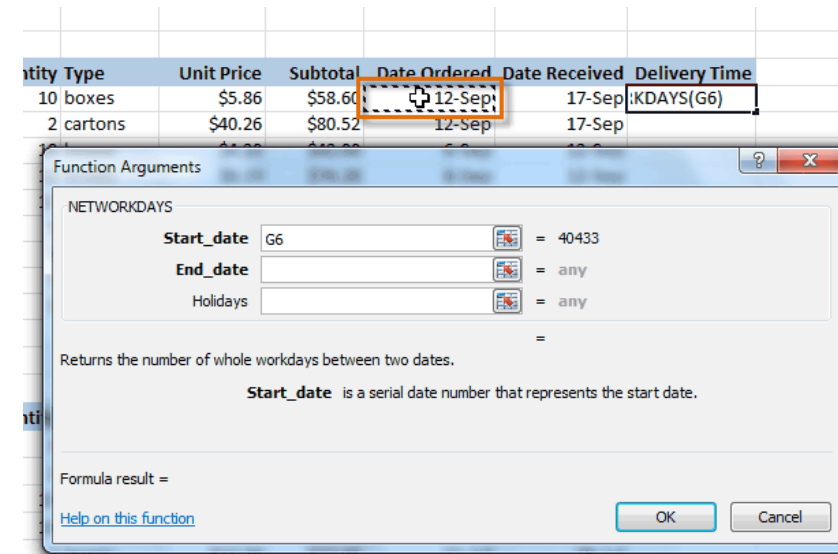
The Function Library

- A great place to explore functions is in the **Function Library** on the Formulas tab. Here, you can search and select Excel functions based on categories such as **Financial**, **Logical**, **Text**, and **Date & Time**. Click the buttons in the interactive below to learn more.



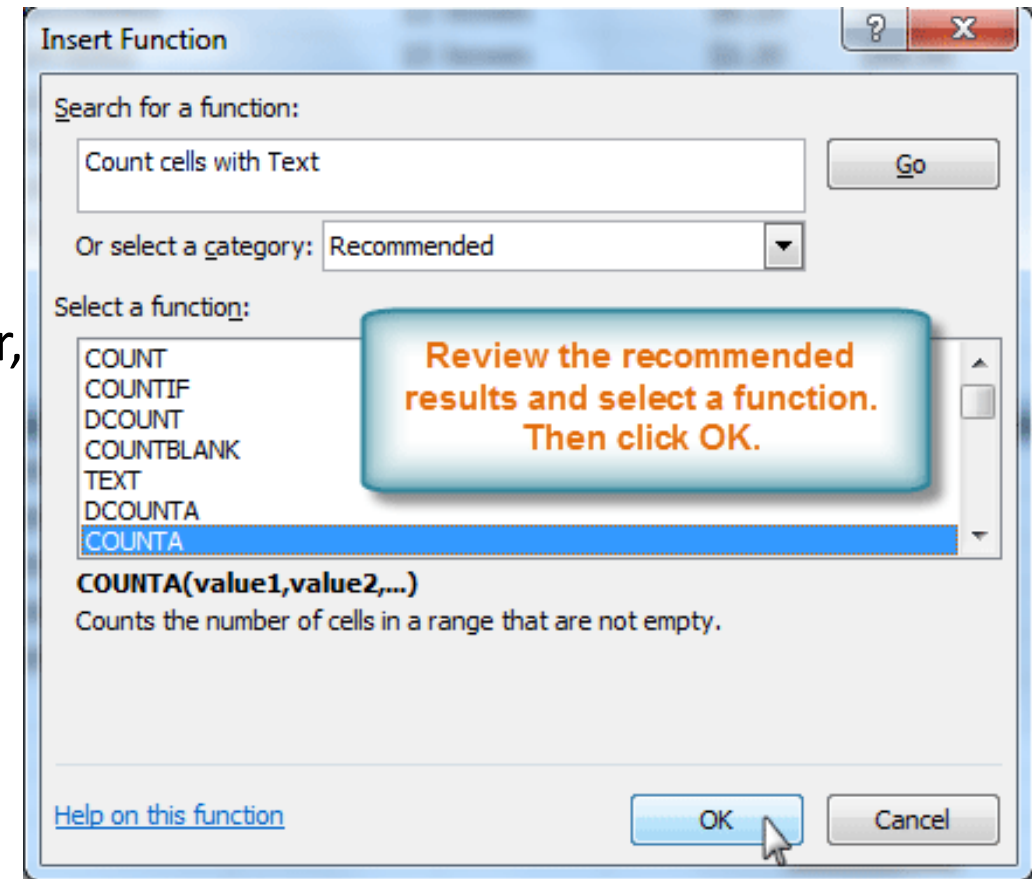
To insert a function from the Function Library

