

Using Excel to Execute Trigonometric Functions

In this activity, you will learn how Microsoft Excel can compute the basic trigonometric functions (sine, cosine, and tangent) using both radians and degrees.

1. Open Microsoft Excel if it's not already running.
A new, blank Excel spreadsheet appears.
2. You will begin with finding the trigonometric values of degrees. Start in cell A1 and type "Degrees" and press **Enter** on your keyboard (or click on A2 with your mouse).

	A
1	Degrees

*What you've typed in A1 is called a **Label**. Labels are text entries. They do not have a value associated with them. They are typically used to identify what we are talking about.*

3. Type the constants in correspondence to degrees. After each constant, press **Enter** to move to the cell below the previous. The degrees used will be the most common degrees used in basic trigonometry. Type 0, 30, 45, 60, 90, and 180, respectively, in cells A2, A3, A4, A5, A6, and A7.

	A
1	Degrees
2	0
3	30
4	45
5	60
6	90
7	180

***Constants** are entries that have a specific fixed value.*

4. Click on cell B1.
5. Type a label that reads SIN(DEG) indicating that the column related to the label will signify that previously-typed constants are being used as degrees and plugged in to the sine function to get your upcoming values.

	A	B
1	Degrees	SIN(DEG)

6. Press the tab key on your keyboard or click the cell C1.

7. Type COS(DEG) with regards to the cosine function and press the tab key or click D1.

B	C
SIN(DEG)	COS(DEG)

8. Type TAN(DEG) in cell D1 with regards to the tangent function.

C	D
COS(DEG)	TAN(DEG)

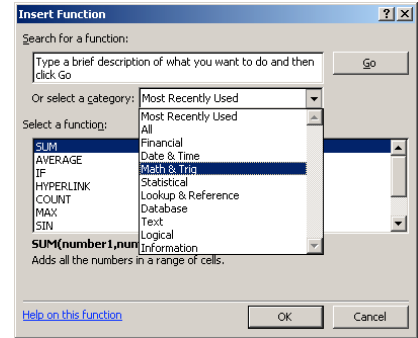
9. Click on cell B2.

10. In the formula bar at the top of Excel and click on the f_x button.

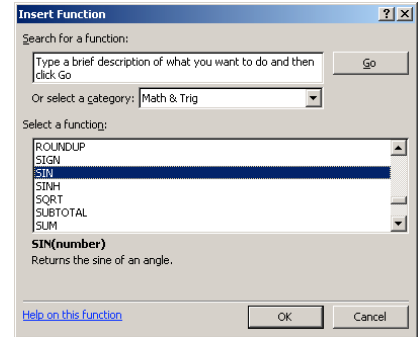


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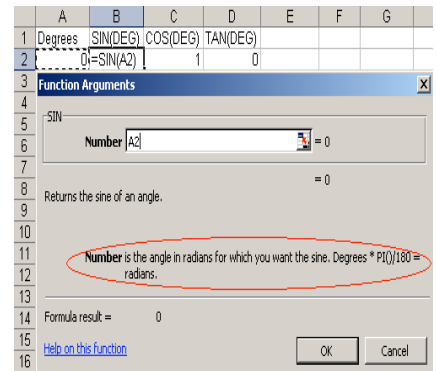
11. In the Select a Category drop-down menu, click “Math & Trig.”



12. Scroll down in the “Select a Function” menu, highlight **SIN** and click OK.



13. A “Function Arguments” pop-up box will appear asking for the number to be plugged into the sine function.



14. Still with the pop-up open, click *outside* the box onto cell A2 on the spreadsheet. Cell A2 should now have a dotted box around it and “A2” should appear next to “Number” in the pop-up box.

15. Before pressing OK, carefully read the note in the middle of the pop-up box. The note reads “**Number** is the angle in *radians* for which you want the sine. Degrees * PI()/180 = radians.” Since we are currently using degrees, you will have to type *PI()/180 next to A2 in the **Number** bar. Now, click OK.

Explain why this needs to be done to show the degree:

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16. Since doing this for every cell in the sine column would be tedious, Excel has made it so we can click the bottom right hand corner of cell B2 (you will know if you are correctly executing this property because your mouse icon will turn into a small black cross) and dragging it down to B6.

	A	B
1	Degrees	SIN(DEG)
2	0	0
3	30	0.5
4	45	0.707107
5	60	0.866025
6	90	1
7	180	1.23E-16

17. Mimicking the steps already given, now complete the table for the values of the cosine and tangent functions with respect to degrees and record your results below.

Degrees	COS(DEG)	TAN(DEG)
0		
30		
45		
60		
90		
180		

18. Once your table is completed, we will move on to radians.

19. In cell A7, type the label “Radians.”

7 Radians

20. In cells B7, C7, and D7 type the labels SIN(RAD), COS(RAD), and TAN(RAD), respectively.

SIN(RAD) COS(RAD) TAN(RAD)

21. We need to use the same constants as before to verify that Excel is giving the same results for radians as it is for degrees. However, we know that 30 degrees is not equivalent to 30 radians. Given the (already known) formula: $\text{radians} = \text{degrees} \times \left(\frac{\pi}{180}\right)$, find the radian values and enter them for 30, 45, 90, and 180 degrees in cells A8, A9, A10, A11 and A12, respectively. Record your conversions in the table on the next page.

Note: Exact values should be used; No approximations. For example, $\frac{\pi}{4}$ is entered in the Excel function bar as “=PI()/4” and for Excel to recognize the value, the equal sign must be present.

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<u>Degree</u>	<u>Radian</u>
0	
30	
45	
60	
90	
180	

22. Loosely mimic the previous steps to find the sine, cosine, and tangent functions to find the values of radians. Since the values you are currently using are in radians, you no longer have to multiply the constant by $\text{PI}()/180$. So, starting with the sine function on cell B8, start by following step 10 and press OK directly after step 15.

Note: Excel will approximate your exact entries to decimals, but the exact value remains in the function bar.

8	Radians	SIN(RAD)
9	0	0
10	0.523599	0.5
11	0.785398	0.707107
12	1.047198	0.866025
13	1.570796	1
14	3.141593	1.23E-16

23. Fill out the table below with your results.

Radians	SIN(RAD)	COS(RAD)	TAN(RAD)
0			
$\frac{\pi}{6}$			
$\frac{\pi}{4}$			
$\frac{\pi}{3}$			
$\frac{\pi}{2}$			
π			

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Do these radian results match the degree values from before?

YES

NO

If your conversions were correct, the tables should match! This proves that you are able to convert degrees to radians and that Microsoft Excel can give values for both.

Finally, carefully explore both Excel-given values for $\tan\left(\frac{\pi}{2}\right)$ and explain your conjectures below:
