

Lesson 6:

Making Decisions in Excel: Using Logical Functions

The following activities are designed to introduce you to the use of the Excel logical function IF for phrasing decisions in your calculations. The exercises are designed for you to perform as you read, so access to Excel and the worksheet *Example1* which we developed in Lessons 1-5 is highly desirable.

1. Modifying the commission rate scheme in our sales data example.

Suppose we wish to change the way in which we allocate the commission rate to each of our sales regions. In our previous example, one rate was used for all regions. Let's assume now that the commission rate is set each six months as an incentive for higher sales in the following way. If a region attains total sales of more than \$100,000 the sales commission rate will be 6%. If the region attains total sales of more than \$80,000, but less than or equal to \$100,000, the rate will be 5%. If a region's total sales are below \$80,000, the rate will be set to 3.5%.

We wish to modify our worksheet to account for these new rules. We begin by setting aside cells for the three sales commission rates as shown in the following figure. Note in that figure that we have deleted the formulas used before for computing adjusted sales, because those formulas must be adjusted now for the new commission scheme.

Example1					
	A	B	C	D	E
1					
2	Month	Sales - Region1	Sales - Region2	Sales - Region3	Totals
3	Jan	\$ 22,876.00	\$ 13,956.00	\$ 6,545.00	\$ 43,377.00
4	Feb	\$ 32,222.00	\$ 3,412.00	\$ 5,546.00	\$ 41,180.00
5	Mar	\$ 14,321.00	\$ 11,233.00	\$ 7,786.00	\$ 33,340.00
6	Apr	\$ 13,423.00	\$ 23,421.00	\$ 4,443.00	\$ 41,287.00
7	May	\$ 15,532.00	\$ 11,233.00	\$ 8,999.00	\$ 35,764.00
8	Jun	\$ 19,087.00	\$ 22,111.00	\$ 10,232.00	\$ 51,430.00
9					
10	Total	\$ 117,461.00	\$ 85,366.00	\$ 43,551.00	\$246,378.00
11					
12	Average	\$ 19,576.83	\$ 14,227.67	\$ 7,258.50	\$ 41,063.00
13	St. Dev.	\$ 7,111.66	\$ 7,505.37	\$ 2,168.78	\$ 6,334.31
14					
15	Adjusted				
16	Sales				
17					
18	High Commission Rate		6%		
19	Normal Commission Rate		5%		
20	Low Commission Rate		3.50%		
21					

2. Constructing a formula for the conditional commission rate assignment.

Let's begin by constructing a formula for cell B15. We know we wish to subtract the commissions paid from the gross sales just as before. The difference is that the commission rate to be paid will in fact depend upon the gross sales. How can we phrase this unknown in our formula?

We'd like our formula to "make a decision" about which commission rate to use based on the value of the total sales. The Excel IF function provides exactly this kind of capability. The IF function is structured as follows.

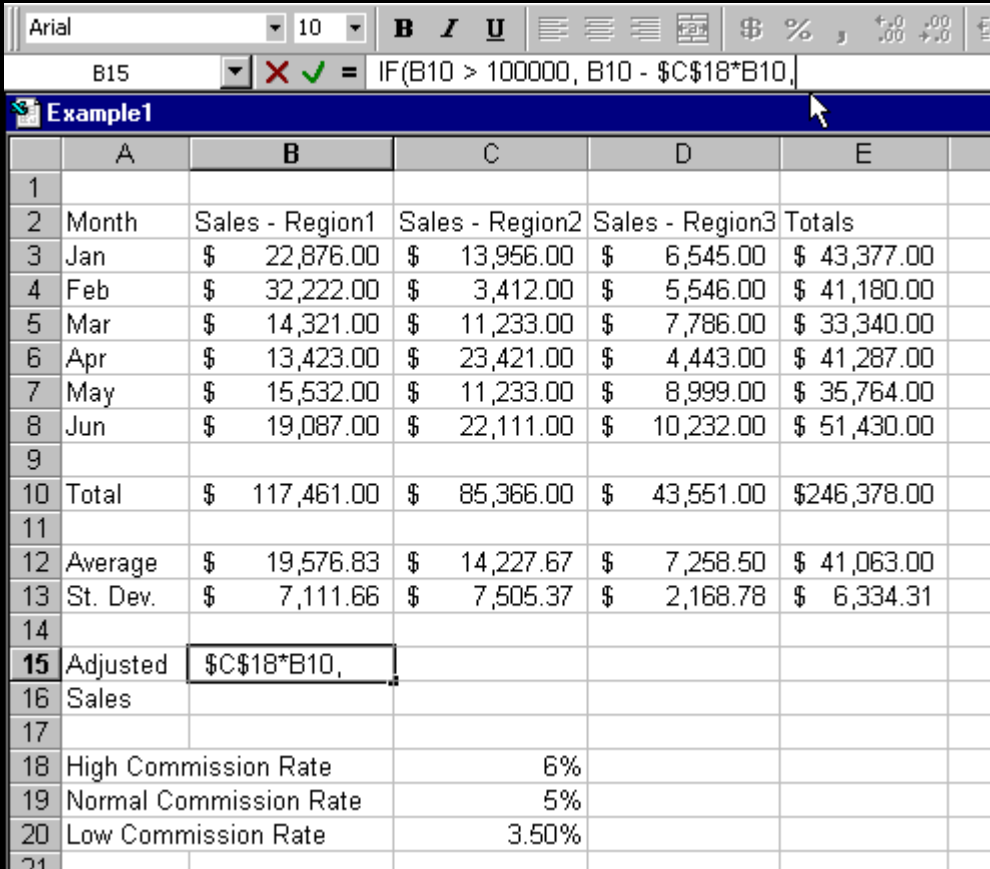
IF(condition, action or value if condition true, action or value if condition false)

