# Trigonometry Practice Questions

## Trig Ratios

1. State the value of each of the following:

a) sin 30° $= 0.5$

b) cos 60° $= 0.5$

c) tan 45° $= 1$

d) sec 45°

$\cos 45 = \frac{\sqrt{2}}{2}$

$\therefore \frac{1}{\cos 45} = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \boxed{\sqrt{2}}$ or 1.41

e) csc 70°

$\frac{1}{\sin 70^\circ} = 1.06418$

f) cot 30°

$\frac{1}{\tan 30^\circ} = 1.732$

g) sin 0°

$= 0$

h) cos 0°

$= 1$

i) tan 0°

$= 0$

2. Find the value of $\theta$

a) $\tan\theta = 1$

$\tan^{-1}(1) = 45^\circ$

b) $\cos\theta = \frac{1}{\sqrt{2}}$ $= 45^\circ$

c) $\sin\theta = \frac{1}{2}$ $= 30^\circ$

d) $\sec\theta = 2$

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

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

$\theta = 60^\circ$

e) $\csc\theta = \frac{2}{\sqrt{3}}$

$\frac{1}{\sin\theta} = \frac{2}{\sqrt{3}}$

$\sin\theta = \frac{\sqrt{3}}{2}$

$\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = 60^\circ$

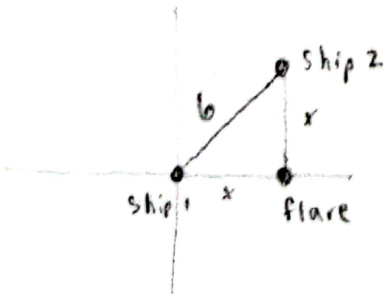
f) $\cot\theta = \frac{1}{\sqrt{3}}$

$\frac{1}{\tan\theta} = \frac{1}{\sqrt{3}}$

$\tan\theta = \frac{\sqrt{3}}{1}$

$\tan^{-1}(\sqrt{3}) = 60^\circ$

3. One ship observes a second ship 6km away to the north-east. The first ship sights a flare due east. For the second ship, the flare is due south. How far is each ship from the flare?




$x^2 + x^2 = 6^2$

$2x^2 = 36$

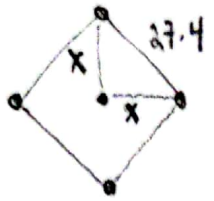
$x^2 = 18$

$x = \sqrt{18}$ km

or

4.24km

4. In a baseball diamond, each baseline is 27.4m long. If the pitcher stands at the centre of the diamond, how far is she from each base?




$2x^2 = (27.4)^2$

$2x^2 = 750.76$

$x^2 = 375.38$

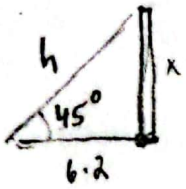
$x = 19.37m$

5. A guy wire is fastened 6.2 m from the base of a hydro pole. Find the length of the guy wire and how far up the pole it is fastened for each of the following angles of elevation.

