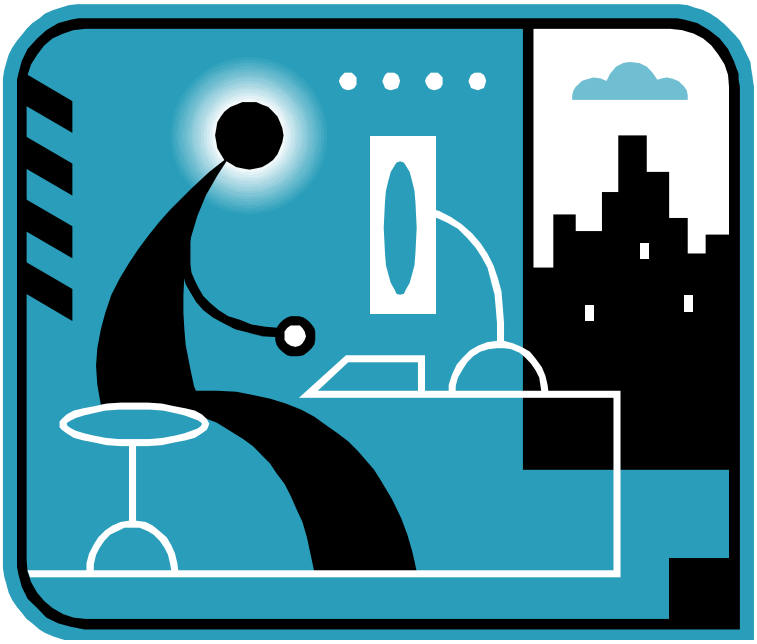
Excel 2007
Formulas and Functions



For additional help with this or other software programs, contact the Center for Teaching and Learning (ctl@mcmail.maricopa.edu)
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This manual was created using excerpts from Introduction to Excel 2002, created by the Technology Training Services department at the Maricopa Community College District Office.

Other portions of this manual were created by Christine Held, BPC/CIS Faculty at Mesa Community College.

Some picture excerpts were supplied by Thomson-Course Technology 2007.

Some text and pictures were inserted directly from the Microsoft Excel Help feature.

Learning Objectives:

Adding Comments to Cells
Absolute vs. Relative Cell References
Creating multiple worksheets and adding 3D references
Creating Conditional formatting
Grouping Worksheets
Date Functions
Using If Functions
Naming Ranges
Round Function
Using Min, Max and Average functions
Auditing Formulas

Review Exercise: Create the following worksheet

1. Create the following worksheet and used the formulas as displayed below. Name the sheet “Quarter 1”.
2. Save as Quarterly Budget.

	A	B	C	D	E
1	Quarterly Budget				
2		January	February	March	Quarter Total
3	Salaries	$13,500.00	$13,500.00	$13,500.00	$ 40,500.00
4	Benefits	3,375.00	3,375.00	3,375.00	10,125.00
5	Student Wages	50.24	40.20	73.70	164.14
6	Office Supplies	177.75	202.13	78.70	458.58
7	Computer Softw	315.60	74.78	115.20	505.58
8	Special Projects	$ 450.60	$ 1,010.15	$ 311.55	$ 1,772.30
9					
10	Total Expenses				$ 53,525.60
11					

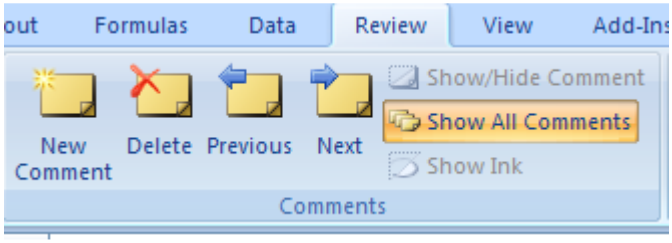
Formulas to be used:

	A	B	C	D	E
1		January	February	March	Quarter Total
2	Salaries	13500	13500	13500	=SUM(B2:D2)
3	Benefits	=B2*0.25	=C2*0.25	=D2*0.25	=SUM(B3:D3)
4	Student Wages	50.24	40.2	73.7	=SUM(B4:D4)
5	Office Supplies	177.75	202.13	78.7	=SUM(B5:D5)
6	Computer Software	315.6	74.78	115.2	=SUM(B6:D6)
7	Special Projects	450.6	1010.15	311.55	=SUM(B7:D7)
8					
9	Total Expenses				=SUM(E2:E7)

ADDING COMMENTS TO CELLS

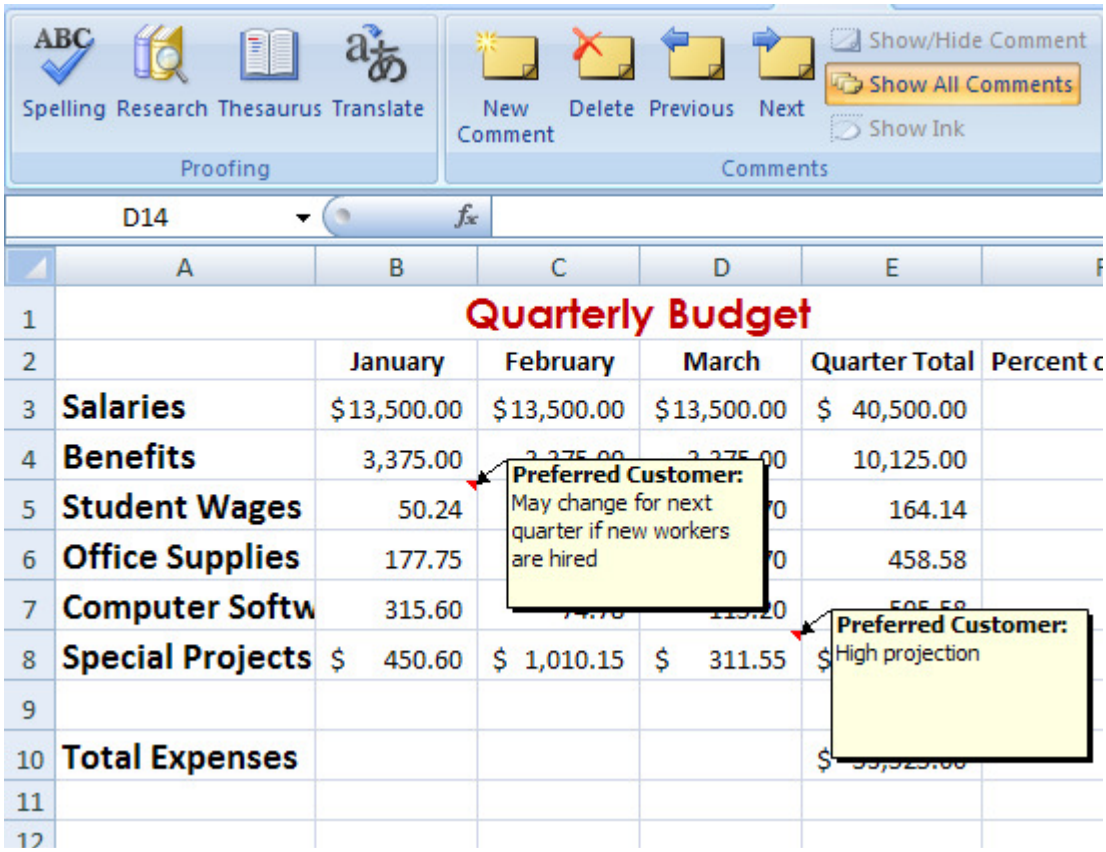
Excel has a useful feature call COMMENTS. The comments are notes attached to a specific cell in a worksheet. They are useful as references or as a help to others who use the worksheet. When a note is attached to a cell, a small triangular marker displays at the top right corner of the cell. These markers, as well as the comments, do not automatically print.

