

Pre-Calculus Test Chapter 4 Part 1

Form A

Show ALL work!!!

- 1 Rewrite the angle measure in radians. Leave answer in terms of π .

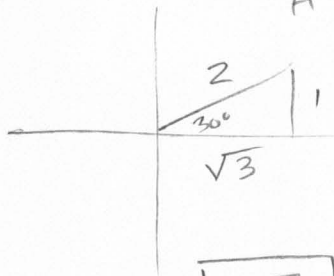
$$150^\circ$$

$$\frac{5}{180} \text{ deg.} \cdot \frac{\pi \text{ rad}}{180 \text{ deg}}$$

$$\boxed{\frac{5\pi}{6}}$$

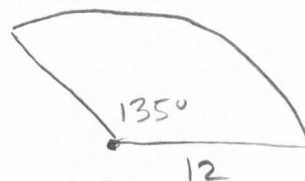
- 2 Find the exact value of $\cos 30^\circ$.

$$\frac{A}{H} = \frac{x}{r}$$



$$\boxed{\frac{\sqrt{3}}{2}}$$

- 3 A water sprinkler sprays water on a lawn over a distance of 12 feet and rotates through an angle of 135° . Find the area of the lawn watered by the sprinkler. Leave answer in terms of π .



$$\theta = 135^\circ \cdot \frac{\pi}{180 \text{ deg}}$$

$$\theta = \frac{3\pi}{4}$$

$$A = \frac{1}{2} r^2 \theta$$

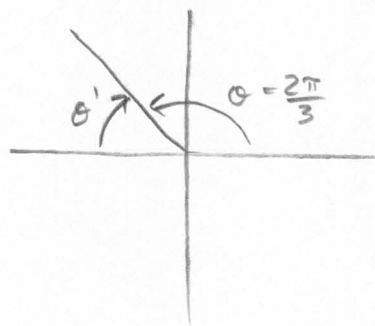
$$= \frac{1}{2} (12)^2 \left(\frac{3\pi}{4} \right)$$

$$= \frac{1}{2} (12^6) \left(\frac{3\pi}{4} \right)$$

$$\boxed{A = 54\pi \text{ ft}^2}$$

- 4 Find the reference angle of θ in radians.

$$\theta = \frac{2\pi}{3}$$



$$\theta' = \pi - \frac{2\pi}{3}$$

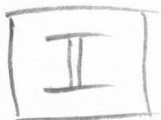
$$= \boxed{\frac{\pi}{3}}$$

- 5 State the quadrant in which θ lies.

$$\sin \theta > 0 \text{ and } \tan \theta < 0$$

$$\frac{O}{H} = \frac{Y}{X} \quad \frac{O}{A} = \frac{Y}{X}$$

In what quadrant is
x negative and y-positive?

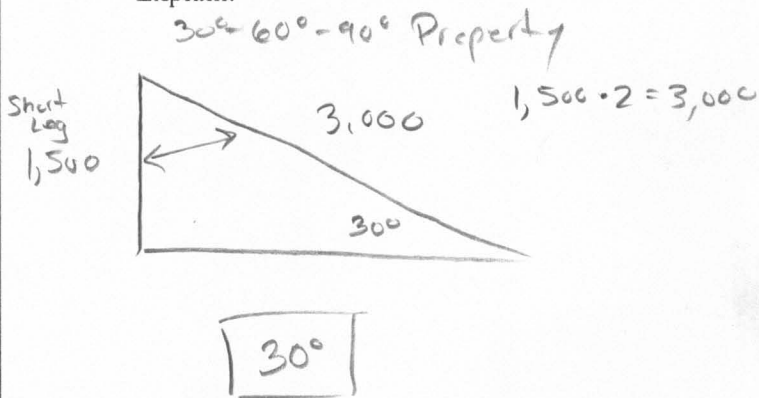


- 6 Use trigonometric identities to transform the left side of the equation into the right side.