1. Select the cell where the answer will appear (**I6**, for example).
2. Click the **Formulas** tab.
3. From the **Function Library** group, select the **function category** you want. In this example, we'll choose **Date & Time**.
4. Select the desired **function** from the Date & Time drop-down menu. We'll choose the **NETWORKDAYS** function to count the days between the order date and receive date in our worksheet.
5. The **Function Arguments** dialog box will appear. Insert the cursor in the **first field**, then enter or select the cell(s) you want (**G6**, for example).
6. Insert the cursor in the **next field**, then enter or select the cell(s) you want (**H6**, for example).



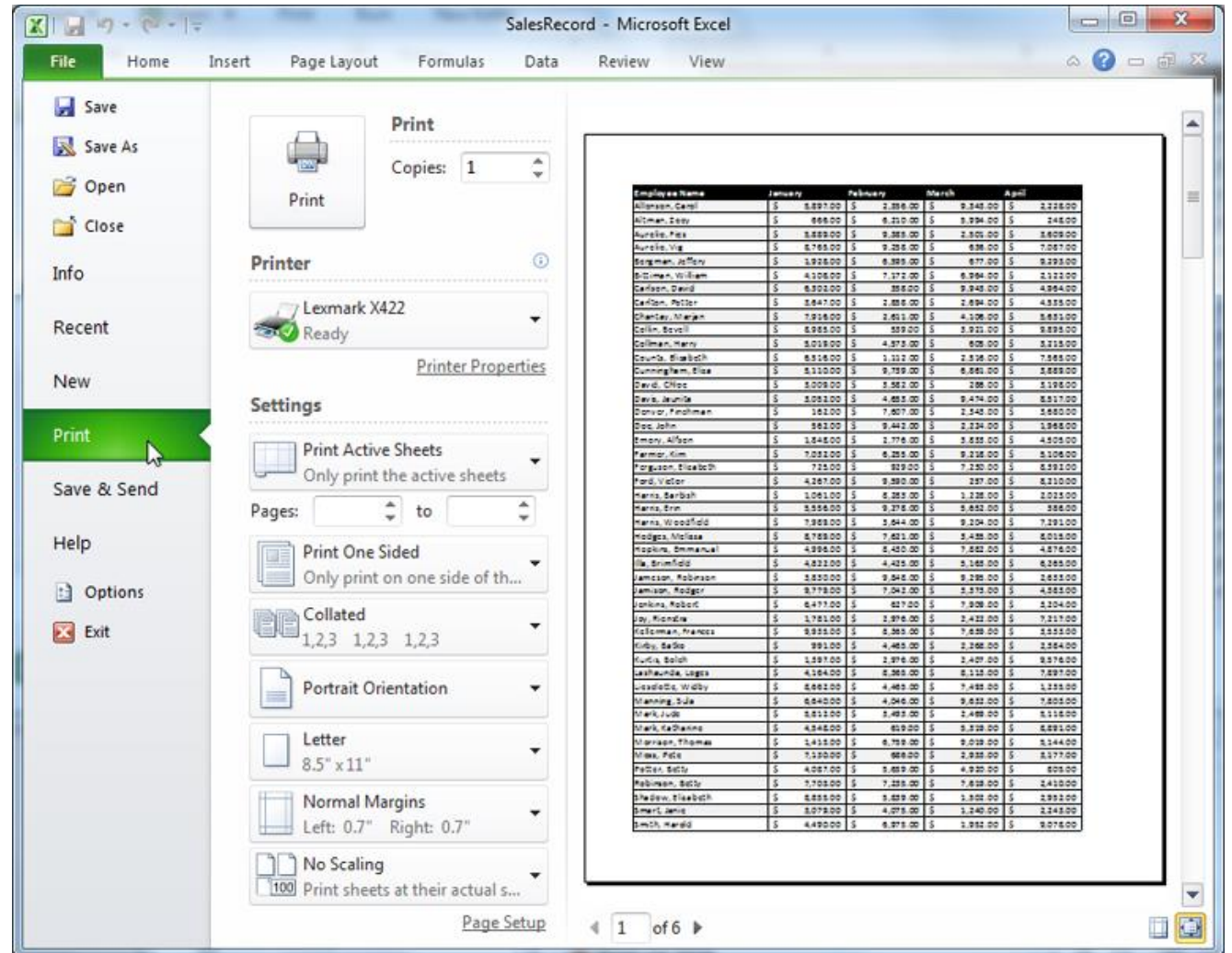
Using the Insert Function command

1. Select the cell where the answer will appear (**A27**, for example).
2. Click the **Formulas** tab, then select the **Insert Function** command.
3. The **Insert Function** dialog box will appear.
4. Type a **description** of the function you are searching for, then click **Go** (**Count cells with text**, for example). You can also search by selecting a category.
5. Review the results to find the function you want (**COUNTA**, for example). Click **OK**.
6. The **Function Arguments** dialog box will appear. Insert the cursor in the **first field**, then enter or select the cell(s) you want (**A6:A14**, for example).
7. Insert the cursor in the **next field**, then enter or select the cell(s) you want (**A19:A23**, for example). You can continue to add additional arguments if needed.



To view the Print pane

1. Click the **File** tab.
This takes you to **Backstage view**.
2. Select **Print**.
The **Print** pane appears, with the **print settings** on the left and **Print Preview** on the right.



SalesRecord - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View

Save
Save As
Open
Close
Info
Recent
New
Print
Save & Send
Help
Options
Exit

Print
Copies: 1

Printer
Lexmark X422
Ready
Printer Properties

Settings

Print Active Sheets
Only print the active sheets

Pages: to

Print One Sided
Only print on one side of th...

Collated
1,2,3 1,2,3 1,2,3

Portrait Orientation

Letter
8.5" x 11"

Normal Margins
Left: 0.7" Right: 0.7"

No Scaling
Print sheets at their actual s...