Using the Review Tab, this is what the comment menu choices are:



Add Comments to a Cell	**Add Comments to a Cell** 1. Select the cell to contain the comment. 2. From the **Review tab**, select the insert Comment icon. A text box will display. **Tip**: Right click and select Insert Comment. 3. Type the text of the comment in the text box. 4. Click anywhere outside the text box to close it.
View Comments	Position the mouse pointer over the cell containing the comment. A pop-up window appears displaying the note.
View All Comments	From the **Review tab**, click the **Show All Comments** icon. The comments text boxes appear. To remove, simply click again on Show All Comments.
Steps to delete comments	From the review tab, click on delete. The comments are removed. Tip: right click and select “delete comment”.

EXERCISE - ADDING COMMENTS TO CELLS

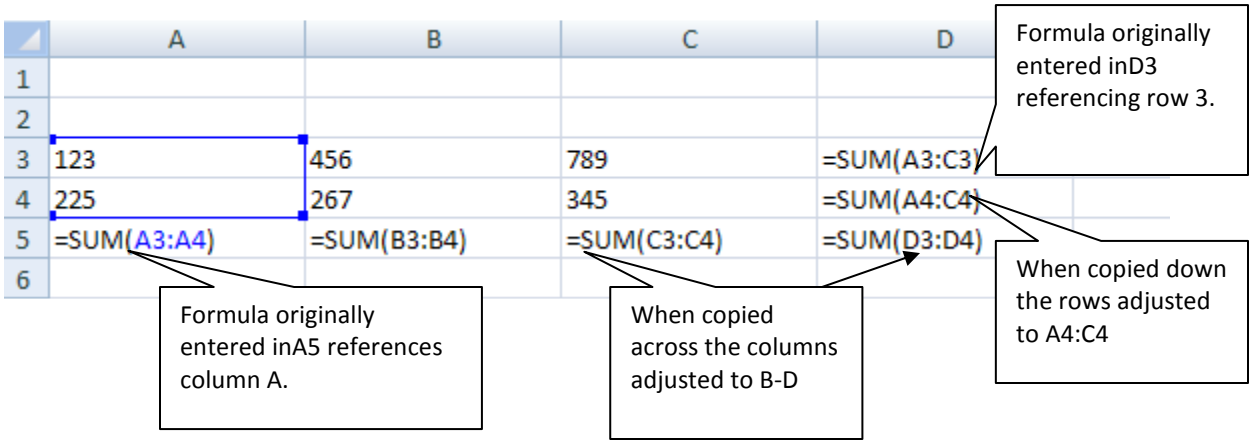


1. Go to the cells where comments are shown.
2. From the Review tab, select New Comment.
3. A box appears ready for you to enter the comment text.
4. Type what I have listed above as the comments.
5. Click outside the comment box and the comments will no longer be displayed.
6. Position your mouse pointer over the cells with the red triangles and the comment will display.

ABSOLUTE VS. RELATIVE CELL REFERENCES

Relative References

Relative cell addressing allows the cells to adjust accordingly "relative" to the location where they are being moved or copied or filled. This is the default method. See the example below:



Absolute References

However, there are times when we do not want the cell reference to change. You may want to reference a value in a single cell to do calculations on several different cells. To do this, you must make the cell reference ***absolute***. To make a cell absolute you enter a dollar sign in the cell reference.

There are different types of absolute referencing:

Type of Reference	Meaning	Example
Relative	The cell references adjust	B4
Absolute	The cell reference "absolutely" will not change the row or column.	$B$4
Mixed	The cell reference will keep either the row or column constant.	$B4 – columns remains constant but the row changes. B$4 – column adjusts but the row reference remains constant.

TIP: While entering the formula, you can press the F4 to cycle through relative, absolute, and mixed references on the referenced cell.

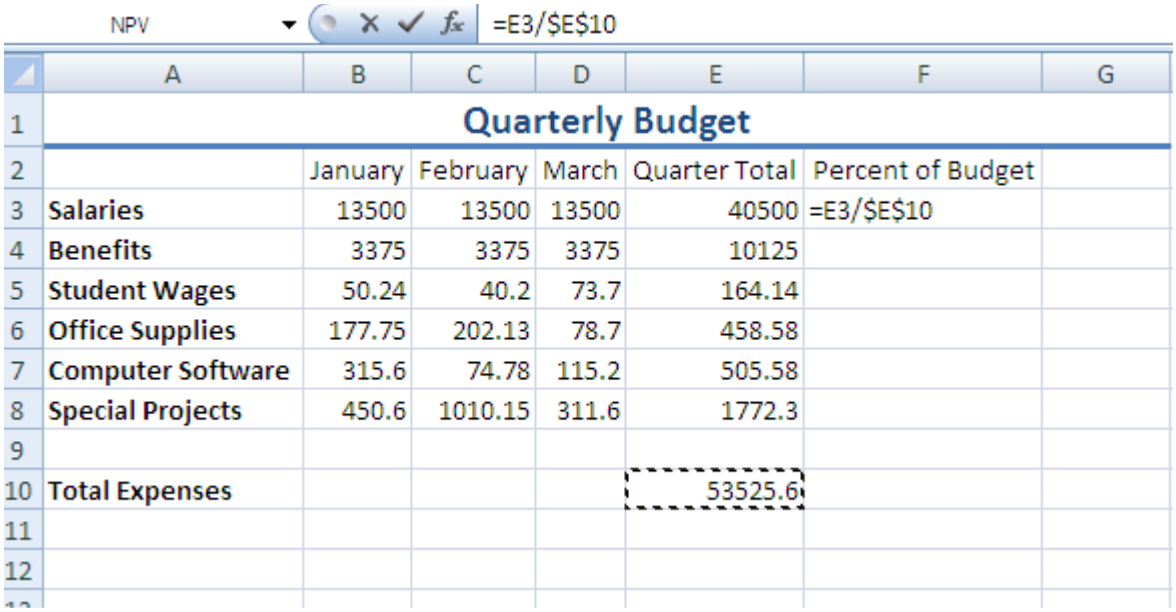
EXERCISE: ENTERING ABSOLUTE CELL REFERENCES

In order to calculate the percent each budget item is of the total expenses, the quarter total of the budget item must be divided by the total expenses for the quarter.