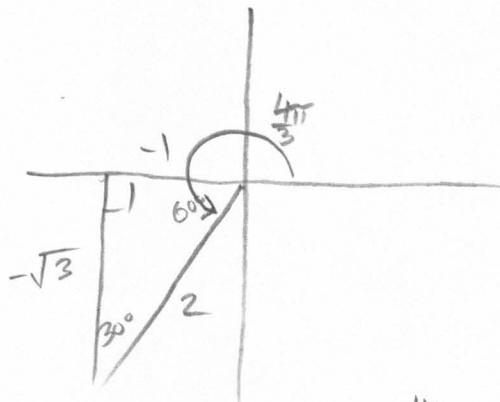
$$\cot \alpha \sin \alpha = \cos \alpha$$

$$\frac{\cancel{\cos \alpha}}{\cancel{\sin \alpha}} \sin \alpha = \cos \alpha \checkmark$$

- 7 **Angle of Elevation** You are skiing down a mountain with a vertical height of 1,500 feet. The distance from the top of the mountain to the base is 3,000 feet. What is the angle of elevation from the base to the top of the mountain in degrees? Explain.



- 8 Find the exact value of $\cos \frac{4\pi}{3}$.



$$\theta' = \frac{4\pi}{3} - \pi$$

$$\cos \frac{4\pi}{3} = \boxed{-\frac{1}{2}} = \frac{\pi}{3} = 60^\circ$$

- 9 Find the exact value of $\cos \theta$ with the given constraint.

$$\tan \theta = -\frac{15}{8}$$

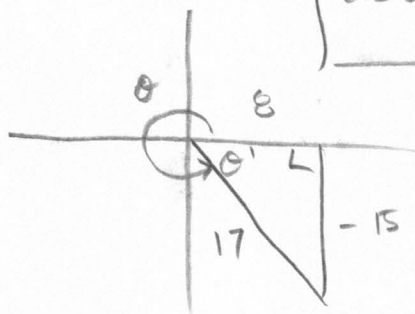
$$\sin \theta < 0$$

$$\frac{O}{A} = \frac{Y}{X} +$$

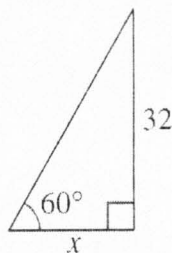
$$\frac{O}{H} = \frac{Y}{r} +$$

$$= -\frac{15}{8}$$

$$\boxed{\cos \theta = \frac{8}{17}}$$



- 10 Solve for x.



$$\frac{x \cdot \sqrt{3}}{\sqrt{3}} = \frac{32}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$\boxed{x = \frac{32\sqrt{3}}{3}}$$

- 11 Find two solutions of the equation. Give your answer in degrees.

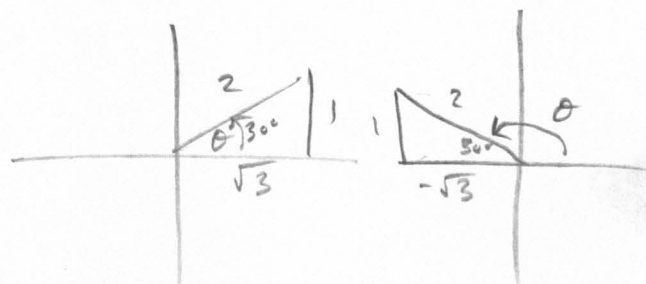
$$\sin \theta = \frac{1}{2}$$

$$30^\circ - 60^\circ - 90^\circ$$

Property

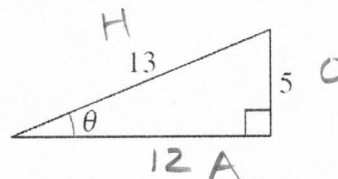
$$\frac{O}{H} = \frac{Y}{r} +$$

$$180 - 30 = 150$$



$$\boxed{30^\circ, 150^\circ}$$

- 12 Find the exact values of the six trigonometric functions of the angle θ .