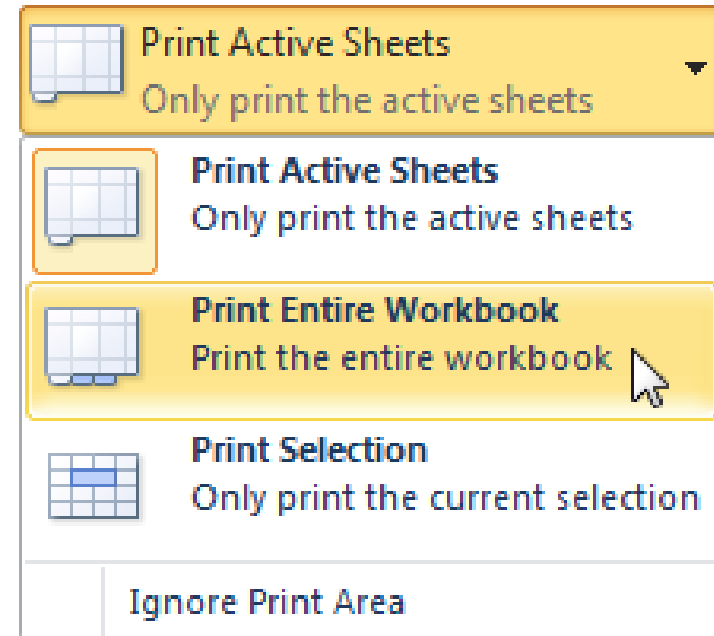
Page Setup

Employee Name	January	February	March	April
Allison, Carol	\$ 1,897.00	\$ 2,396.00	\$ 2,945.00	\$ 2,228.00
Allison, Eddy	\$ 868.00	\$ 8,210.00	\$ 9,394.00	\$ 248.00
Aurelio, Pex	\$ 3,889.00	\$ 9,389.00	\$ 2,900.00	\$ 3,609.00
Aurelio, Vig	\$ 6,785.00	\$ 9,395.00	\$ 938.00	\$ 7,067.00
Bergman, Jeffrey	\$ 1,926.00	\$ 8,399.00	\$ 877.00	\$ 9,293.00
B-Gilman, William	\$ 4,108.00	\$ 7,172.00	\$ 6,994.00	\$ 2,122.00
Carlson, David	\$ 8,302.00	\$ 386.00	\$ 9,948.00	\$ 4,964.00
Carlson, Victor	\$ 8847.00	\$ 2,488.00	\$ 2,894.00	\$ 4,955.00
Charley, Marian	\$ 7,926.00	\$ 2,461.00	\$ 4,106.00	\$ 9,951.00
Collin, Bevel	\$ 6,985.00	\$ 899.00	\$ 9,021.00	\$ 9,893.00
Collman, Mary	\$ 3,019.00	\$ 4,373.00	\$ 608.00	\$ 9,113.00
Covino, Elizabeth	\$ 8,518.00	\$ 1,112.00	\$ 1,260.00	\$ 7,989.00
Cunningham, Dixie	\$ 2,110.00	\$ 9,739.00	\$ 9,860.00	\$ 3,869.00
David, Elliot	\$ 3,009.00	\$ 1,982.00	\$ 298.00	\$ 1,198.00
Devo, Jeanette	\$ 3,092.00	\$ 4,483.00	\$ 9,474.00	\$ 8,517.00
Donov, Fredman	\$ 162.00	\$ 7,407.00	\$ 2,548.00	\$ 3,680.00
Doc, John	\$ 962.00	\$ 9,442.00	\$ 2,234.00	\$ 1,968.00
Emory, Allison	\$ 1,845.00	\$ 1,776.00	\$ 3,855.00	\$ 4,505.00
Farnor, Kim	\$ 7,082.00	\$ 6,285.00	\$ 9,216.00	\$ 3,106.00
Forston, Elizabeth	\$ 725.00	\$ 899.00	\$ 7,250.00	\$ 6,992.00
Ford, Victor	\$ 4,267.00	\$ 9,890.00	\$ 297.00	\$ 8,110.00
Hanna, Sarah	\$ 1,061.00	\$ 6,289.00	\$ 1,238.00	\$ 2,025.00
