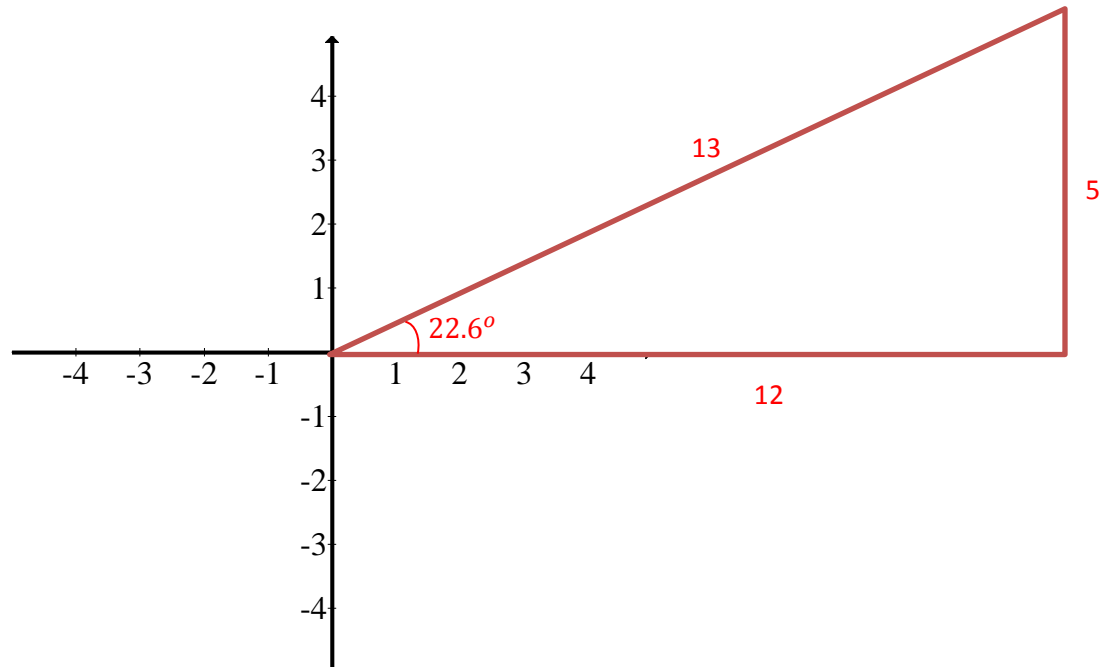


Name Solutions \_\_\_\_\_ Trigonometry Quiz 3

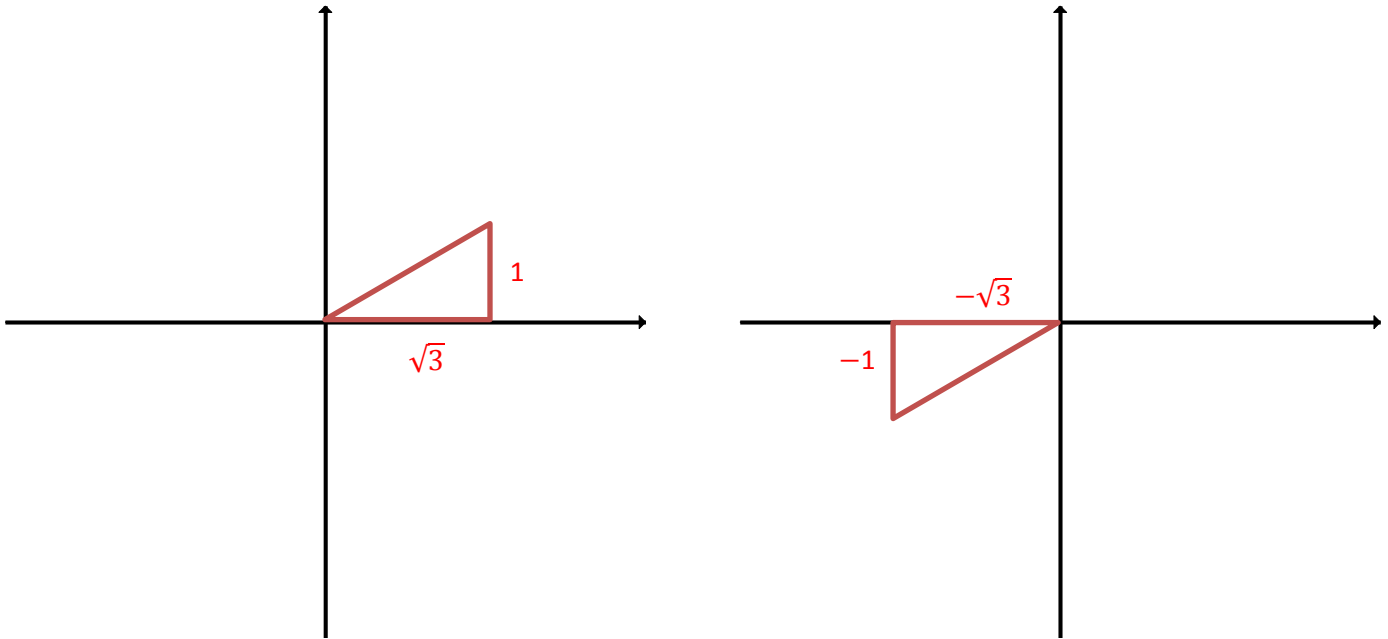
1) On the axis below illustrate the fact that  $\sin(22.6^\circ) = \frac{5}{13}$  and  $\cos(22.6^\circ) = \frac{12}{13}$ .