1. Click on cell **F1.**

2. Type: **Percent of Budget** and press **Enter.** (you may need to increase the width of column E)

3. In cell **F2** enter the function: **=E3/$E$10** and press Enter.



	A	B	C	D	E	F	G
1	Quarterly Budget						
2		January	February	March	Quarter Total	Percent of Budget	
3	**Salaries**	13500	13500	13500	40500	=E3/$E$10	
4	**Benefits**	3375	3375	3375	10125		
5	**Student Wages**	50.24	40.2	73.7	164.14		
6	**Office Supplies**	177.75	202.13	78.7	458.58		
7	**Computer Software**	315.6	74.78	115.2	505.58		
8	**Special Projects**	450.6	1010.15	311.6	1772.3		
9							
10	**Total Expenses**				53525.6		
11							
12							

4. Click back on cell F3.

5. Click on the fill handle and drag the formula down to cell F8. Format Percent of budget values to percent and 2 decimals. Your screen should look similar to the following:

	A	B	C	D	E	F
1	Quarterly Budget					
2		January	February	March	Quarter Total	Percent of Budget
3	**Salaries**	$13,500.00	$13,500.00	$13,500.00	$ 40,500.00	75.66%
4	**Benefits**	3,375.00	3,375.00	3,375.00	10,125.00	18.92%
5	**Student Wages**	50.24	40.20	73.70	164.14	0.31%
6	**Office Supplies**	177.75	202.13	78.70	458.58	0.86%
7	**Computer Software**	315.60	74.78	115.20	505.58	0.94%
8	**Special Projects**	$ 450.60	$ 1,010.15	$ 311.55	$ 1,772.30	3.31%
9						
10	**Total Expenses**				$ 53,525.60	
11						

Viewing Formulas

To do this:

Hold the **[CTRL]** key and the tilde (~). (located next to the number 1 key). To switch back to worksheet view, you press it again. In formula view, your view will look like the following:

	A	B	C	D	E	F
1	Quarterly Budget					
2		January	February	March	Quarter Total	Percent of Budget
3	**Salaries**	13500	13500	13500	=SUM(B3:D3)	=E3/$E$10
4	**Benefits**	3375	3375	3375	=SUM(B4:D4)	=E4/$E$10
5	**Student Wages**	50.24	40.2	73.7	=SUM(B5:D5)	=E5/$E$10
6	**Office Supplies**	177.75	202.13	78.7	=SUM(B6:D6)	=E6/$E$10
7	**Computer Software**	315.6	74.78	115.2	=SUM(B7:D7)	=E7/$E$10
8	**Special Projects**	450.6	1010.15	311.55	=SUM(B8:D8)	=E8/$E$10
9						
10	**Total Expenses**				=SUM(E3:E9)	
11						
12						

Creating Multiple Worksheets and adding 3D references

Formulas Between Sheets/Files

Excel allows you to create formulas that bring in values from other sheets in the same workbook or from sheets in other Excel files. You must first open any files you would like to include in your formula. The easiest way to build a formula using cell references from other sheets or files is to:

STEPS:

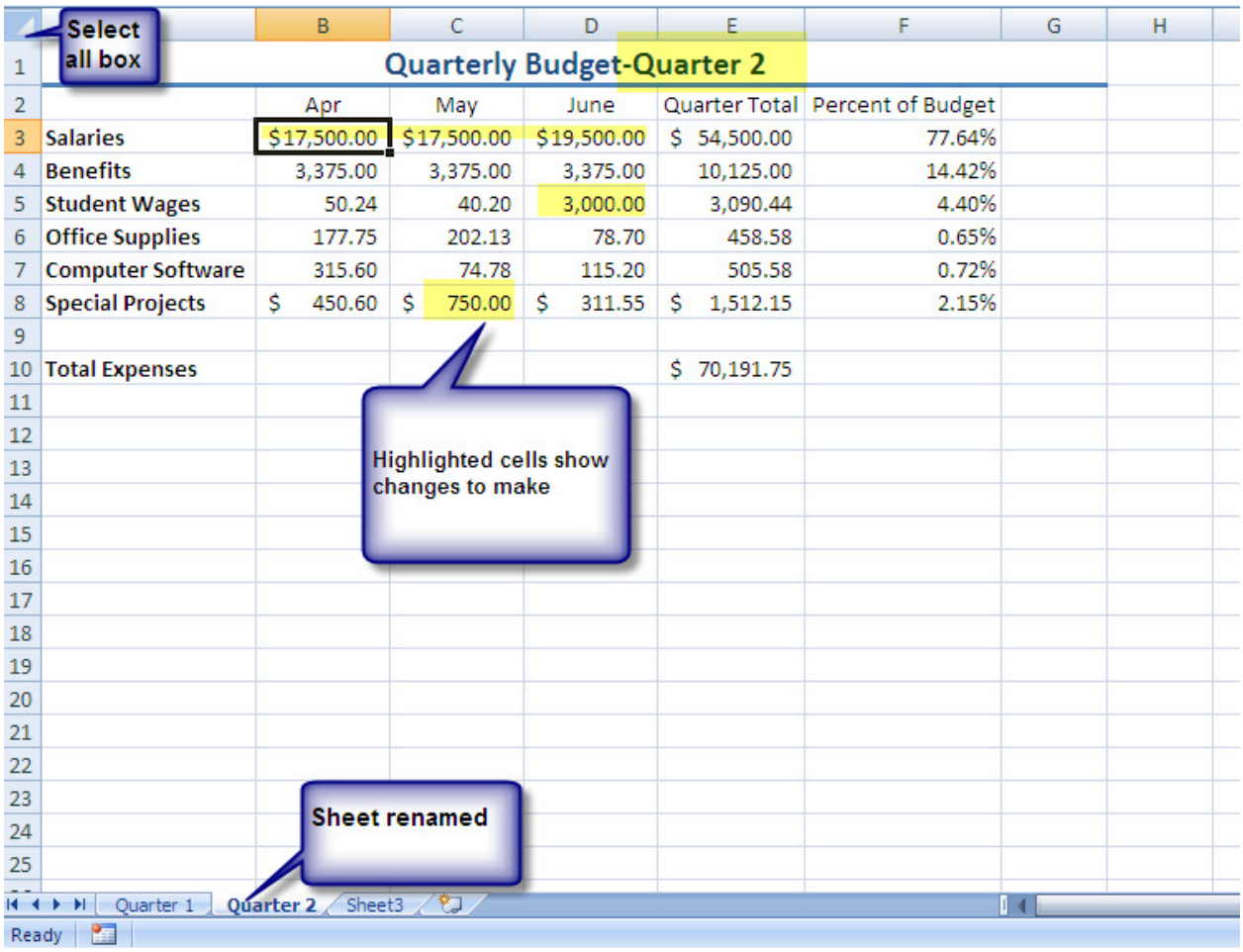
1. Start your formula using the = symbol
2. Use your mouse to locate and click the cell you would like to include in the formula.
3. Include any needed mathematical symbols.
4. Hit Enter when you are done. Excel inserts the appropriate code for you.

