

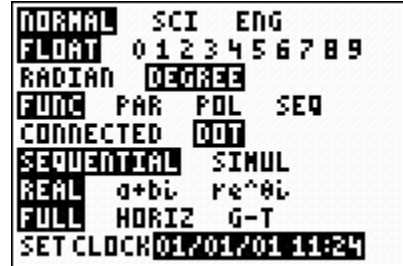
ALGEBRA II ACTIVITY 13: SOLVING TRIGONOMETRIC EQUATIONS

Tlalgebra.com

ACTIVITY OVERVIEW:

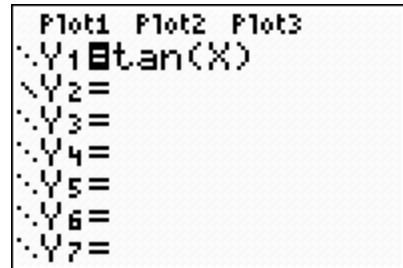
In this activity we will

- Find a missing angle measure in a right triangle by solving trig equations with a graph and table
- Find a point of intersection between two graphs using a CALC feature
- Use the inverse sine command

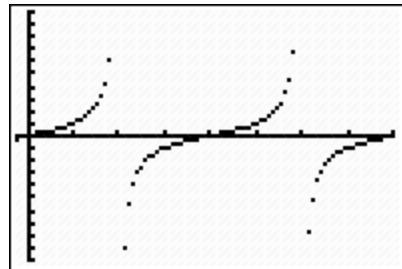


Press **[MODE]**. Set the Mode to Degree and Dot as shown above.

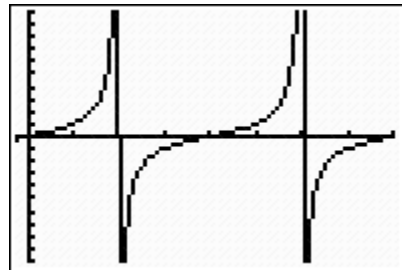
In this activity you will work a problem using the sine ratio, but if you do a series of right triangle problems, you may use tangent. To see how the Dot mode affects the graph of tangent, examine the next three screen shots.



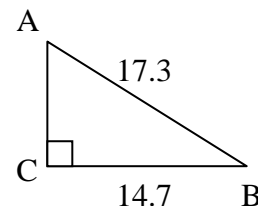
Here is how the graph appears on Dot mode.



Here is how the graph appears in Connected mode.



Consider the right triangle ABC with hypotenuse 17.3 units and one leg 14.7 units. Use the sine ratio to determine the measure of angle A.



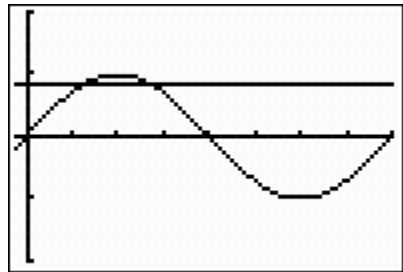
Press $\boxed{Y=}$. Enter the equation $y = \sin(x)$ in **Y1** and the ratio of leg opposite to hypotenuse in **Y2**. This will allow you to examine the table and the graph to determine what value of x (what degree measure) satisfies both.

```
Plot1 Plot2 Plot3
Y1=sin(X)
Y2=14.7/17.3
Y3=
Y4=
Y5=
Y6=
Y7=
```

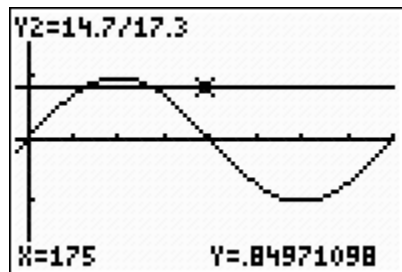
Press \boxed{WINDOW} . Set the window as shown. The **Xmin** and **Xmax** reflect that the period for the sine function is 360 degrees. The function is never below -1 or above 1, so set **Ymin** and **Ymax** accordingly.

```
WINDOW
Xmin=-10
Xmax=360
Xscl=45
Ymin=-2
Ymax=2
Yscl=1
Xres=1
```

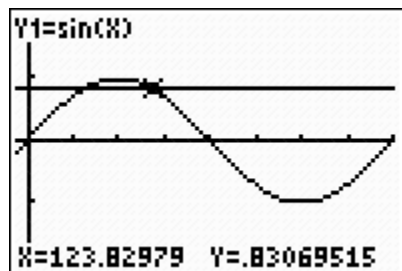
Press \boxed{GRAPH} . What do you notice about the two graphs? How many x -values satisfy both equations? What does this mean about angle A ?



