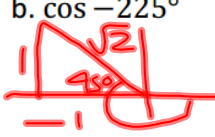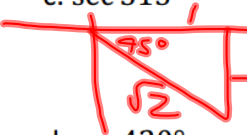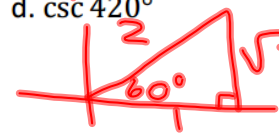Find the exact value of the following.

a. $\sin 270°$ $= \boxed{-1}$

$(0,-1)$

b. $\cos -225°$ $= \boxed{-\dfrac{1}{\sqrt{2}}}$

$45°$

c. $\sec 315°$ $= \boxed{\sqrt{2}}$

$45°$

d. $\csc 420°$ $= \boxed{\dfrac{2}{\sqrt{3}}}$

$60°$

e. $\cot -135°$ $= \boxed{1}$

$45°$

$\cos \dfrac{2\pi}{3}$. $= \boxed{-\dfrac{1}{2}}$

$60°$

$\tan \dfrac{7\pi}{4}$. $= \boxed{-1}$

$45°$

$\sin \dfrac{7\pi}{6}$. $= \boxed{-\dfrac{1}{2}}$

$30°$

$\dfrac{\pi}{2} = -\dfrac{3\pi}{2}$

$\pi = -\pi$

$0 = 2\pi$

$\dfrac{3\pi}{2} = -\dfrac{\pi}{2}$

$\dfrac{7\pi}{6} = \dfrac{\pi}{6} + \pi$
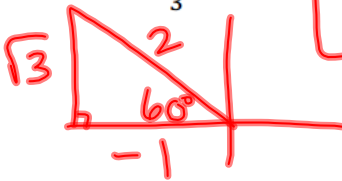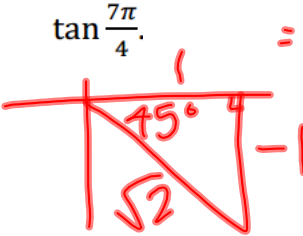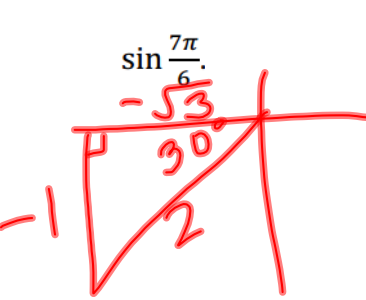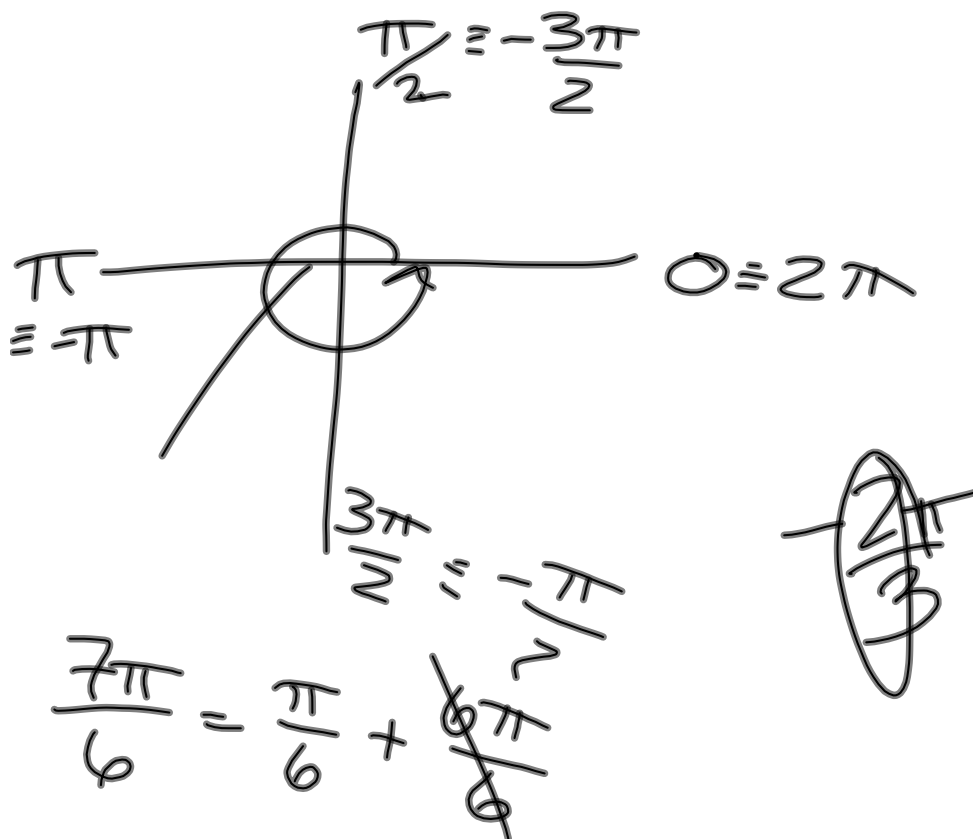
7. Write the following in terms of sin 38° and cos 38°.