Examples

If referencing values in another sheet: ='Sheetname'!B4+'Sheetname'!B5
If referencing values in another file: ='[Filename.xls]Sheetname'!$B$139/0.25

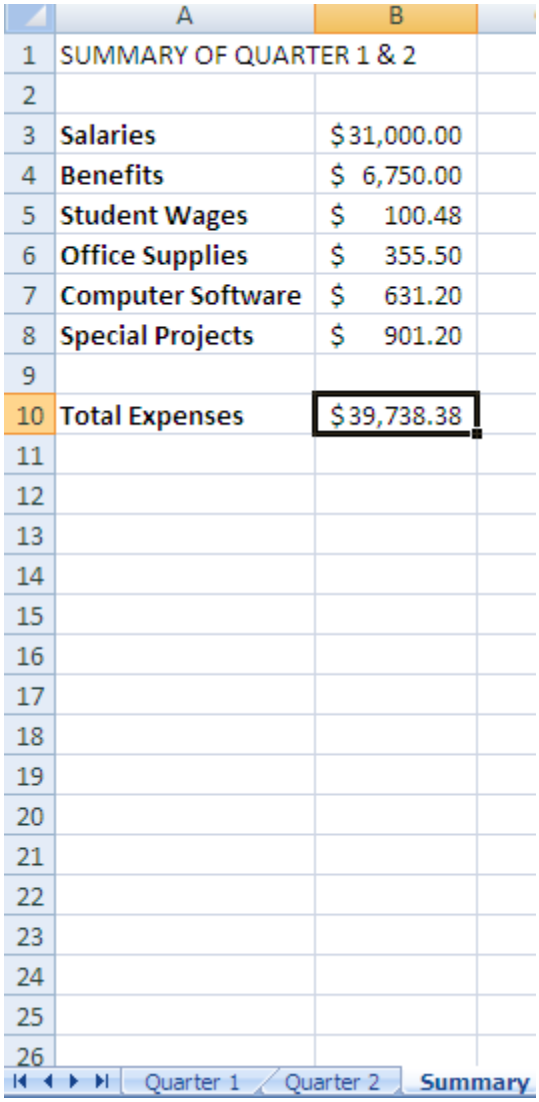
EXERCISE: ENTERING 3D REFERENCES

1. Click on **Sheet 2** and make sure it is blank. Double click the sheet name and call it **Quarter 2**.
2. Click back on the Quarter sheet you created.
3. Click the select all square.
4. Click copy.
5. Click on the Quarter 2 sheet. Position the insertion point in cell A1.
6. Click paste.
7. Make the following changes to the new worksheet:



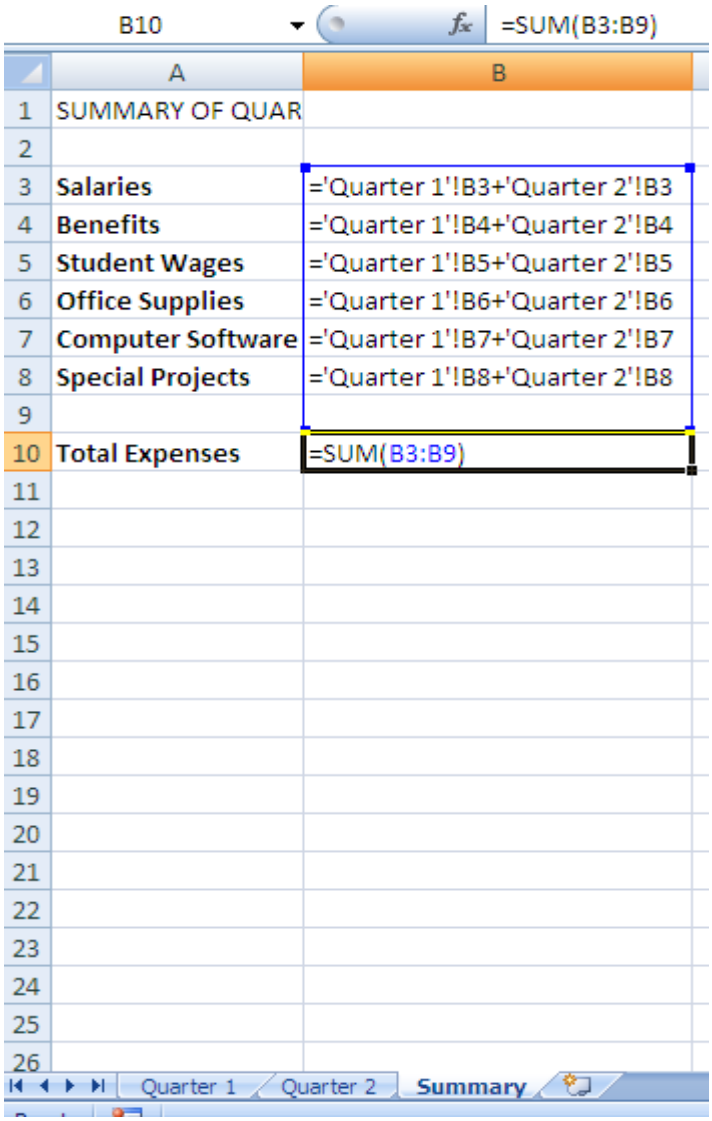
EXERCISE: Creating 3D References

1. Click on **Sheet 3** and make sure it is blank. Double click the sheet name and call it **Summary.**
2. Click back on one of the quarter sheets. Copy the cells A3:A7.
3. Paste into the summary sheet starting at A3.
4. In A1 type Summary of Quarters 1 & 2
5. Click on B3 in the summary worksheet and type **=**
6. Click on B3 in the Quarter 1 worksheet and type **+**
7. Click on B3 in the Quarter 2 worksheet and click the **√** to end the formula.
8. Use the fill handle to copy the formula through B8.
9. In the Summary worksheet go to **B10** and **sum B3:B8**.
10. Switch to formula view. Your screen should look similar to the following:



	A	B
1	SUMMARY OF QUARTER 1 & 2	
2		
3	Salaries	$31,000.00
4	Benefits	$ 6,750.00
5	Student Wages	$ 100.48
6	Office Supplies	$ 355.50
7	Computer Software	$ 631.20
8	Special Projects	$ 901.20
9		
10	Total Expenses	$39,738.38

Quarter 1 | Quarter 2 | Summary



B10 =SUM(B3:B9)

	A	B
1	SUMMARY OF QUAR	
2		
3	Salaries	='Quarter 1'!B3+'Quarter 2'!B3
4	Benefits	='Quarter 1'!B4+'Quarter 2'!B4
5	Student Wages	='Quarter 1'!B5+'Quarter 2'!B5
6	Office Supplies	='Quarter 1'!B6+'Quarter 2'!B6
7	Computer Software	='Quarter 1'!B7+'Quarter 2'!B7
8	Special Projects	='Quarter 1'!B8+'Quarter 2'!B8
9		
10	Total Expenses	=SUM(B3:B9)

Quarter 1 | Quarter 2 | Summary

Creating Conditional Formatting

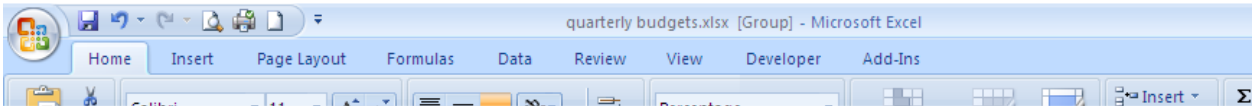
Microsoft Excel's definition of conditional formatting is that it helps to answer specific questions by highlighting cells or ranges of cells, To visually emphasize unusual values. A conditional format changes the appearance of a cell range based on a condition (or criteria). If the condition is true, the cell range is formatted based on that condition; if the conditional is false, the cell range is not formatted based on that condition.

Note When you create a conditional format, you can only reference other cells on the same worksheet; you cannot reference cells on other worksheets in the same workbook, or use external references to another workbook.

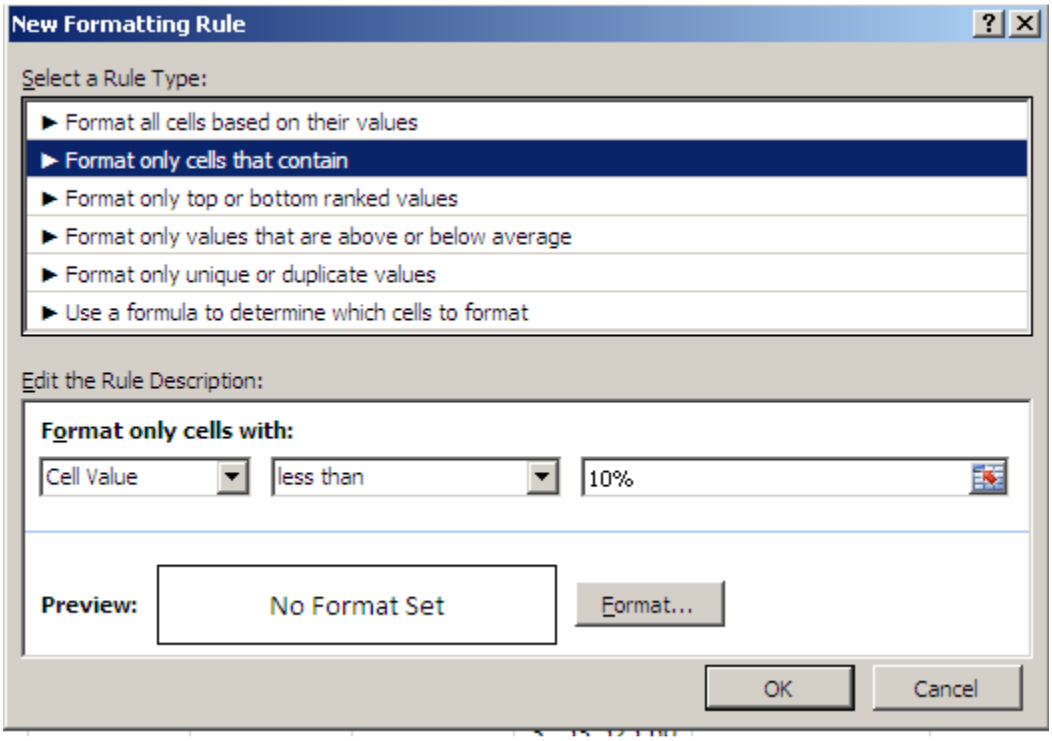
EXERCISE: Creating Conditional Formatting and selecting multiple sheets