Hanna, Erin	\$ 3,556.00	\$ 9,376.00	\$ 9,892.00	\$ 386.00
Hanna, Woodford	\$ 7,988.00	\$ 3,644.00	\$ 9,204.00	\$ 7,191.00
Hodges, Melissa	\$ 6,788.00	\$ 7,461.00	\$ 3,438.00	\$ 6,018.00
Hopkins, Emmanuel	\$ 4,999.00	\$ 2,400.00	\$ 7,949.00	\$ 4,979.00
Ili, Steven	\$ 4,822.00	\$ 4,405.00	\$ 3,149.00	\$ 6,369.00
Jamison, Robinson	\$ 1,870.00	\$ 9,246.00	\$ 9,299.00	\$ 2,822.00
Jamison, Rodger	\$ 3,778.00	\$ 7,092.00	\$ 2,575.00	\$ 4,582.00
Jenkins, Robert	\$ 6,477.00	\$ 87.00	\$ 7,908.00	\$ 2,204.00
Joy, Michelle	\$ 1,781.00	\$ 2,976.00	\$ 2,423.00	\$ 7,217.00
Kilmerman, Frances	\$ 9,933.00	\$ 8,385.00	\$ 7,859.00	\$ 2,553.00
Kirby, Saele	\$ 991.00	\$ 4,465.00	\$ 2,266.00	\$ 2,564.00
Kurtis, Soloh	\$ 1,597.00	\$ 2,976.00	\$ 2,407.00	\$ 9,376.00
LeRhone, Loggs	\$ 4,164.00	\$ 6,385.00	\$ 6,115.00	\$ 7,897.00
Leschke, Wilby	\$ 6,662.00	\$ 4,469.00	\$ 7,489.00	\$ 1,259.00
Manning, Sula	\$ 6,840.00	\$ 4,046.00	\$ 9,822.00	\$ 7,803.00
Mark, Judi	\$ 9,812.00	\$ 1,483.00	\$ 2,499.00	\$ 1,116.00
Mark, Katherine	\$ 4,346.00	\$ 819.00	\$ 9,228.00	\$ 6,992.00
Morrison, Thomas	\$ 1,413.00	\$ 6,789.00	\$ 9,028.00	\$ 5,144.00
Moss, Pete	\$ 1,139.00	\$ 889.00	\$ 2,995.00	\$ 8,177.00
Patric, Betty	\$ 4,087.00	\$ 1,893.00	\$ 4,925.00	\$ 829.00
Polkman, Betty	\$ 7,705.00	\$ 7,229.00	\$ 7,829.00	\$ 2,410.00
Shelton, Elizabeth	\$ 8,815.00	\$ 1,929.00	\$ 1,909.00	\$ 2,992.00
Smart, Janis	\$ 3,078.00	\$ 4,078.00	\$ 1,240.00	\$ 2,242.00
Smith, Harold	\$ 4,490.00	\$ 6,971.00	\$ 1,992.00	\$ 9,076.00

