Lesson 15 Advanced Cell Properties

Lesson Topics

- Absolute Cell References
- Percentages
- Exercise: Calculating Percentages
- Exercise: Calculating Commissions

Lesson Objectives

At the end of the lesson, you will be able to:

- Explain the difference between absolute and relative cell references;
- Use absolute cell references in workbooks;
- Use the ABS key to enter absolute cell references;
- Format values as percentages;
- Use percentages in formulas for calculating sales tax.

Student Files Used

You will use the following files from your student folder:

- Salaries 1
- Salaries 2
- Sales Tax
- Contributions
- Commission Report

Student Files Created

You will save the following new file to your student folder:

- New Commission Report

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Absolute Cell References

You have seen that when you copy a formula to other cells, the cell references in the formula change. For example, if you were to copy the formula *=B3+C3* to the cell below, Excel would change the formula to *=B4+C4*. This is because the cell references are *relative*. Sometimes, however, you do not want a cell reference in a formula to change when it is copied. You want it to be *absolute*.

It is easiest to learn this feature by writing a formula incorrectly and noticing what happens when it is copied to other cells. You are going to use a workbook named *Salaries*.

1. **Open *Salaries 1*.**

   This workbook contains a list of employee salaries. At the top, notice that each employee is to receive a bonus of $15 this week. Also notice that $2 is to be deducted. You are going to use the techniques that you have learned so far to write an incorrect formula in column C that will add the bonus to the salary.

	A	B	C	D
1	Bonus:	15		
2	Deduction:	2		
3			Salary +	Salary -
4		Salary	Bonus	Deduction
5				
6	Franklin, D.	350		
7	Schnieder, J.	200		
8	Perry, A.	375		
9	Karlin, M.	500		
10	Rose, W.	450		
11	Talbot, B.	475		
12	Holden, P.	250		
13	Fisher, S.	400		
14				

2. **Go to C6.**

3. **Type** =B6+B1 **and tap the ENTER key.**

   Notice that the result is correct: *365*. You are going to copy this formula down to the other cells in the column.

4. **Go to C6.**

5. **On the Edit menu, choose *Copy*.**

   Tip: Remember that you can use the Shortcut menu, toolbars or keyboard for many commands.

6. **Select C7:C13.**

7. **Tap the ENTER key.**

8. **Click to remove the highlight.**

   Notice that the results are not correct. Some of the values did not even change, and one has *#VALUE!* in it. You are going to see why.

9. **Use CTRL/~ (CTRL/TILDE) in order to display the formulas. (Do not hold down the SHIFT key.)**

   The Formula Auditing toolbar appears. If it is in the way, drag its title bar out of the way.

   Notice the formulas in column C. When you copied the contents of C6 into the other cells, Excel changed the cell references automatically. For example, the formula in C7 reads *=B7+B2*. B7 is correct, but B2 contains the value for the deduction, not the bonus. The cell reference for the bonus must always remain B1, otherwise, the formula will be incorrect. In other words, the cell reference for the bonus should be an *absolute* cell reference, not a *relative* cell reference. Notice the same problems in the other cells of column C.

   In C9, the incorrect formula *=B9+B4* produces the result *#VALUE!*. This is because B4 contains text, not a value.

10. **Use CTRL/~ to hide the formulas.**

To make a cell reference absolute, put a dollar sign ($) before each part of it, like this: *$B$1*. This tells Excel not to change the column letter or the row number when the formula is copied to other cells.

You are going make a correct formula using absolute cell references.

1. **Go to C6.**

2. **Type** =B6+$B$1 **and then tap the ENTER key.**

   Now when you copy the formula, B6 will change, but B1 will remain the same. You are going to copy the formula as before. The old formulas in those cells will be overwritten with the new ones.

3. This time, you are going to use the Fill handle to copy the formula.

Go to C6.

4. **Drag the Fill handle to C13.**

   Notice that the results are correct.

	A	B	C
1	Bonus:	15	
2	Deduction:	2	
3			Salary +
4		Salary	Bonus
5			
6	Franklin, D.	350	365
7	Schnieder, J.	200	215
8	Perry, A.	375	390
9	Karlin, M.	500	515
10	Rose, W.	450	465
11	Talbot, B.	475	490
12	Holden, P.	250	265
13	Fisher, S.	400	415
14			

5. **Use CTRL/~ to show the formulas.**

   Notice that the first cell reference changed throughout column C, but *$B$1* remained the same.