1. Click on the Quarter 1 sheet.

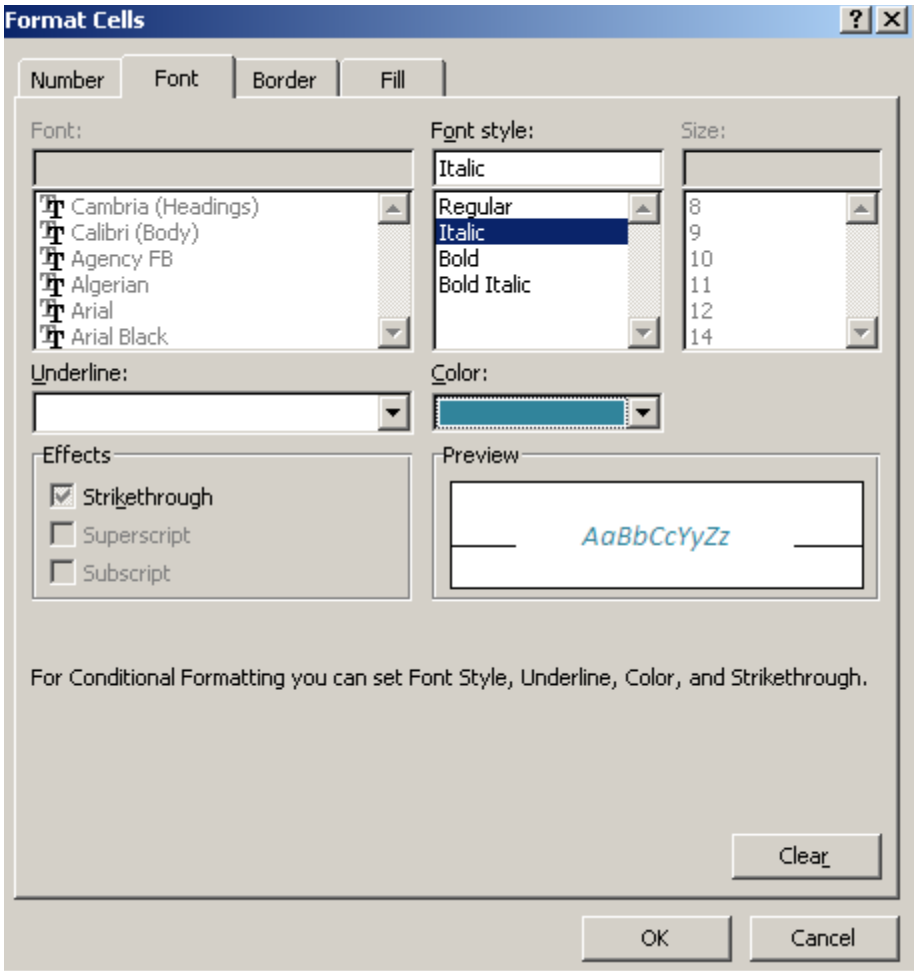
2. Hold the SHIFT key and click on Quarter 2 Sheet. You have selected both sheets. What you do to one sheet will automatically do the same to the other. Your title bar should look like this and show the word [GROUP}
   :



3. On the Quarter 1 sheet, select the range **F3:F8.** Click the **Bold** option.
4. Click on the Quarter 2 sheet to make sure those ranges were bolded.
5. Click the summary sheet to ungroup the worksheets.
6. Click on the Quarter 1 sheet and select the range **F3:F8.**
7. Click the HOME tab and click on **CONDITIONAL FORMATTING.**
8. Click on **NEW RULE**. The following screen appears. Select the same settings



9. Click **FORMAT** and make the following selections:



10. Click **FILL** and choose a fill color.
11. Depending on your choices, your screen should look similar to the following:

	A	B	C	D	E	F
1	Quarterly Budget					
2		January	February	March	Quarter Total	Percent of Budget
3	**Salaries**	$13,500.00	$13,500.00	$13,500.00	$ 40,500.00	**75.66%**
4	**Benefits**	3,375.00	3,375.00	3,375.00	10,125.00	**18.92%**
5	**Student Wages**	50.24	40.20	73.70	164.14	*0.31%*
6	**Office Supplies**	177.75	202.13	78.70	458.58	*0.86%*
7	**Computer Software**	315.60	74.78	115.20	505.58	*0.94%*
8	**Special Projects**	$ 450.60	$ 1,010.15	$ 311.55	$ 1,772.30	*3.31%*
9						
10	**Total Expenses**				$ 53,525.60	
11						

NOTE: As you change numbers the conditional formatting may change based on your criteria.

Using Date Functions

The most commonly used date functions are:

TODAY ()

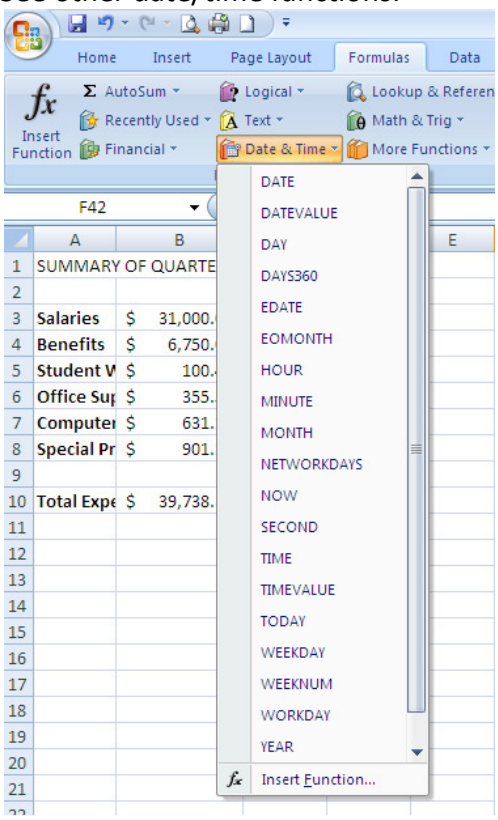
Returns the serial number of the current date. The serial number is the date-time code used by Microsoft Excel for date and time calculations. If the cell format was General before the function was entered, the result is formatted as a date.

TODAY( )

NOW( )

Microsoft Excel stores dates as sequential serial numbers so they can be used in calculations. By default, January 1, 1900 is serial number 1, and January 1, 2008 is serial number 39448 because it is 39,448 days after January 1, 1900. Microsoft Excel for the Macintosh uses a different date system as its default. It does not need an argument.

See other date/time functions:



Exercise: Using Date Functions

1. Click on the Summary sheet and go to D1.
2. Type **=NOW()**. The date and time appears. Use Format cells to format it as date with no time.
3. Go to another blank cell and type **=TODAY()**.

IF Functions

IF =IF(test,truevalue,falsevalue)

Use IF to conduct conditional tests on values and formulas. This function returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE. Up to seven IF functions can be nested to construct more elaborate tests.·

EXAMPLE:
=IF (A7=175,B15,0)
IF the value in cell A17 is equal to 175
THEN (the comma signifies the then expression when talking it out) the expression evaluates to TRUE so the number in B15 will be placed in the formula cell.
ELSE (the comma also signifies the then expression when talking it out) the expression IF the value in cell A17 is NOT equal to 175 then it is false and a 0 will be placed in the formula cell.

More detailed IF function can be created for more elaborate tests. One of these functions would be used to test the AND and the OR would be used as the test. The AND and OR functions. IF AND functions may hold a maximum of 30 arguments, but the NOT function can only hold one argument.

