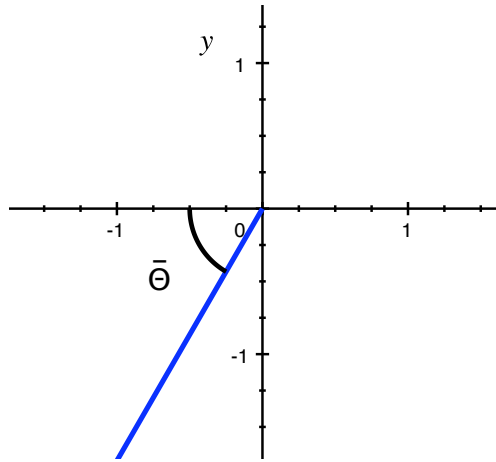


Math 120 Quiz #2 Solutions

1. (a) (2 pts.) Find the reference angle for $\theta = \frac{10\pi}{3}$.



Note that $\theta = \frac{10\pi}{3}$ is in quadrant III since $\theta = \frac{10\pi}{3} = 3\pi + \frac{\pi}{3}$.

So, the reference angle $\bar{\theta} = \frac{10\pi}{3} - 3\pi = \frac{\pi}{3}$.

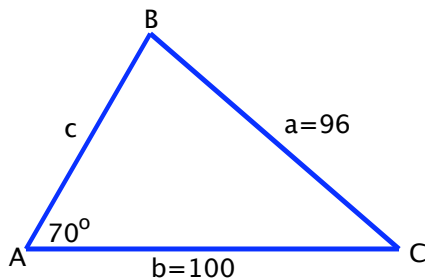
- (b) (2 pts.) Find the **exact** value of $\csc \frac{10\pi}{3}$.

Using the reference angle from part (a), we have that $\sin \frac{10\pi}{3} = -\sin \frac{\pi}{3} = -\frac{\sqrt{3}}{2}$ since sine is negative in quadrant III.

$$\text{So, } \csc \frac{10\pi}{3} = \frac{1}{\sin \frac{10\pi}{3}} = -\frac{2}{\sqrt{3}}.$$

2. (3 pts.) For a triangle with the given conditions, find all possible values **for the angle B** given that $\angle A = 70^\circ$, $b = 100$, and $a = 96$. **Do not solve the triangle.**

Here's a tentative sketch of the triangle.



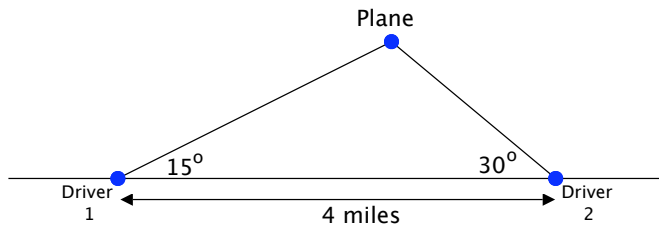
Using the Law of Sines, we have that

$$\frac{\sin 70^\circ}{96} = \frac{\sin B}{100} \quad \Rightarrow \quad \sin B = \frac{100 \sin 70^\circ}{96} \approx 0.9788$$

$$\text{So, } \angle B \approx 78.1941^\circ \quad \text{or} \quad \angle B \approx 180^\circ - 78.1941^\circ = 101.8059^\circ.$$

Both of the angles listed above are possible since the sum of the angles A and B are less than 180° in both cases.

3. Two drivers that are 4 miles apart are looking at an airplane that is flying over a straight highway. The angles of elevation are 15° and 30° as shown in the figure. What is the elevation of the plane? (Hint: How far is either driver 1 or 2 away from the plane?)

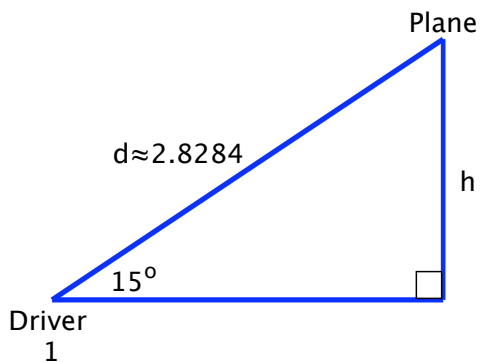


Let d = distance between driver 1 and the plane.
 Note that the third angle of the triangle is 135° .

Using the Law of Sines, we have that

$$\frac{\sin 30^\circ}{d} = \frac{\sin 135^\circ}{4} \Rightarrow d = \frac{4 \sin 30^\circ}{\sin 135^\circ} = 2\sqrt{2} \approx 2.8284 \text{ miles}$$

We have the following right triangle, where h = elevation of the plane.



$$\begin{aligned} \sin 15^\circ &= \frac{h}{d} \Rightarrow h = d \sin 15^\circ \\ &\approx 2.8284 \sin 15^\circ \\ &\approx 0.7321 \text{ miles} \end{aligned}$$

So, the plane is approximately 0.7321 miles above ground.