6. **Use CTRL/~ to hide the formulas.**

   Note: You can also make only one part of the cell reference absolute. For example, *$G11* makes the column absolute, but the row number will change when the formula is copied. *G$11* makes the row absolute, but the column letter will change when the formula is copied. In your formula it was not necessary to put a dollar sign in front of the column, because it would not have changed when copied. Therefore, the formula could have been written *=B6+B$1*.

The ABS key (F4)

The ABS key (F4) saves you the trouble of typing the dollar signs in order to make an absolute cell reference. If you tap it once after typing a cell reference, both dollar signs are inserted. Tapping it twice puts a dollar sign before the row part only. Tapping it three times puts a dollar sign before the column part only. Tapping it four times removes the dollar signs.

You are going to re-type the formula for C6 in this manner.

1. **Go to C6.**

2. **Type the following, but do not tap the ENTER key:** =B6+B1

3. **Tap the ABS key (F4).**

   Notice that the dollar signs were inserted in the most recently typed cell reference (B1). The first cell reference (B6) has not been changed.

4. **Tap the ABS key (F4) again.**

   Only the row number has a dollar sign.

5. **Tap the ABS key (F4) again.**

   Only the column letter has a dollar sign.

6. **Tap the ABS key (F4) again.**

   The dollar sign disappears. The absolute cell reference has been removed.

7. **Tap the ABS key (F4) again.**

   Both dollar signs are again inserted.

8. **Tap the ENTER key.**

   Remember: You can use the ABS key (F4) to insert absolute cell references as you are typing a formula.

You are going to create the formulas for column D. This time B2 will be an absolute cell reference. This will then be subtracted from the values in column C.

1. **Go to D6.**

2. **Type:** =C6-B2

3. **Tap the ABS key (F4).**

   The dollar signs are inserted. The formula should look like this: *=C6-$B$2*

4. **Tap the ENTER key.**

5. **Copy this formula to D7:D13.**

   Your screen should look like the example at the top of the next page.

	A	B	C	D
1	Bonus:	15		
2	Deduction:	2		
3			Salary +	Salary -
4		Salary	Bonus	Deduction
5				
6	Franklin, D.	350	365	363
7	Schnieder, J.	200	215	213
8	Perry, A.	375	390	388
9	Karlin, M.	500	515	513
10	Rose, W.	450	465	463
11	Talbot, B.	475	490	488
12	Holden, P.	250	265	263
13	Fisher, S.	400	415	413
14				

6. **Go to D7.**

   Notice that the first cell reference changed to C7, but B2 remained the same.

7. **Go to several other cells in column D and notice the absolute cell references.**

8. **Change the values in B1 and B2 to other values and watch the results change in the cells with formulas.**

9. **Close** *Salaries 1*. **If you wish, save the changes (the file will not be used again).**

Percentages

In arithmetic, a value with a percent sign is converted to a decimal value by moving the decimal point two places to the left. For example, *6%* is the same as *.06; 25%* is the same as *.25; 100%* is the same as *1*, and *250%* is the same as *2.5*. If you have forgotten your arithmetic, do not worry — Excel can convert percentages to decimals automatically.

1. **Open a new workbook.**

2. You are going to enter a percentage and then reference it in a formula.

   Verify that A1 is the current cell.

3. **Type** 25% **and click the check box to keep the cell active.**

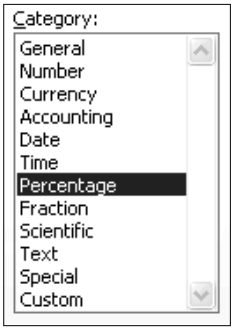
   Since you entered a value with a percent sign, Excel applied the Percentage format to the cell

automatically. Notice that a percent sign appears in the cell and in the Formula bar.

4. **On the Format menu, choose *Cells*.**

5. **If necessary, click the Number tab.**

   In the *Category* box, notice that *Percentage* is selected. Excel applied this format automatically.



6. **Click OK to close the dialog box.**

7. **Go to B1.**

8. **Type** 50 **and then tap the TAB key to go to C1.**

9. You are going to enter a formula to multiply the percentage in A1 by the value in B1.

   In C1, type =A1*B1 **and then tap the ENTER key.**

   Notice the results of the formula (*12.5*). Excel converted the percentage in A1 to a decimal in order to multiply the contents of the two cells.