$$\sin \theta = \frac{5}{13}$$

$$\cos \theta = \frac{12}{13}$$

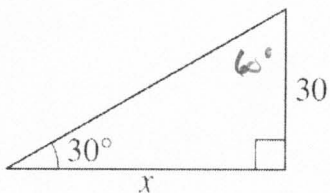
$$\tan \theta = \frac{5}{12}$$

$$\csc \theta = \frac{13}{5}$$

$$\sec \theta = \frac{13}{12}$$

$$\cot \theta = \frac{12}{5}$$

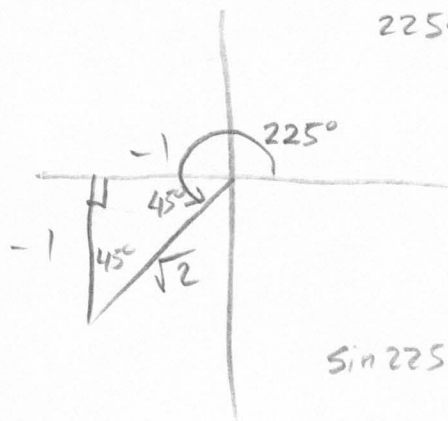
- 13 Solve for x.



$$30 \cdot \sqrt{3} = x$$

$$\boxed{x = 30\sqrt{3}}$$

- 14 Find the exact value of $\sin 225^\circ$.



$$225 - 180 = 45$$

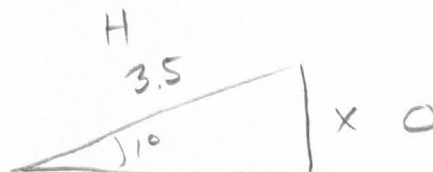
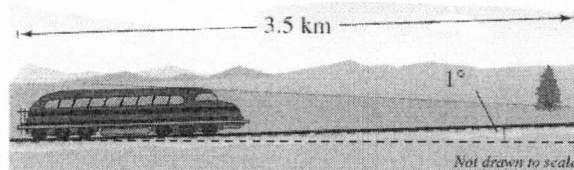
$$\sin 225 = \frac{y}{r} = \frac{-1}{\sqrt{2}}$$

$$= \frac{-1 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}}$$

$$\boxed{-\frac{\sqrt{2}}{2}}$$

- 15 **Railroad Grade** What is the vertical rise of a train that travels 3.5 kilometers on a straight track with a 1° angle of elevation?

Example answer: $4.7 \tan(5^\circ)$



$$3.5 \sin 1^\circ = \frac{x}{3.5} \cdot 3.5$$

$$\boxed{x = 3.5 \sin 1^\circ}$$

- 16 Use trigonometric identities to transform the left side of the equation into the right side.

$$(1 + \cos \theta)(1 - \cos \theta) = \sin^2 \theta$$

Pythagorean Identity

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 - \cos^2 \theta = \sin^2 \theta$$

$$\sin^2 \theta = 1 - \cos^2 \theta$$

- 17 A truck is moving at a rate of 30 kilometers per hour, and the diameter of its wheels is 1 meter. Find the angular speed of the wheels in radians per minute.



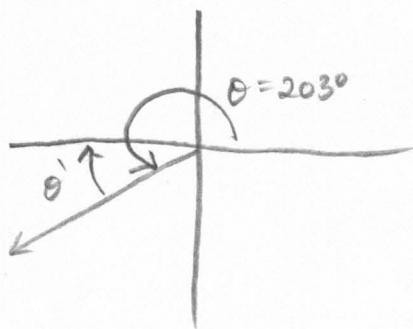
$$\theta = \frac{s}{r} = \frac{30 \text{ km}}{.5 \text{ m}} \cdot \frac{1,000 \text{ m}}{1 \text{ km}} = 60,000$$

Angular Speed

$$\omega = \frac{\theta}{t} = \frac{60,000}{1 \text{ hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} = \boxed{1,000 \text{ rad/min}}$$

- 18 Find the reference angle of θ in degrees.

$$\theta = 203^\circ$$



$$\theta' = 203 - 180$$

$$\boxed{\theta' = 23^\circ}$$

- 19 Rewrite the angle measure in degrees.

$$\frac{7\pi}{6} \cdot \frac{180}{\pi} = \boxed{210^\circ}$$

- 20 What is the first coterminal angle less than $\frac{2\pi}{3}$?

$$\frac{2\pi}{3} - \frac{2\pi}{1}$$

$$\frac{2\pi}{3} - \frac{6\pi}{3} = \boxed{-\frac{4\pi}{3}}$$