a. $\csc 322° = -\csc 38° = \boxed{\dfrac{-1}{\sin 38°}}$

b. $\tan 52° =$

$= \cot(90° - 52°)$

$= \cot 38°$

$= \boxed{\dfrac{\cos 38°}{\sin 38°}}$
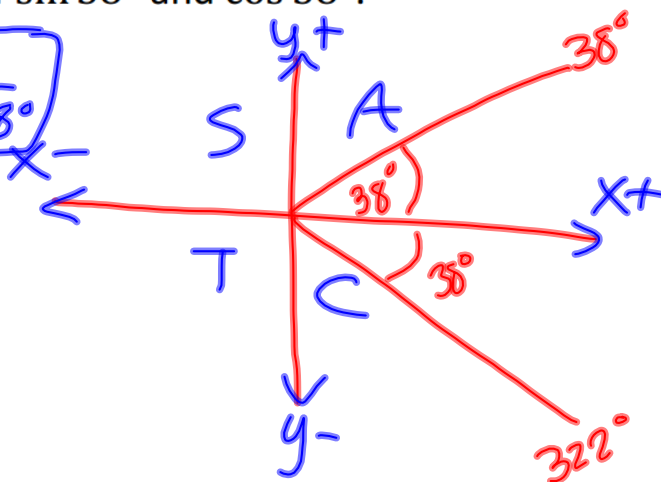
8. The angle of depression from the top of a cliff to an object on the ground is 30°. If the object is 250 feet from the base of the cliff, how tall is the cliff? Give an exact answer in feet.

top of cliff

$30°$

$60°$

$? = h$

$30°$

250 ft

object

base of cliff

2 $30°$ 1

$\sqrt{3}$
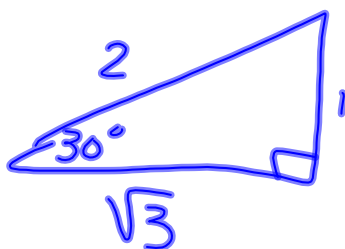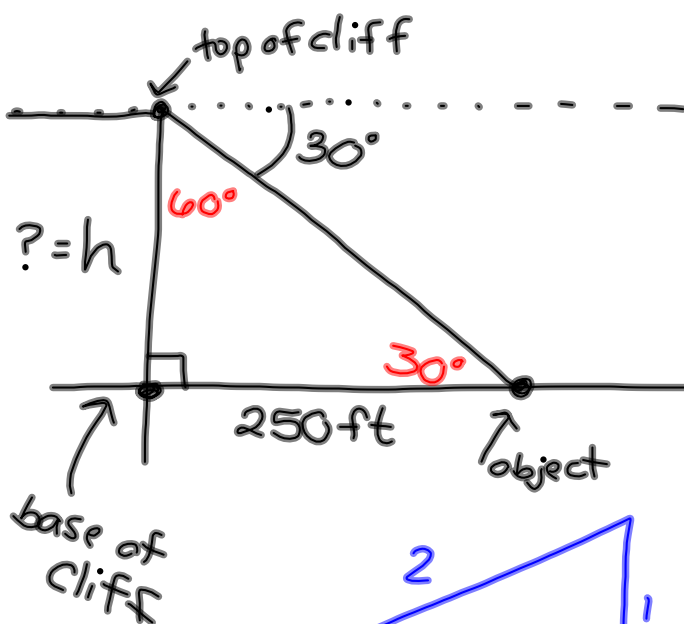
$\tan 60° = \dfrac{250}{h}$

$\tan 30° = \dfrac{h}{250}$

$h = 250 \tan 30°$

$= 250 \cdot \dfrac{1}{\sqrt{3}}$

$= \boxed{\dfrac{250}{\sqrt{3}} \text{ ft}}$

9. A child rides his tricycle at a rate of 20 miles per hour. If the diameter of the front wheel is 8 inches, find the angular speed of the wheel in revolutions per minute. Give an exact answer, in terms of π if necessary.