10. You are going to change the value in A1.

    Go to A1.

11. **Type:** 8

    Notice that Excel maintains the percent symbol in the cell and on the Formula bar. This is because Excel has formatted the cell with the Percent format.

12. **Tap the ENTER key.**

    Notice the results of the formula in C1. Excel has evaluated 8% of 50.

You can hide the percent sign, by changing the number format of the cell.

1. **Go to A1.**

2. **Use CTRL/SHIFT/~ to apply the *General* format to the cell.**

Notice that *0.08* now appears in the cell and on the Formula bar. When you apply the General format, Excel converted 8% to its decimal equivalent. Notice that the value in C1 has not changed.

3. **Close the workbook without saving.**

Calculating a Sales Tax

Now that you know how to display percentages, you are going to use a workbook named *Sales Tax*.

1. **Open** *Sales Tax*.

   Notice that the workbook is designed to calculate a sales tax.

	A	B
1	**Sales Tax Calculator**	
2		
3	Purchase Amount	120
4	Sales Tax Rate	
5	Sales Tax Amount	
6	Total Amount	
7	Extract Tax	

2. You are going to type 8% as the current sales tax rate.

   Go to B4.

3. **Type** 8% **and tap the ENTER key.**

4. You are going to format the cell as a percentage with 2 decimal places.

   Go to B4.

5. **On the Format menu, choose** *Cells*.

6. **Verify that the Number tab is displayed.**

7. **Verify that** *Percentage* **is chosen in the** *Category* **list box.**

8. **Change the contents of the** *Decimal places* **text box to:** 2

9. **Click OK.**

   Notice that *8.00%* is displayed in the cell.

You can now find the *Sales Tax Amount* by multiplying the *Purchase Amount* by the *Sales Tax Rate*.

1. **Go to B5.**
2. **Type** =B3*B4 **and tap the ENTER key.**

   The sales tax is *9.6*.
3. Before continuing, you are going to change the format of cells containing dollar amounts to the *Currency* format with two decimal places.

   Select cell B3, B5, B6, and B7. (Remember to hold down the CTRL key after you select B3, so as not to de-select cells.)
4. **On the Format menu, choose** *Cells*.
5. **Verify that the Number tab is displayed.**
6. **In the** *Category* **list box, choose** *Currency*.
7. **Verify that two decimal places have been chosen and specify that negative numbers are displayed within parentheses.**
8. **Click OK.**

   Notice that the *Purchase Amount* is now *$120.00* and the *Sales Tax Amount* is *$9.60*.

   Note: You could also have changed to the *Currency* format by clicking the Currency Style button on the Formatting toolbar, but we wanted to be sure you were comfortable with the menu command.

There are two ways you can calculate the *Total Amount*.

1. **Go to cell B6.**
2. One way to calculate the total is to simply add the purchase amount to the sales tax amount.

   Type =B3+B5 **and tap the ENTER key.**

   The total amount is $129.60.
3. You can also calculate the total by using only the purchase amount and the sales tax rate. To do this, simply multiply the purchase amount by the sum (1 + sales tax rate). In this case, you would multiply the

purchase amount by (1 + 0.08), which is the same as 1.08. (Be sure to convert the percent to a decimal.)

In B6, type =B3*(1+B4) **and then tap the ENTER key. (Remember that Excel calculates whatever is in parentheses first.)**

Notice the results of the second formula. (Again, do not worry if the arithmetic escapes you.) Although it may seem more complicated at first glance, the second formula is a more direct way of calculating the total amount.

A variation on this can be used to extract the sales tax from the total amount to find out what the purchase amount was.

1. **Go to B7.**
2. **Type** =B6/(1+B4) **and tap the ENTER key.**

   Your screen should look like the following:

	A	B
1	**Sales Tax Calculator**	
2		
3	Purchase Amount	$120.00
4	Sales Tax Rate	8.00%
5	Sales Tax Amount	$9.60
6	Total Amount	$129.60
7	Extract Tax	$120.00
8		

   You can see that the answer matches the *Purchase Amount* in B3. This can also be used to show an 8% decrease in a figure. Both of these variations are useful for developing projected figures quickly.

3. **Close the workbook. It will not be used again.**

Exercise: Calculating Percentages

In the following example, four people have made charitable contributions. You are interested in knowing what percentage of the total was contributed by each person.