Examples:=IF(AND(A1>10,B1>10),”yes”,”no”)=IF(NOT(C1=“F”),”You passed!”,”Sorry you failed”)

EXERCISE: IF Functions

Your goal is to increase Student Wages to $500 for Quarters 1 & 2. If it is already over $500 you don't want to do anything with it.

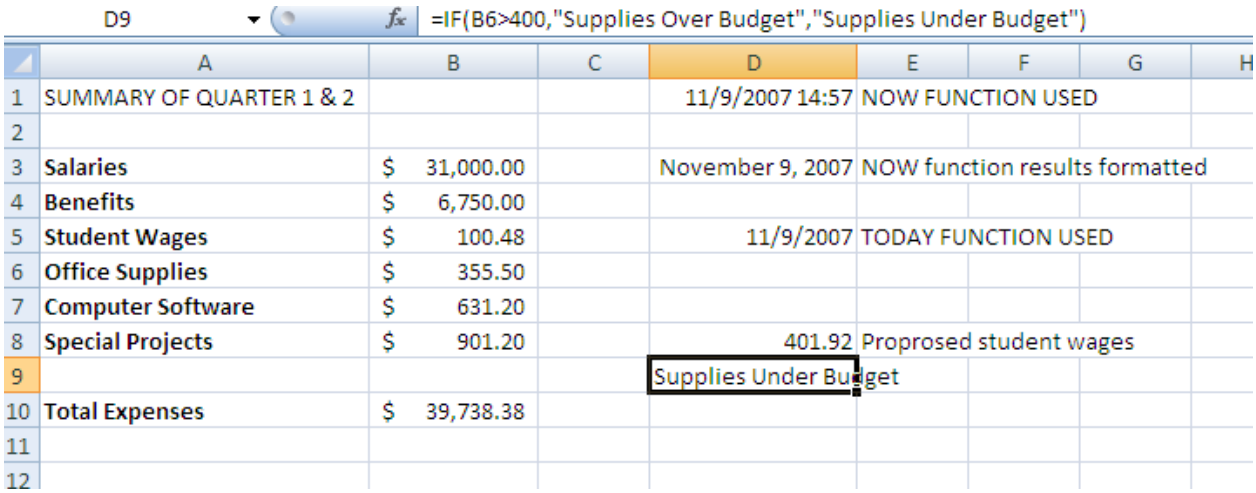
1. In cell D8 type the following:

=IF(B5<=500,B5*300%+B5,"Already more than500")

2. Press ENTER.

3. In D9 type the following:

=IF(B6>400,"Supplies Over Budget","Supplies Under Budget")



	A	B	C	D	E	F	G	H
1	SUMMARY OF QUARTER 1 & 2			11/9/2007 14:57	NOW FUNCTION USED			
2								
3	**Salaries**	$ 31,000.00		November 9, 2007	NOW function results formatted			
4	**Benefits**	$ 6,750.00						
5	**Student Wages**	$ 100.48		11/9/2007	TODAY FUNCTION USED			
6	**Office Supplies**	$ 355.50						
7	**Computer Software**	$ 631.20						
8	**Special Projects**	$ 901.20		401.92	Proprosed student wages			
9				Supplies Under Budget				
10	**Total Expenses**	$ 39,738.38						
11								
12								

NAMING RANGES

Excel allows you to select a range of cells and give them a name. Once you've done this, you can quickly find that range again or use the named range in a formula.

To name a cell or range of cells:

1) Select a cell or group of cells.
2) Click in the Name Box and type a name for the cell or cell group (no spaces allowed).
3) Click Enter.

To find a named range :

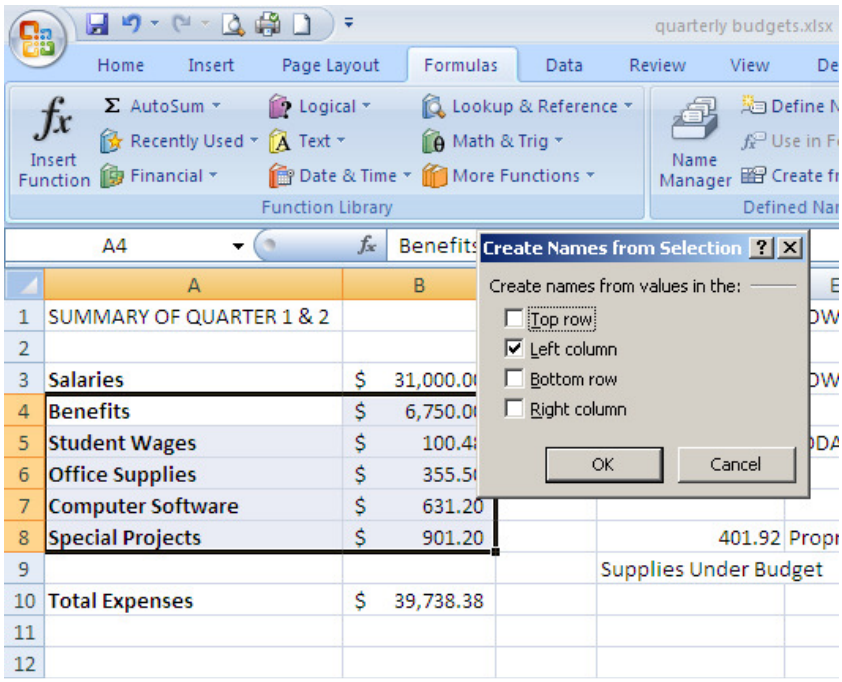
1) Click the drop down arrow next to the name box. A list of named ranges will appear.
2) Select the name you want to find.

To use a named range in a formula you are creating.
1) Begin your formula as normal.
2) Type in the name of the range in place of the cell references or point to the cell reference and name will automatically appear.

To Quickly Name a range of cells using the row or column description:

1. Select the description and cell.
2. Select Formulas
3. Select Create names from Selection.
4. Select if it is the name is to the left, right, top, or bottom of the cell.

If the formula is already typed, then you can select from the formulas menu:
1. Define Name drop down menu
2. Apply names and then select the names to apply to the existing formulas.



EXERCISE: Naming ranges

1) Select **A3**.
2) Click in the Name Box and type **FULL_TIME_SALARIES** (no spaces allowed).
3) Click Enter.
4) Click the cell and see the name appear.

