

Student Name: KEY

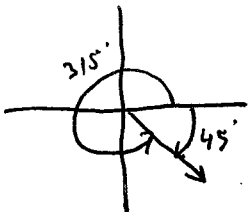
Show all relevant work (use back of pages for scratch paper, if needed). **CIRCLE FINAL ANSWERS.**

1. [35 pts] The first column of the chart below shows angle, θ , measured in radians. In each row convert θ to degrees, then show exact values (write answers as fractions, *not* decimals) of the trigonometric functions. If a value is undefined, write "undef."

θ in radians	θ in degrees	$\sin \theta$	$\cos \theta$	$\tan \theta$	$\csc \theta$	$\sec \theta$	$\cot \theta$
0	0°	0	1	0	undef.	1	undef.
$\frac{\pi}{6}$	30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$	$\frac{2}{\sqrt{3}}$ 2	$\frac{2}{\sqrt{3}}$	$\sqrt{3}$
$\frac{\pi}{4}$	45°	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	$\sqrt{2}$ $\frac{2}{\sqrt{2}}$	$\sqrt{2}$	1
$\frac{\pi}{3}$	60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{2}{\sqrt{3}}$	2	$\frac{1}{\sqrt{3}}$
$\frac{\pi}{2}$	90°	1	0	undef.	1	undef.	0

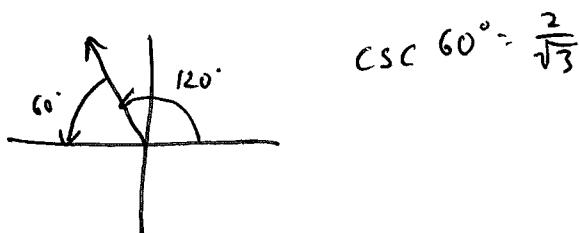
2. [5 pts each] Find the exact (fractions not decimals) value of each part.

(a) $\sin 315^\circ = \boxed{-\frac{\sqrt{2}}{2}}$
 $\sin 45^\circ = \frac{\sqrt{2}}{2}$



(b) $\csc \frac{8\pi}{3} = \csc 480^\circ = \csc 120^\circ = \boxed{\frac{2}{\sqrt{3}}}$

$\left(\frac{8\pi}{3}\right) \left(\frac{180^\circ}{\pi}\right) = 480^\circ$

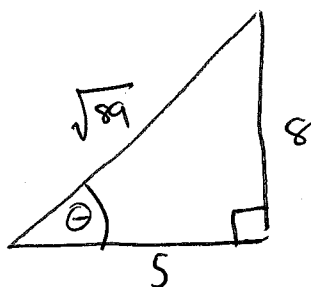


3. [5 pts] Find two different angles that are coterminal with an angle of measure 285° :

$$\begin{array}{l} 285^\circ - 360^\circ = -75^\circ \\ 285^\circ + 360^\circ = 645^\circ \end{array}$$

3. [5 pts] Find the exact value (fractions not decimals) of $\sin(\underbrace{\tan^{-1}(\frac{8}{5})}_{\theta}) =$

$$\frac{8}{\sqrt{89}}$$



$$\begin{aligned} 8^2 + 5^2 &= c^2 \\ 64 + 25 &= c^2 \\ 89 &= c^2 \\ c &= \sqrt{89} \end{aligned}$$

4. [10 pts] Given θ in Quadrant II and the value of $\sin \theta$, find the exact values (fractions not decimals) of the remaining trigonometric functions:

$$\sin \theta = \frac{7}{10}$$

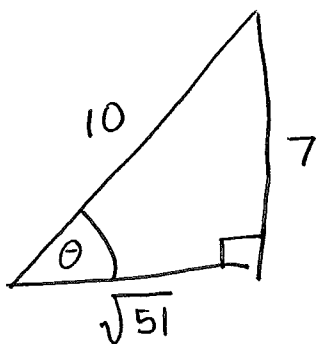
$$\csc \theta = \frac{10}{7}$$

$$\cos \theta = -\frac{\sqrt{51}}{10}$$

$$\sec \theta = -\frac{10}{\sqrt{51}}$$

$$\tan \theta = -\frac{7}{\sqrt{51}}$$

$$\cot \theta = -\frac{\sqrt{51}}{7}$$



$$\begin{aligned} 10^2 &= 7^2 + b^2 \\ 100 &= 49 + b^2 \\ 51 &= b^2 \\ b &= \sqrt{51} \end{aligned}$$