1 of 6

To print the entire workbook:

1. Click the **File** tab.
2. Select **Print** to access the **Print pane**.
3. Select **Print Entire Workbook** from the **print range** drop-down menu.
4. Click the **Print** button.



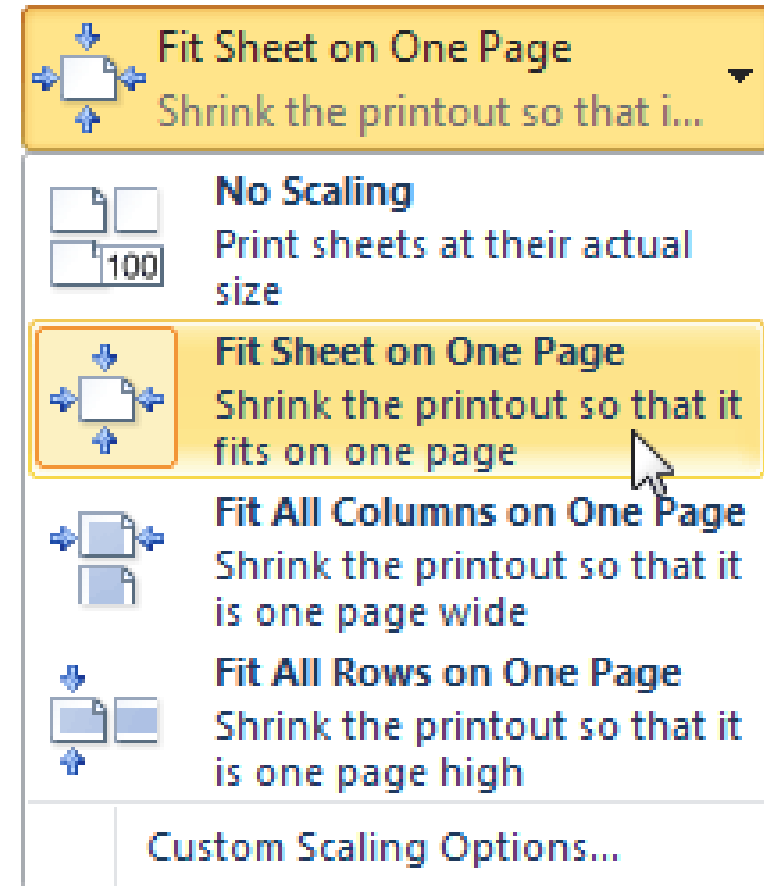
To print a selection or set the print area

- Select the cells you want to print.
- Click the **File** tab.
- Select **Print** to access the **Print pane**.
- Select **Print Selection** from the **print range** drop-down menu.
- You can see what your selection will look like on the page in **Print Preview**.
- Click the **Print** button.

