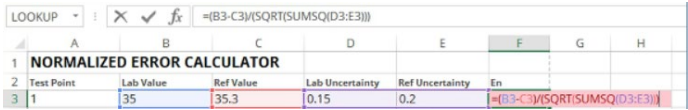


Common Excel Functions in Metrology (All functions must be validated for your version of Excel.)

Function	Description	Example	Where in Metrology
+	Add	=A1+B1	
-	Subtract	=A1-B1	
*	Multiply	=A1*B1	
/	Divide	=A1/B1	
^	Raises a number to an exponential power	=A1^2	
=SUM(...)	Returns the arithmetic sum of a set of data	=SUM(A1:A10)	
= ROUND	Rounds number to “n” significant digits (up, down or fixed)	=ROUND(number1,(num_digits-1-INT(LOG10(ABS(number2)))+3)) =ROUNDUP(number1,(num_digits-1-INT(LOG10(ABS(number2)))+3)) =ROUNDDOWN(number1,(num_digits -1-INT(LOG10(ABS(number2)))+3)) =FIXED(number1,(num_digits -1-INT(LOG10(ABS(number2)))+3))	Rounding to two significant digits in reporting (GLP9)
=CONVERT	Converting from one unit to another	=CONVERT (number, from_unit, to_unit)	Converting units
=AVERAGE(...)	Returns the mean or average of a set of data	=AVERAGE(A1:A10)	$\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$
=STDEV(...)	Returns the standard deviation of a set of data	=STDEV(A1:A10)	$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{(n - 1)}}$
=SQRT(...) =SQRT(3)	Returns the square root of a number Returns the $\sqrt{3}$	=SQRT(A1) =SQRT(3)	Rectangular Distribution
=SUMSQ(...)	Returns the sum of the squares of a set of data	=SUMSQ(A1:A10)	Uncertainty Calculations
RSS	Returns the square root of the sum of the squares of a set of data	=SQRT(SUMSQ(A1:A10))	$RSS = \sqrt{(a^2 + b^2 + \dots + n^2)}$
Expanded Uncertainty	Returns the expanded uncertainty of a set of uncertainty contributors (u) all at the equivalent of one standard deviation	=k*SQRT(SUMSQ(A1:A10))	$U = k_{=2 \text{ or } 3} x u_c$

=COUNT(...)	Counts the cells, within the specified range, that contains numbers COUNTA(...) will return a count for cells with text.	=COUNT(A1:A10)	Counting to find Degrees of Freedom =COUNT(A1:10)-1
=TINV(...) (And other t functions)	Returns the two-tailed inverse of the statistical t-distribution Syntax: TINV(probability,deg_freedom) (T.INV is a one-tailed t-test)	=TINV(1-0.9545,9) =TINV(0.9973,X) Matches Table 9.3, column 99.73 % ----- =T.INV.2T (0.0027,X) Matches Table 9.3, column 99.73 % =T.INV.2T (0.05,X) Matches Table 9.3, column for 95 %	$t = \frac{\bar{x}_{old} - \bar{x}_{new}}{\sqrt{\frac{s_{old}^2}{n} + \frac{s_{new}^2}{n}}} \quad ($
=FINV(...) (And other F functions)	Calculates the inverse of the F probability distribution Syntax: FINV(probability,deg_freedom1,deg_freedom2)	=FINV(1-0.95,9,29) ----- =F.INV.RT(0.025,d.f. 1,d.f. 2) Matches Table 9.4 (one-tailed test) =F.INV(0.95,d.f. 1,d.f. 2) Matches table 9.12 at 0.05	$F = \frac{s_{large}^2}{s_{small}^2} \quad ($ $F = \frac{s_{observed}^2}{s_{accepted}^2}$
E _n	Normalized Error: Evaluates the bias of the lab value from the reference value relative to the combined uncertainties		$E_n = \frac{(x_{lab} - \mu_{ref})}{\sqrt{(U_{95\%}^2 + U_{95\%}^2)}}$
P _n	Normalized Precision Error: Evaluates whether the uncertainty of the lab value is less than 1/3 the applicable tolerance.		$P_n = \frac{Unc_{Lab}}{\frac{1}{3}Tolerance}$ -or- $P_n = \frac{Unc_{Lab}}{Tolerance}$

Common Excel Errors

Error	Problem	Fix
#####	The column is not wide enough to display all the characters in a cell.	Extend the width of the column.
# Div/0!	Excel displays this error when a number is divided either by zero (0) or an empty cell	Change the divider to a value that is not equal to 0.
#Name?	The text in a formula is not recognized by Excel. This is caused by misspelling the function names.	Correct the error by entering correct formula name
#Value!	This error will be displayed if the formula includes cells that contain different data types - when it finds spaces, characters, or text in a formula where it is expecting a number.	Replace incorrect data type with a consistent value and the error will be corrected.
#REF!	The error will be displayed when a cell reference is not valid. Deleting cells that were referred by other formulas will cause this error.	Refer the cells to the correct ranges and the error will be corrected.
#NUM!	The formula or function contains invalid numeric values	Using \$,% symbols with the number can result in this error, so avoid using these
#NULL	Excel displays this error when you specify an intersection of two areas that do not intersect (cross). The intersection operator is a space character that separates references in a formula.	Ensure the intersections entered cross
#N/A	this typically means that the numbers you are referring to in your formula cannot be found. You may have accidentally deleted a number or row that's being used in your formula, or are referring to a sheet that was deleted or not saved.	Triple check all your formulas and be sure to look closely at which sheets or rows may have been deleted or incorrectly referenced. If you have a few formulas linked together, check to see that everything in every formula has a value.