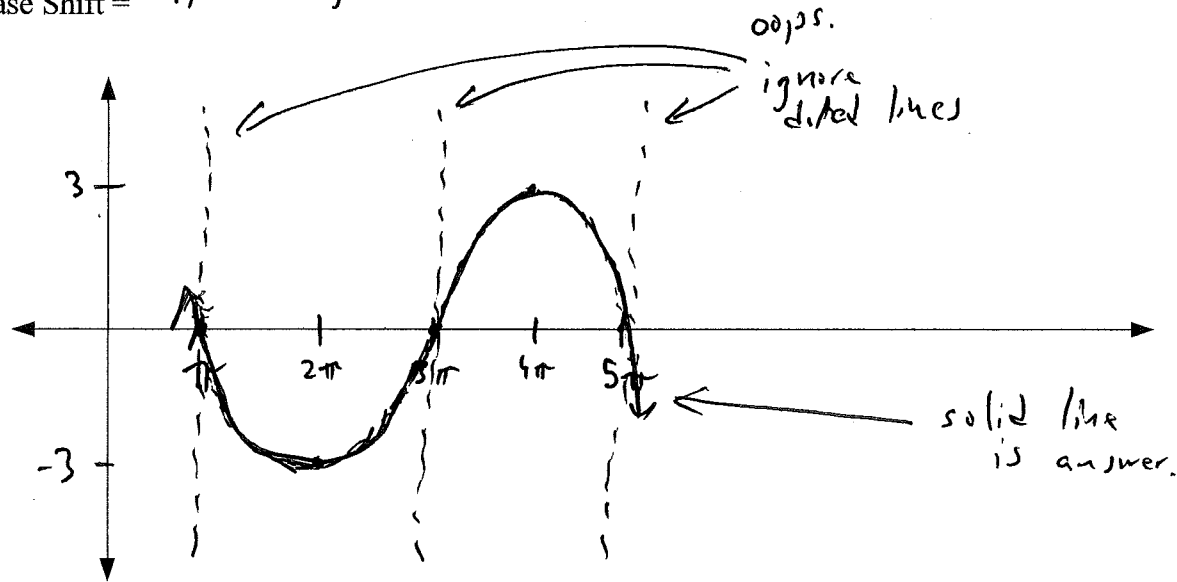
$$-3 \sin \frac{1}{2}(x - \pi)$$

5. [10 pts] Find the period, amplitude, and phase shift of the function $y = -3 \sin \left(\frac{1}{2}x - \frac{\pi}{2} \right)$. Then graph one period and label all relevant points along the axes.

Period = $\frac{2\pi}{\frac{1}{2}} = 4\pi$

Amplitude = $|-3| = 3$

Phase Shift = π to right



7. [10 pts] Given the following information, solve for all possible triangles. If no triangle is possible, write, "Impossible." If, two triangles are possible, circle both sets of values. Express side lengths and angle measurements to one decimal place.

$\angle A = 37.0^\circ$

$a = 30.0$

ASS Law of sines

$\angle B = 64.5^\circ$
 $\angle C = 78.5^\circ$

or

115.5°
 27.5°

$b = 45.0$

$c = 48.8$

23.0

$$\frac{\sin 37^\circ}{30} = \frac{\sin B}{45}$$

$$\sin B = \frac{45 \sin 37^\circ}{30}$$

$$B = \sin^{-1} \left(\frac{45 \sin 37^\circ}{30} \right)$$

$B = 64.5^\circ$

$$\frac{\sin 37^\circ}{30} = \frac{\sin 78.5^\circ}{c}$$

$$c = \frac{30 \sin 78.5^\circ}{\sin 37^\circ}$$

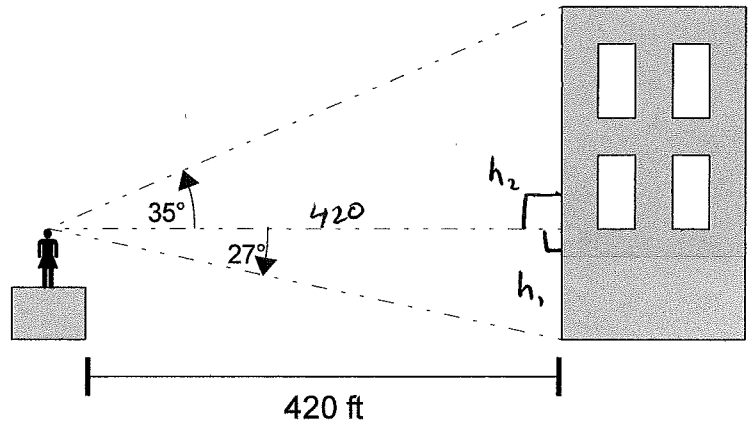
$c = 48.8$

$$\frac{\sin 37^\circ}{30} = \frac{\sin 27.5^\circ}{c}$$

$$c = \frac{30 \sin 27.5^\circ}{\sin 37^\circ}$$

$c = 23.0$

8. [10 pts] A woman stands atop a platform and notes that the angle of elevation to the top on the building is 35° while the angle of depression to the foot of the building is 27° . If she is standing 420 ft from the building, how tall is it?



~~tan 27° =~~

$$\tan 27^\circ = \frac{h_1}{420}$$

$$h_1 = 420 \tan 27^\circ$$

$$h_1 = 214$$

$$\tan 35^\circ = \frac{h_2}{420}$$

$$h_2 = 420 \tan 35^\circ$$

$$h_2 = 294$$

building = $h_1 + h_2$

$$\boxed{508'}$$

9. [10 pts] Two cables tether a blimp to the ground as shown. How high in the air is the blimp?

$$\frac{\sin 25^\circ}{1200} = \frac{\sin 50^\circ}{d}$$

$$d = \frac{1200 \sin 50^\circ}{\sin 25^\circ}$$

$$d = 2175.138689$$

$$\sin 75^\circ = \frac{h}{d}$$

$$\sin 75^\circ = \frac{h}{2175.138689}$$

$$h = 2175.138689 \sin 75^\circ$$

$$\boxed{h = 2101 \text{ ft}}$$