For example, the hypothetical expression (this has nothing to do with our example):

IF(A2 > 10, 25, 4*A2)

would assign the value 25 if the number in cell A2 is larger than 10 and assign the number 4 times the value in cell A2 if the value in A2 is not larger than 10.

With this in mind, we can begin the construction of our formula for cell B15. The first part of the formula is shown in the figure below. It computes the adjusted sales based on the rate in cell C18 whenever the total sales in cell B10 is larger than \$100,000. We've left blank for the moment what happens otherwise.



	A	B	C	D	E
1					
2	Month	Sales - Region1	Sales - Region2	Sales - Region3	Totals
3	Jan	\$ 22,876.00	\$ 13,956.00	\$ 6,545.00	\$ 43,377.00
4	Feb	\$ 32,222.00	\$ 3,412.00	\$ 5,546.00	\$ 41,180.00
5	Mar	\$ 14,321.00	\$ 11,233.00	\$ 7,786.00	\$ 33,340.00
6	Apr	\$ 13,423.00	\$ 23,421.00	\$ 4,443.00	\$ 41,287.00
7	May	\$ 15,532.00	\$ 11,233.00	\$ 8,999.00	\$ 35,764.00
8	Jun	\$ 19,087.00	\$ 22,111.00	\$ 10,232.00	\$ 51,430.00
9					
10	Total	\$ 117,461.00	\$ 85,366.00	\$ 43,551.00	\$246,378.00
11					
12	Average	\$ 19,576.83	\$ 14,227.67	\$ 7,258.50	\$ 41,063.00
13	St. Dev.	\$ 7,111.66	\$ 7,505.37	\$ 2,168.78	\$ 6,334.31
14					
15	Adjusted	\$C\$18*B10,			
16	Sales				
17					
18	High Commission Rate		6%		
19	Normal Commission Rate		5%		
20	Low Commission Rate		3.50%		
21					

Now let's consider what happens whenever the sales figure in B10 is **not** larger than \$100,000. It depends again. If the figure is larger than \$80,000, we use the rate in cell C19, otherwise we use the rate in cell C20. This calls for a **second IF function inside the first IF function**. The following figure shows the first part of this second IF function being entered.

	A	B	C	D	E	F	G
1							
2	Month	Sales - Region1	Sales - Region2	Sales - Region3	Totals		
3	Jan	\$ 22,876.00	\$ 13,956.00	\$ 6,545.00	\$ 43,377.00		
4	Feb	\$ 32,222.00	\$ 3,412.00	\$ 5,546.00	\$ 41,180.00		
5	Mar	\$ 14,321.00	\$ 11,233.00	\$ 7,786.00	\$ 33,340.00		
6	Apr	\$ 13,423.00	\$ 23,421.00	\$ 4,443.00	\$ 41,287.00		
7	May	\$ 15,532.00	\$ 11,233.00	\$ 8,999.00	\$ 35,764.00		
8	Jun	\$ 19,087.00	\$ 22,111.00	\$ 10,232.00	\$ 51,430.00		
9							
10	Total	\$ 117,461.00	\$ 85,366.00	\$ 43,551.00	\$246,378.00		
11							
12	Average	\$ 19,576.83	\$ 14,227.67	\$ 7,258.50	\$ 41,063.00		
13	St. Dev.	\$ 7,111.66	\$ 7,505.37	\$ 2,168.78	\$ 6,334.31		
14							
15	Adjusted	- \$C\$19*B10,					
16	Sales						
17							
18	High Commission Rate		6%				
19	Normal Commission Rate		5%				
20	Low Commission Rate		3.50%				
21							

Finally, if the sales amount is not larger than \$80,000, we wish to use the rate in C20. This condition then finishes the formula off, as shown in the following figure.