	A	B	C
1	Name	Contribution	Percent
2			
3	Smith	21,000	
4	Wilson	34,000	
5	Brant	27,000	
6	Jerome	5,000	
7			
8	TOTAL	$	

1. **Open** *Contributions*.

2. The first task is to use a *SUM function* in order to find out the total contributions.

   Go to B8.

3. **On the Standard toolbar, click the AutoSum button.**

   The formula =*SUM(B3:B7)* is entered on the Formula bar.

4. **Tap the ENTER key.**

   87,000 is entered in B8.

5. The percentage of the total can be found by dividing the individual contribution by the total contribution. The reference to B8 should be absolute, so that the total does not change as you copy the formula down.

   Go to C3.

6. **Type** =B3/$B$8 **and tap the ENTER key.**

   Notice that a value with a lot of decimal places appears.

7. You are going to format this cell as a percentage with two decimal places. When you copy the cell down, the formatting information will be copied with it.

   Go to C3.

8. Instead of using the Format Cells dialog box, you are going to use the buttons on the Formatting toolbar.

   On the Formatting toolbar, click the Percent Style button. 

Notice that the number is formatted with a percent sign.

9. You are going to add two places after the decimal point.

   On the Formatting toolbar, click the Increase Decimal button two times. 

   The value changes to *24.14%*.

10. **Copy the formula to C4:C6.**

11. **Click to remove the highlight.**

    You can now see what percentage of the total each person contributed. Your screen should look like the example on the next page. (The bottom border in C6 was removed, because the format of C3 was also copied. It is not necessary to replace it.)

	A	B	C
1	Name	Contribution	Percent
2			
3	Smith	21,000	24.14%
4	Wilson	34,000	39.08%
5	Brant	27,000	31.03%
6	Jerome	5,000	5.75%
7			
8	TOTAL	87,000	

12. **Go to other cells with formulas and notice that B8 remained an absolute cell reference.**

13. **Close the workbook. It will not be used again.**

Exercise: Calculating Commissions

In this exercise you will calculate each sales person's commission and its percent of the total commissions. If you need step-by-step instructions, refer to the Solutions section following the exercise.

	A	B	C	D
1	Salesperson Commission Report			
2				
3	Commission Rate:			
4				Percent
5				of Total
6	Name	Sales	Commissions	Commissions
7	Locke, A	30000		
8	Young, F	45000		
9	Bear, P	26000		
10	Small, B	33000		
11	Mouse, M	37000		
12	Total Commissions:			

1. **If you feel you need the practice, feel free to type the above workbook yourself. If not, open** *Commission Report*, **which has the information entered already.**
2. **Go to B3 and type** 12% **for the commission rate.**
3. **Format this cell with the** *Percentage* **format with 2 decimal places.**
4. You are going to change the format of B7:C12.

   Select B7:C12.
5. **On the Format menu, choose** *Cells*.
6. **On the Number tab, choose a number format with no decimal places and a thousands separator. It does not matter if negative numbers are displayed, so you can ignore that option.**
7. **Click OK.**
8. **Go to C7 and write a formula that will calculate Locke's commission. Remember that the current commission rate is in cell B3.**
9. **Copy this formula down to C8:C11. The bottom border in C11 will be removed because you are also copying the format of C8, which does not have a bottom border. You will fix it shortly.**
10. **Go to C12 and write a SUM function that adds the commissions.**
11. **Go to D7 and write a formula that divides the commission in C7 by the total commissions in C12.**
12. **Format the cell with the Percentage format with 2 decimal places.**
13. **Copy the formula to D8:D11.**
14. **Format A11:D11 with a medium line at the bottom of the cells.**

Your screen should look like the following:

	A	B	C	D
1	Salesperson Commission Report			
2				
3	**Commission Rate:**	12.00%		
4				**Percent**
5				**of Total**
6	**Name**	**Sales**	**Commissions**	**Commissions**
7	Locke, A	30,000	3,600	17.54%
8	Young, F	45,000	5,400	26.32%
9	Bear, P	26,000	3,120	15.20%
10	Small, B	33,000	3,960	19.30%
11	Mouse, M	37,000	4,440	21.64%
12	**Total Commissions:**		20,520	

15. **Type other values into B3 and notice how the commissions change.**

16. **Save the workbook as** *New Commission Report***.**

End of Lesson 15