2) Solve for  $\theta$  in the equation  $\tan(\theta) = \frac{1}{\sqrt{3}}$ .

Answers:  $30^\circ$  and  $210^\circ$

First note that  $\frac{1}{\sqrt{3}} = \frac{-1}{-\sqrt{3}}$ , so that the angle could be in either the first or fourth quadrant. We use a "1 - 2 -  $\sqrt{3}$ " triangle in both cases as shown below:



On the left we see that  $\theta = 30^\circ$  is a solution. On the right we see that  $\theta = 180^\circ + 30^\circ = 210^\circ$  is a solution.

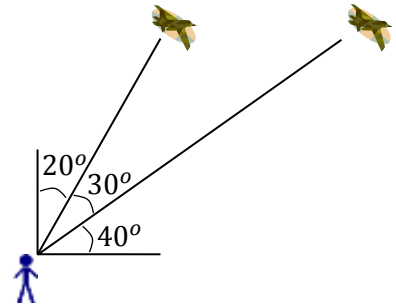
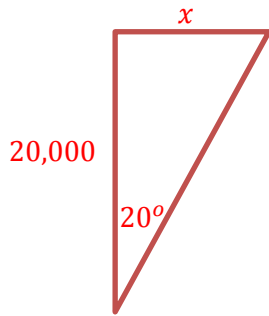
All other solutions are coterminal to one of these.

3) An observer sees two planes in the sky at different angles as shown below. He knows that the planes are both flying at an elevation of 20,000 feet. How far apart are the planes?

Answer: 16555 feet

There are two ways to draw the triangles. On this page is one solution, on the next page is the other solution. Both come out to the same answer.

First let's find the horizontal distance to the first plane using the triangle below.

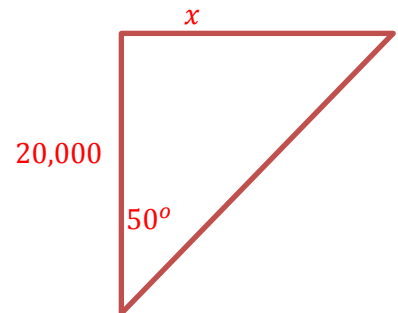


Here we solve for  $x$  by setting up an equation using tangent:

$$\begin{aligned} \tan(20^\circ) &= \frac{x}{20000} \\ 0.3639 &= \frac{x}{20000} \\ x &= 7279.4 \end{aligned}$$

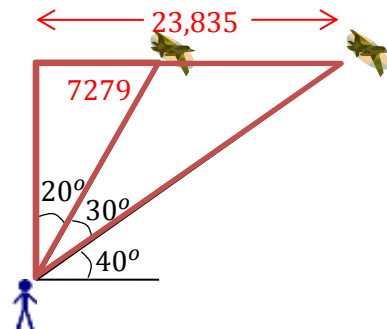
Now we do the same thing for the second plane:

$$\begin{aligned} \tan(50^\circ) &= \frac{x}{20000} \\ 1.1917 &= \frac{x}{20000} \\ x &= 23835.1 \end{aligned}$$

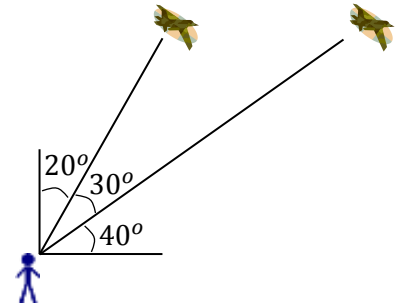
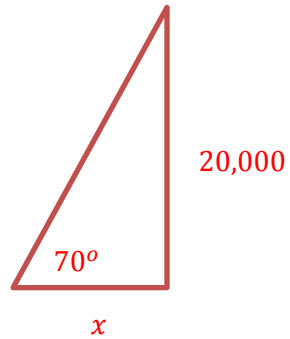


Now we put these two together to find that the distance between the planes is:

$$23835.1 - 7279.4 = 16555.7$$



First let's find the horizontal distance to the first plane using the triangle below.

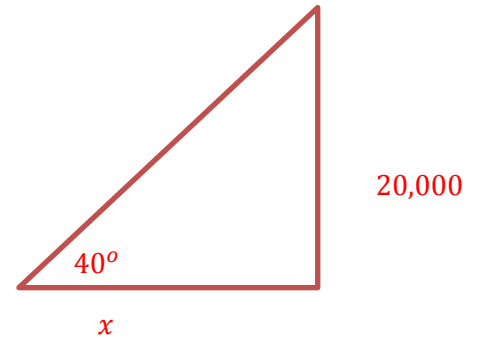


Here we solve for  $x$  by setting up an equation using tangent:

$$\begin{aligned}\tan(70^\circ) &= \frac{20000}{x} \\ 2.74 &= \frac{20000}{x} \\ 2.74x &= 20000 \\ x &= 7279.4\end{aligned}$$

Now we do the same thing for the second plane:

$$\begin{aligned}\tan(40^\circ) &= \frac{20000}{x} \\ 0.839 &= \frac{20000}{x} \\ 0.839x &= 20000 \\ x &= 23835.1\end{aligned}$$



Now we put these two together to find that the distance between the planes is:

$$23835.1 - 7279.4 = 16555.7$$