	A	B	C
1	Employee Name	January	February
2	Allenson, Carol	\$ 5,897.00	\$ 2,356.00
3	Altman, Zoey	\$ 666.00	\$ 6,210.00
4	Aurelio, Fies	\$ 5,889.00	\$ 9,385.00
5	Aurelio, Vig	\$ 8,765.00	\$ 9,258.00
6	Bergman, Jeffery	\$ 1,928.00	\$ 6,595.00
7	Bittiman, William	\$ 4,108.00	\$ 7,172.00
8	Carlson, David	\$ 6,302.00	\$ 358.00
9	Carlton, Potter	\$ 3,647.00	\$ 2,858.00

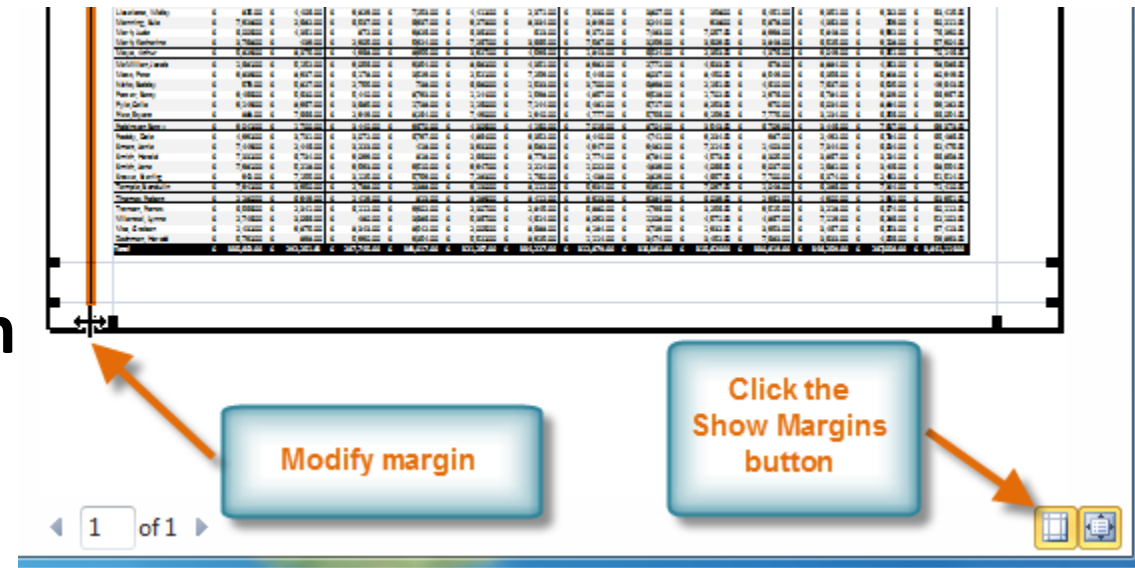
To fit a worksheet on one page

1. Click the **File** tab.
2. Select **Print** to access the **Print pane**.
3. Select **Fit Sheet on One Page** from the **scaling** drop-down menu.
4. Your worksheet is reduced in size until it fits on one page. Remember that if it is scaled too small, it might be difficult to read.



To modify margins while in Print Preview

1. Click the **File** tab.
2. Select **Print** to access the **Print pane**.
3. Click the **Show Margins** button. Your margins will appear.
4. Hover your mouse over one of the **margin markers** until the **double arrow** appears.
5. **Click and drag** the margin to your desired location.
6. Release the mouse. The margin is modified.



To use print titles

1. Click the **Page Layout** tab.
2. Select the **Print Titles** command.
3. The **Page Setup** dialog box appears. Click the icon at the end of the **Rows to repeat at top** field.
4. Your mouse becomes the small **selection arrow** . Click the rows you want to appear on each printed page. The **Rows to repeat at top** dialog box will record your selection.
5. Click the icon at the end of the **Rows to repeat at top** field.
6. Repeat for **Columns to repeat at left**, if necessary.
7. Click **OK**. You can go to **Print Preview** to see how each page will look when printed.