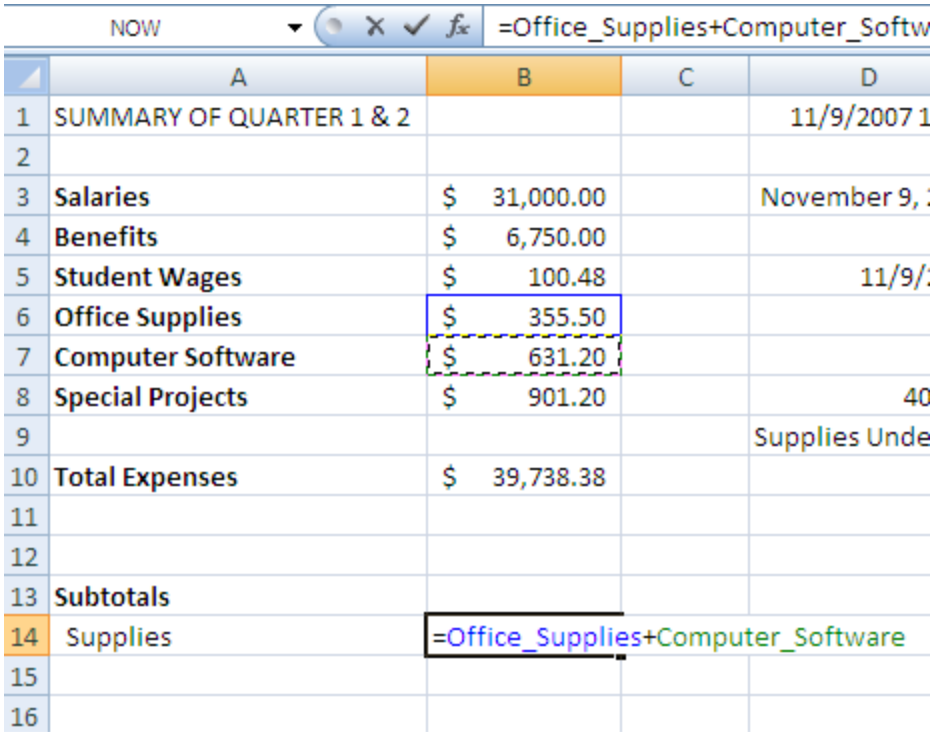
1. Select A4:B*.
2. Select Formulas
3. Select Create names from Selection.
4. Make sure that the box showing **left** is checked.

Using the name in the formulas:

Make the worksheet look like below by adding a Subtotal area:
Add Supplies in A14
Add Wages in A15

In B15 type **=**
Point to B6 (the name appears in the formula)
Type **+**
Point to **B7** (the name appears)
(See Below)
Press Enter.

Do the same for B16 by summing Salaries and Students wages



Rounding Numbers

=ROUND(number,num_digits)

Rounds a number to a specified number of digits. For the number argument you can either enter a number or a cell reference. For the num digits argument you need to specify the number of digits to which you want to round.

If num_digits is greater than zero, then number is rounded to the specified number of decimal places.

If num_digits is 0, then number is rounded to the nearest integer.

If num_digits is less than 0, then number is rounded to the left of the decimal point.

Examples:=ROUND(123.45,1) will equal 123.5
=ROUND(123.45,0) will equal 123
=ROUND(123.45,-2) will equal 100

Exercise: Rounding Numbers

In D14 and D15, type the following round functions:

	A	B	C	D
1	SUMMARY OF QUARTER 1 & 2			=NOW()
2				
3	**Salaries**	='Quarter 1'!B3+'Quarter 2'!B3		=NOW()
4	**Benefits**	='Quarter 1'!B4+'Quarter 2'!B4		
5	**Student Wages**	='Quarter 1'!B5+'Quarter 2'!B5		=TODAY()
6	**Office Supplies**	='Quarter 1'!B6+'Quarter 2'!B6		
7	**Computer Software**	='Quarter 1'!B7+'Quarter 2'!B7		
8	**Special Projects**	='Quarter 1'!B8+'Quarter 2'!B8		=IF(B5<=500,B5*300%+B5,
9				=IF(B6>400,"Supplies Ove
10	**Total Expenses**	=SUM(B3:B9)		
11				
12				
13	**Subtotals**			
14	Supplies	=Office_Supplies+Computer_S		=ROUND(B14,0)
15	Wages	=Full_Time_Salaries+Student_V		=ROUND(B14,-1)

Your results should be:

$	986.70		987
	31100.48	$	990.00

Using Min/Max/Average Functions

These formulas can be accessed using the Insert Function feature, or can be typed directly into the cell.

The MIN function will return the minimum value in a range of cells.

=MIN(RANGE)

The MAX function will return the maximum value in a range of cells.

=MAX(RANGE)

The AVERAGE function will return the Average value from the range of cells.

=AVERAGE(RANGE)

Exercise: Using Min/Max/Average Functions

Add the following highlighted information to the Summary worksheet:

	A	B
1	SUMMARY OF QUARTER 1 & 2	
2		
3	**Salaries**	='Quarter 1'!B3+'Quar
4	**Benefits**	='Quarter 1'!B4+'Quar
5	**Student Wages**	='Quarter 1'!B5+'Quar
6	**Office Supplies**	='Quarter 1'!B6+'Quar
7	**Computer Software**	='Quarter 1'!B7+'Quar
8	**Special Projects**	='Quarter 1'!B8+'Quar
9		
10	**Total Expenses**	=SUM(B3:B9)
11		
12		
13	**Subtotals**	
14	Supplies	=Office_Supplies+Co
15	Wages	=Full_Time_Salaries+
16		
17	Minimum Expenses	=MIN(B3:B8)
18	Maximum Expenses	=MAX(B3:B8)
19	Averages Expenses	=AVERAGE(B3:B8)
20		

Your results should be as shown below:

	A	B
1	SUMMARY OF QUARTER 1 & 2	
2		
3	**Salaries**	$ 31,000.00
4	**Benefits**	$ 6,750.00
5	**Student Wages**	$ 100.48
6	**Office Supplies**	$ 355.50
7	**Computer Software**	$ 631.20
8	**Special Projects**	$ 901.20
9		
10	**Total Expenses**	$ 39,738.38
11		
12		
13	**Subtotals**	
14	Supplies	$ 986.70
15	Wages	31100.48
16		
17	Minimum Expenses	$ 100.48
18	Maximum Expenses	$ 31,000.00
19	Averages Expenses	$ 6,623.06

Trace Precedents/Dependents

The best way to see if your formulas are pulling values from the correct cells is to activate the Formula Auditing toolbar and then turn on arrows for Trace Precedents (cells that feed into the formula) or Trace Dependents (cell that depend on this formula). These arrows show which cells are being used to build formulas and can greatly reduce troubleshooting time. Also, you can use the Error Checking option to see if your formulas are correct.

To use this feature click on Formulas and the appropriate choice from the Formula auditing feature from the ribbon.