$$V = \frac{20 \text{ mi}}{h} \; ; \; r = 4 \text{ in} \; ; \; \omega = ? \frac{\text{rev}}{\text{min}} \qquad \frac{\frac{20 \text{mi}}{h}}{4 \text{ in}}$$

$$\frac{V}{r} = \frac{\cancel{r}\omega}{\cancel{r}} \qquad \omega = \frac{V}{r} = \frac{V}{1} \cdot \frac{1}{r}$$

$$\omega = \frac{20 \cancel{\text{mi}}}{\cancel{h}} \cdot \frac{1}{4 \cancel{\text{in}}} \cdot \frac{1\cancel{h}}{\cancel{60}_{\;3}\text{min}} \cdot \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mi}}} \cdot \frac{\cancel{12}\cancel{\text{in}}}{1 \cancel{\text{ft}}} \cdot \frac{1 \text{ rev}}{2\pi}$$

$$= \boxed{\frac{2640}{\pi} \text{ rev}\big/\text{min}}$$

10. Find the exact measure in inches of the radius of a circle with a central angle of 72° that subtends an arc of length 8 feet.

$$r = ? \text{ in} \; ; \; \theta = 72° \; ; \; S = 8 \text{ ft}$$

$$\frac{S = r\cancel{\theta}}{\cancel{\theta}} \qquad r = \frac{S}{\theta}$$

$$r = \frac{\cancel{8}^{\;4}\cancel{\text{ft}}}{\cancel{72}°_{\;\cancel{9}_{\;3}}} \cdot \frac{\cancel{12} \text{ in}}{1 \cancel{\text{ft}}} \cdot \frac{\cancel{180}°^{\;60}}{\pi} = \boxed{\frac{240}{\pi} \text{ in}}$$

Formulas to know for Test #1:

Trig Functions of an Acute Angle

$$\sin\theta = \frac{side\ opposite\ \theta}{hypotenuse} \qquad\qquad \csc\theta = \frac{hypotenuse}{side\ opposite\ \theta}$$

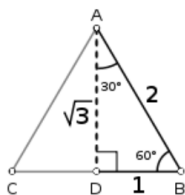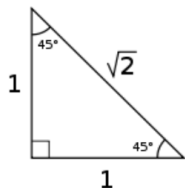$$\cos\theta = \frac{side\ adjacent\ to\ \theta}{hypotenuse} \qquad \sec\theta = \frac{hypotenuse}{side\ adjacent\ to\ \theta}$$

$$\tan\theta = \frac{side\ opposite\ \theta}{side\ adjacent\ to\ \theta} \qquad \cot\theta = \frac{side\ adjacent\ to\ \theta}{side\ opposite\ \theta}$$

Converting Between Degree & Radian Measure

To convert from degree to radian measure, multiply by $\frac{\pi}{180°}$

To convert from radian to degree measure, multiply by $\frac{180°}{\pi}$

Trig Identities

Reciprocal Identities

$$\csc x = \frac{1}{\sin x}\ ,\ \sin x = \frac{1}{\csc x}\ ,\ \sec x = \frac{1}{\cos x}\ ,\ \cos x = \frac{1}{\sec x}\ ,\ \cot x = \frac{1}{\tan x}\ ,\ \tan x = \frac{1}{\cot x}$$

Ratio Identities

$$\tan x = \frac{\sin x}{\cos x}\ ,\ \cot x = \frac{\cos x}{\sin x}$$

Arc Length and Angular Speed

Variables

$s = distance\ traveled$ or $arc\ length$ $(inches, kilometers, etc)$
$t = time$ $(seconds, minutes, hours, days, etc)$
$\theta = amount\ of\ rotation$ or $included\ angle$ $(degrees, radians, rotations, revolt$
$r = radius$ or $distance\ from\ the\ center\ of\ rotation$ $(centimeters, inches, etc)$

$$v = linear\ speed = \frac{distance}{time}$$

$$\omega = angular\ speed = \frac{amount\ of\ rotation}{time}$$

Formulas

$$s = r\theta\ ,\qquad v = \frac{s}{t}\ ,\qquad \omega = \frac{\theta}{t}\ ,\qquad v = r\omega$$

Dimensional analysis conversion factors

$$\frac{5280\ ft}{1\ mi}\ ,\ \frac{12\ in}{1\ ft}\ ,\ \frac{2\pi}{1\ rev}\ ,\ \frac{\pi}{180°}\ ,\ \frac{60\ min}{1\ hr}\ ,\ \frac{60\ sec}{1\ min}\ , and\ their\ reciprocals$$

Key words:
cofunction
complement
coterminal
reference angle
heading
bearing
angle of elevation/depression

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