	A	B	C	D	E	F	G	H
1								
2	Month	Sales - Region1	Sales - Region2	Sales - Region3	Totals			
3	Jan	\$ 22,876.00	\$ 13,956.00	\$ 6,545.00	\$ 43,377.00			
4	Feb	\$ 32,222.00	\$ 3,412.00	\$ 5,546.00	\$ 41,180.00			
5	Mar	\$ 14,321.00	\$ 11,233.00	\$ 7,786.00	\$ 33,340.00			
6	Apr	\$ 13,423.00	\$ 23,421.00	\$ 4,443.00	\$ 41,287.00			
7	May	\$ 15,532.00	\$ 11,233.00	\$ 8,999.00	\$ 35,764.00			
8	Jun	\$ 19,087.00	\$ 22,111.00	\$ 10,232.00	\$ 51,430.00			
9								
10	Total	\$ 117,461.00	\$ 85,366.00	\$ 43,551.00	\$246,378.00			
11								
12	Average	\$ 19,576.83	\$ 14,227.67	\$ 7,258.50	\$ 41,063.00			
13	St. Dev.	\$ 7,111.66	\$ 7,505.37	\$ 2,168.78	\$ 6,334.31			
14								
15	Adjusted	$\$C\$20*B10)$						
16	Sales							
17								
18	High Commission Rate		6%					
19	Normal Commission Rate		5%					
20	Low Commission Rate		3.50%					
21								

3. The completed IF formula.

Study the nested IF function in the previous figure carefully so that you understand how it represents the procedure for assigning a commission rate that we described earlier. Once you are confident of that understanding, replicate the formula to cells C15 and D15. We do **not** want to replicate to E15 as before (why not?). The following figure shows the results your worksheet should now contain. Find and correct any errors before proceeding.

Example1						
	A	B	C	D	E	
1						
2	Month	Sales - Region1	Sales - Region2	Sales - Region3	Totals	
3	Jan	\$ 22,876.00	\$ 13,956.00	\$ 6,545.00	\$ 43,377.00	
4	Feb	\$ 32,222.00	\$ 3,412.00	\$ 5,546.00	\$ 41,180.00	
5	Mar	\$ 14,321.00	\$ 11,233.00	\$ 7,786.00	\$ 33,340.00	
6	Apr	\$ 13,423.00	\$ 23,421.00	\$ 4,443.00	\$ 41,287.00	
7	May	\$ 15,532.00	\$ 11,233.00	\$ 8,999.00	\$ 35,764.00	
8	Jun	\$ 19,087.00	\$ 22,111.00	\$ 10,232.00	\$ 51,430.00	
9						
10	Total	\$ 117,461.00	\$ 85,366.00	\$ 43,551.00	\$246,378.00	
11						
12	Average	\$ 19,576.83	\$ 14,227.67	\$ 7,258.50	\$ 41,063.00	
13	St. Dev.	\$ 7,111.66	\$ 7,505.37	\$ 2,168.78	\$ 6,334.31	
14						
15	Adjusted	\$ 110,413.34	\$ 81,097.70	\$ 42,026.72		
16	Sales					
17						
18	High Commission Rate		6%			
19	Normal Commission Rate		5%			
20	Low Commission Rate		3.50%			
21						

4. Completing the worksheet calculations.

To complete the worksheet calculations, we need to supply a formula for cell E15 to compute the grand total of adjusted sales. We do this by adding the three regional total adjusted sales. We employ the SUM function as shown below.

Example1						
	A	B	C	D	E	
1						
2	Month	Sales - Region1	Sales - Region2	Sales - Region3	Totals	
3	Jan	\$ 22,876.00	\$ 13,956.00	\$ 6,545.00	\$ 43,377.00	
4	Feb	\$ 32,222.00	\$ 3,412.00	\$ 5,546.00	\$ 41,180.00	
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7	May	\$ 15,532.00	\$ 11,233.00	\$ 8,999.00	\$ 35,764.00	
8	Jun	\$ 19,087.00	\$ 22,111.00	\$ 10,232.00	\$ 51,430.00	
9						
10	Total	\$ 117,461.00	\$ 85,366.00	\$ 43,551.00	\$246,378.00	
11						
12	Average	\$ 19,576.83	\$ 14,227.67	\$ 7,258.50	\$ 41,063.00	
13	St. Dev.	\$ 7,111.66	\$ 7,505.37	\$ 2,168.78	\$ 6,334.31	
14						
15	Adjusted	\$ 110,413.34	\$ 81,097.70	\$ 42,026.72	=SUM(B15:D15)	
16	Sales					
17						