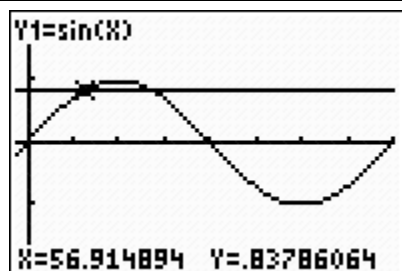
Press \boxed{TRACE} . Press $\boxed{\blacktriangle}$ to trace on Y2. This allows you to see that the ratio $14.7/17.3$ is about 0.8497.



Press $\boxed{\blacktriangledown}$ to trace on Y1. Move to one of the intersection points. It appears to be about 124 degrees. What does this tell about angle A ?



Move to the other intersection point. It appears to be about 57 degrees. What does this tell about angle A ? Which measure, 124 degrees or 57 degrees, is going to be the measurement of angle A ? Why?



To get a more exact estimate, examine the table in smaller increments. Press $\boxed{2\text{nd}}\boxed{\text{WINDOW}}$ and set the **TblStart** and **ΔTbl** (change in table) as shown. This will “zoom in” on the area surrounding the estimated point of intersection.

```
TABLE SETUP
TblStart=56
 $\Delta\text{Tbl}=.1$ 
IndPnt:  $\boxed{\text{Auto}}$  Ask
Depend:  $\boxed{\text{Auto}}$  Ask
```

At what x-coordinate do the two functions seem to be the closest in y-value?

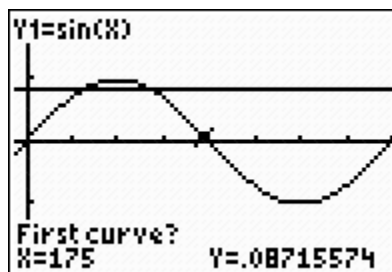
X	Y ₁	Y ₂
57.7	.84526	.84971
57.8	.84619	.84971
57.9	.84712	.84971
58	.84805	.84971
58.1	.84897	.84971
58.2	.84989	.84971
58.3	.85081	.84971

X=58.2

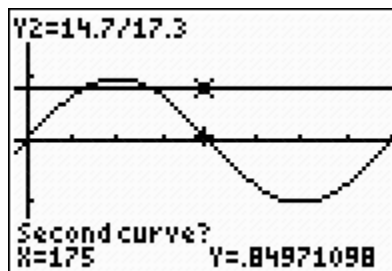
To calculate the exactly intersection, press $\boxed{\text{GRAPH}}$. Press $\boxed{2\text{nd}}\boxed{\text{TRACE}}$ to access the CALCULATE menu. Select **5: intersect**.

```
5:intersect
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7: $\int f(x)dx$ 
```

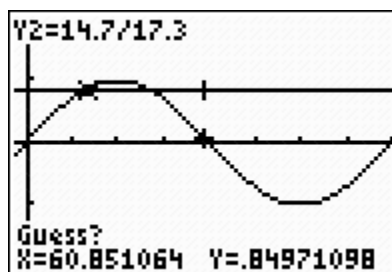
The query “First curve?” will appear on the screen, asking you to identify one of the two functions you want to find the intersection of. Press $\boxed{\text{ENTER}}$.



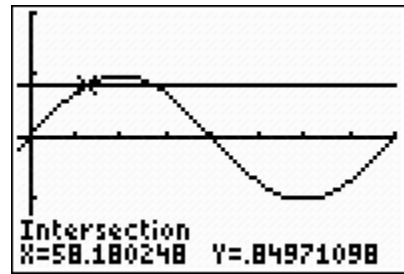
The query “Second curve?” will appear on the screen, and the cursor will have hopped to the other function, asking you to identify the other of the two functions you want to find the intersection of. Press $\boxed{\text{ENTER}}$. [*NOTE: if there was more than two curves graphed, this feature allows you to find the intersection of any two.]



The query “Guess?” will appear on the screen, asking you to move close to the intersection that you want calculated. In this instance there are two, but only one satisfies the question about the measure of angle A. Move close to it and press $\boxed{\text{ENTER}}$.



The point of intersection will be provided.



Another method for solving this problem would be to return to the home screen by pressing $\boxed{2\text{nd}}\boxed{\text{MODE}}$. Press $\boxed{2\text{nd}}\boxed{\text{SIN}}$ to access the inverse sine command. Enter the ratio 14.7/17.3 and press $\boxed{\text{ENTER}}$.

Explore using these methods with other right triangle problems.

$$\sin^{-1}(14.7/17.3)$$
$$58.18024817$$