

**tip****Eliminating divide by zero errors with the IF function**

I'm often asked how it is possible to avoid the unsightly divide by zero errors in worksheets:

**#DIV/0!**

The IF function provides an easy solution. By testing the divisor for a zero value, the error can be eliminated.

Here's an example:

You wish to divide A1 by B1 but the formula:

**=A1/B1**

... gives divide by zero errors when B1=0.

Replace the formula with:

**=IF(B1=0,0,A1/B1)**

This time no attempt is made to divide by zero when B1=0 eliminating divide by zero errors.

You could also use the IF function to provide a custom error message like this:

**=IF(B1=0,"Divide by Zero Error",A1/B1)**

This technique is very useful when you only want to test for a divide by zero error.

Later in this session (in *Lesson 3-23: Use an IFERROR function to suppress error messages*) you'll learn a different technique to suppress all types of error messages, including divide by zero errors.

## Lesson 3-5: Use the IF logic function

The IF function is one of Excel's most widely used and useful functions. It is also a function that often confuses my students, so I'll begin this lesson by explaining the concept of the logical test. Later, you'll construct a worksheet containing three examples of the IF function at work.

The IF function requires a *logical test* and then performs one action if the test returns TRUE and a different action if the test returns FALSE.

Here are some examples of logical tests:

Expression	Returns	Why?
<b>6=2</b>	False	Because six does not equal two.
<b>100&lt;90</b>	False	Because 100 is not less than 90.
<b>6+2 = 4+4</b>	True	Because eight does equal eight.

In this lesson, you'll use three different logical tests in order to calculate several employees' earnings during a week.

### 1 Open *Earnings Summary-1* from your sample files folder.

Notice the *Payroll Rules* section:

	A	B	C	D	E	F	
3	<b>Payroll Rules:</b>						
4	<i>All hours up to 35 hours per week paid at hourly rate</i>						
5	<i>All hours over 35 hours per week paid at time and a half (150% of hourly rate)</i>						
6	<i>Bonus of 5% paid on all sales above target</i>						

Logical tests will be constructed to calculate *Standard Pay*, *Overtime Pay* and *Bonus*:

	A	B	C	D	E	F	G	H	I
8	<b>Name</b>	<b>Sales</b>	<b>Target</b>	<b>Hourly Rate</b>	<b>Hours Worked</b>	<b>Standard Pay</b>	<b>Overtime Pay</b>	<b>Bonus</b>	<b>Total</b>
9	Brad Cruise	22,000	10,000	15.00	40				

In the case of *Standard Pay*, the logical test will be:

"Did this employee work more than 35 hours this week?"

The formula for the logical test is: **E9<=35** (Cell E9 is less than or equal to 35).

If this returns **TRUE**, then standard pay will be:

**Hours Worked \* Hourly Rate**, (E9\*D9)

...because the employee worked for 35 hours or less.

If this returns **FALSE**, then standard pay will be:

**35\*Hourly Rate** (35\*D9)

... because the employee worked more than 35 hours.

**Earnings  
Summary-1**

**tip**

**Avoid nesting IF functions**

My students often bring their own workbooks to my courses in order to find a solution to their real-world problems.

Some hideously complex and completely unfathomable workbooks turn up at my courses!

A common theme to many of these difficult-to-use workbooks is the use of nested IF functions.

Here's an example of a two-level nested IF function:

`=IF(A31="Apples",10%,IF(A31="Lemons",20%,0))`

This would return 10% if the value in A31 was *Apples*, 20% if the value was *Lemons* and zero if the value was anything else. Note that the words *Apples* and *Lemons* are enclosed in quotation marks. You must refer to text in this way within Excel formulas.

Whenever I see nested IF functions, I know that there's almost surely a better, less complex, and more understandable solution. In the above example, a VLOOKUP would provide a better solution (VLOOKUP functions will be covered in: *Lesson 3-22: Use a VLOOKUP function for an exact lookup*).

Excel 2013 allows you to nest IF functions up to 64 levels deep (which is 63 too many).

**2 Use an IF function to calculate standard pay.**

1. Click in cell F9.
2. Click: Formulas→Logical→IF.

The *Function Arguments* dialog appears.

3. Complete the dialog as follows:

Logical_test	E9<=35	=	FALSE
Value_if_true	E9*D9	=	600
Value_if_false	35*D9	=	525

If you do not completely understand why the above formulas are used, read the introduction to this lesson again.

4. Click the OK button.

*Standard Pay* is correctly displayed in cell F9 (525.00).

**3 Use an IF function to calculate overtime pay.**

It should now be clear to you why the correct arguments for the IF function, this time, are:

Logical_test	E9<=35	=	FALSE
Value_if_true	0	=	0
Value_if_false	(E9-35)*D9*1.5	=	112.5

**4 Use the IF function to calculate bonus.**

Once again, it should be clear to you why the correct arguments for the IF function this time are:

Logical_test	B9>C9	=	TRUE
Value_if_true	(B9-C9)*5%	=	600
Value_if_false	0	=	0

**5 Add a formula to cell I9 to calculate total pay.**

The correct formula could be either of the following:

`=F9+G9+H9`  
`=SUM(F9:H9)`

**6 AutoFill the formulas in cells F9:I9 to cells F10:I17.**

The payroll worksheet is now complete.

	A	B	C	D	E	F	G	H	I
8	<b>Name</b>	<b>Sales</b>	<b>Target</b>	<b>Hourly Rate</b>	<b>Hours Worked</b>	<b>Standard Pay</b>	<b>Overtime Pay</b>	<b>Bonus</b>	<b>Total</b>
9	Brad Cruise	22,000	10,000	15.00	40	525.00	112.50	600.00	1,237.50
10	Ian Dean	9,000	8,000	13.00	35	455.00	-	50.00	505.00
11	Paris Smith	10,000	12,000	15.00	42	525.00	157.50	-	682.50

**7 Save your work as *Earnings Summary-2*.**