Excel has several error-handling functions:

- ISNA() evaluates #N/A errors.
- ISERR() evaluates all error types except for #N/A.
- ISERROR() evaluates all errors.
- ERROR.TYPE() returns an integer value that represents the error by type.
- IFERROR() evaluates the error and allows you to return alternate content.

Important VBA Terms

Term	Definition	Use	Example
Module			
Sub	Subroutine	A block of code that performs a specific task but does not return a value	<pre>Sub MyMacro() ' Insert Code Here End Sub</pre> This defines a simple macro named MyMacro
Dim	Dimension	Used to declare variables. Declare means we are telling VBA about a function we will use later.	<pre>Sub MyMacro() ' Insert Code Here Dim x As Integer End Sub</pre> This creates a variable x that will hold an integer
Function	Function	Similar to Sub, but returns a value	<pre>Sub MyMacro() ' Insert Code Here Function AddNumbers(x As Integer, y As Integer) As Integer AddNumbers = x + y End Function</pre> This creates a function that adds two numbers and returns a result
End	End	Used to end a block of code	Ends the Sub, Function or Loop (see examples above)

If...Then...Else	Conditional Logic	Checks if a condition is true and executes code based on that	<pre> Sub MyMacro() ' Insert Code Here If x > 10 Then MsgBox "Greater than 10" Else MsgBox "Less than or equal to 10" End If </pre> This creates a message box who's message has conditions to what it will say.
For...Next	Loop	A loop that runs code under a specific number of items	<pre> Sub MyMacro() ' Insert Code Here For i = 1 To 5 MsgBox "Loop " & i Next i </pre> Initializes a variable "i" and makes it go from 1 to 5. The message box will display a pop up message with the text "Loop x" (whatever number it is on). After each iteration, the loop increases i by one. Next signals the end of the loop and moves to the next value of i. Result: You will see 5 message boxes: Loop 1, Loop 2, Loop 3, Loop 4, Loop 5
Do...Loop	Loop	A loop that runs while a condition is true or until a condition becomes true	<pre> Sub MyMacro() ' Insert Code Here Do While x < 10 x = x + 1 Loop </pre> This loop will run as long as x is less than 10. Each time the loop runs, x increases by 1. Loop marks the end of the loop, and the program goes back to check the condition. Result: If x starts at 0, then the loop will execute 10 times, increasing x from 0 to 9. Once x reaches 10, the condition x < 10 is no longer true, and the loop stops.
Set	Set	Used to assign an object reference to a variable	<pre> Sub MyMacro() ' Insert Code Here Set objSheet = ThisWorkbook.Sheets("Sheet1") </pre> Refers to Sheet1 in your workbook and applies whatever next string of code to it.

			<pre>Sub MyMacro() ' Insert Code Here Set objSheet = ThisWorkbook.Sheets("Sheet1") objSheet.Range("A1").Value = "Hey There" End Sub</pre> Cell A1 on Sheet 1 will display Hey There when this macro is ran.
Array	Array	A data structure that holds multiple values; good for handling lists of data	<pre>Sub MyMacro() ' Insert Code Here Dim numbers(5) As Integer numbers(0) = 10 numbers(1) = 20 EndSub</pre> Declares an array that can hold 6 integers (from numbers 0 to 5. Assigns the value 10 to the first element and 20 to the second element.
MsgBox	Message Box	A built-in function that displays a message box	<pre>Sub MyMacro() ' Insert Code Here MsgBox "Hello, friends!" End Sub</pre> Pops up a message box with your custom message
ActiveSheet	Active Sheet	Refers to the currently active sheet in Excel (otherwise must specify and select)	<pre>Sub MyMacro() ' Insert Code Here With ActiveSheet .Range("A1").Value = "Hello" .Range("A2").Value = "Friends" End With</pre> In Cell A1 an A2 of whatever sheet is active will have Hello Friends displayed
Application	Application	Refers to the Excel application itself	<pre>Sub MyMacro() ' Insert Code Here Application.ActiveWorkbook.Save</pre>

InputBox	Input Box	A function that prompts the user to enter a value	<pre>Sub MyMacro() ' Insert Code Here Dim userInput As String userInput = InputBox("Enter your name") End Sub</pre>
Creates a pop up message box requesting user input			