a) 45° $\tan 45^\circ = \frac{x}{6.2}$

$x = 6.2m$

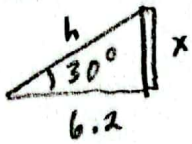
$h = 8.77m$




b) 30° $\tan 30^\circ = \frac{x}{6.2}$

$x = 3.58m$

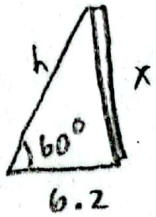
$h = 7.16m$




c) 60° $\tan 60^\circ = \frac{x}{6.2}$

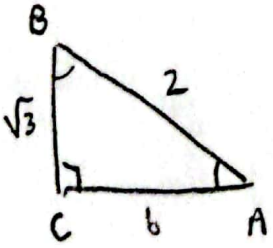
$x = 10.7m$

$h = 12.4m$




6. Triangle ABC contains a right angle at C. Find the value of $\sin A$ if:

a) $\cos B = \frac{\sqrt{3}}{2}$




$(2)^2 = (\sqrt{3})^2 + b^2$

$4 = 3 + b^2$

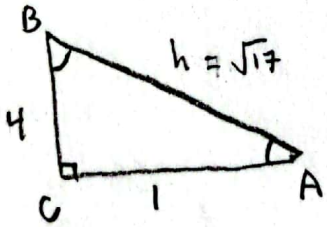
$1 = b^2$

$1 = b$

$\boxed{\sin A = \frac{\sqrt{3}}{2}}$

$A = 60^\circ$

b) $\tan B = 0.25$




$1^2 + 4^2 = h^2$

$1 + 16 = h^2$

$17 = h^2$

$4.12 = h$

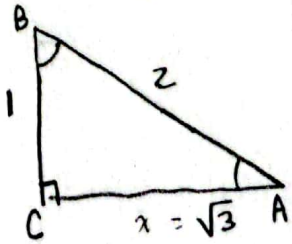
$\boxed{\sin A = \frac{4}{\sqrt{17}}}$

$\sin^{-1}\left(\frac{4}{\sqrt{17}}\right) = 75.96^\circ$

c) $\sec B = 2$

$\frac{1}{\cos B} = 2$

$\cos B = \frac{1}{2}$




$1^2 + x^2 = 2^2$

$1 + x^2 = 4$

$x^2 = 3$

$x = \sqrt{3}$

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

$\theta = 30^\circ$

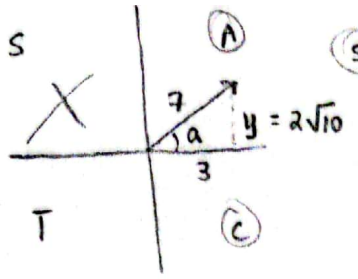
2

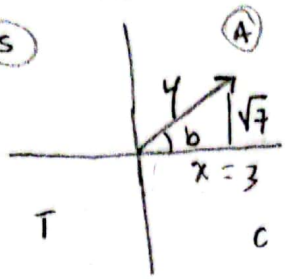
$3^2 + y^2 = 7^2$

$9 + y^2 = 49$

$y^2 = 40$

$y = \sqrt{40} = 2\sqrt{10}$




$x^2 + (\sqrt{7})^2 = (4)^2$

$x^2 + 7 = 16$

$x^2 = 9$

$x = 3$

restricted to Q1

**Co-terminal angles and CAST**

7. Considering that $\cos a = \frac{3}{7}$ where $0 \le a \le 180$ and $\sin b = \frac{\sqrt{7}}{4}$ where $0 \le b \le 90$, determine the value of each of the following trigonometric expressions.

can only be quad 1. . cos is neg in Q2

a) $\sin a$

$\frac{2\sqrt{10}}{7}$

b) $\tan a$

$\frac{2\sqrt{10}}{3}$

c) $\sec a$

$\cos a = \frac{3}{7}$

$\sec a = \frac{7}{3}$

d) $\csc a$

$\sin a = \frac{2\sqrt{10}}{7}$

$\csc a = \frac{7}{2\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = \frac{7\sqrt{10}}{20}$

e) $\cot a$

$\frac{\frac{3}{7}}{\frac{2\sqrt{10}}{7}} = \frac{3}{7} \cdot \frac{7}{2\sqrt{10}}$

$= \frac{3}{2\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = \boxed{\frac{3\sqrt{10}}{20}}$

f) $\cos b$

$= \frac{3}{4}$

g) $\tan b$

$\frac{\sin b}{\cos b}$

$\frac{\sqrt{7}}{4} \div \frac{3}{4}$

$= \frac{\sqrt{7}}{4} \cdot \frac{4}{3}$

$\boxed{= \frac{\sqrt{7}}{3}}$

h) $\sec b$

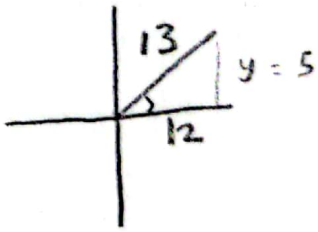
$\frac{1}{\cos b} = \frac{4}{3}$

i) $\csc b$

$\frac{1}{\sin b} = \frac{4}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \boxed{\frac{4\sqrt{7}}{7}}$

j) $\cot b$

8. If $\cos x = \frac{12}{13}$ and $0 \le x \le 90$, determine the value of each of the following:




a) $\sin x$

$= \frac{5}{13}$

b) $\sec x$

$\frac{1}{\cos x}$

$= \frac{13}{12}$

c) $\tan x$

$= \frac{\sin x}{\cos x}$

$= \frac{5}{13} \div \frac{12}{13}$

$= \frac{5}{13} \cdot \frac{13}{12} = \boxed{\frac{5}{12}}$

$12^2 + y^2 = 13^2$

$144 + y^2 = 169$

$y^2 = 25$

$y = 5$

d) $\csc x$

$\frac{1}{\sin x} = \frac{13}{5}$

e) $\cot x$

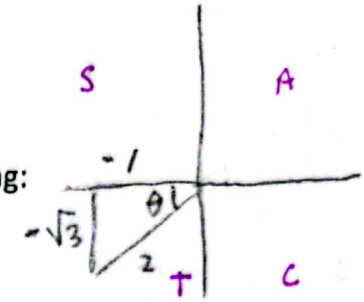
$\frac{1}{\tan x} = \frac{12}{5}$

$1^2 + \sqrt{3}^2 = h^2$

$1 + 3 = h^2$

$2 = h$

9. If $\tan x = \sqrt{3}$ and $\boxed{180 \le x \le 360}$, determine the value of each of the following:




a) $\cos x$

$= \boxed{\frac{-1}{2}}$

b) $\cot x$

$= \frac{-1}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{3}}{3}}$

c) $\csc x$

$\sin\theta = -\frac{\sqrt{3}}{2}$

$\frac{1}{\sin\theta} = \frac{2}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{-2\sqrt{3}}{3}}$

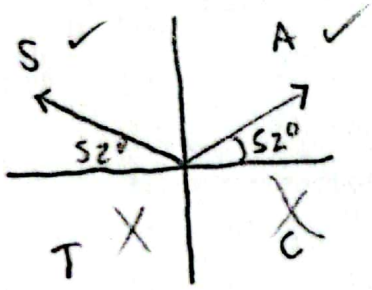
d) $\sin x$

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

e) $\sec x$ — $\frac{1}{\cos\theta}$

$\boxed{-2.}$

10. Given $\sin\theta = 0.788$, find the values of $\theta$ over $\boxed{0 \le x \le 360.}$




$\sin^{-1}(0.788) = 51.999\ldots = 52°$

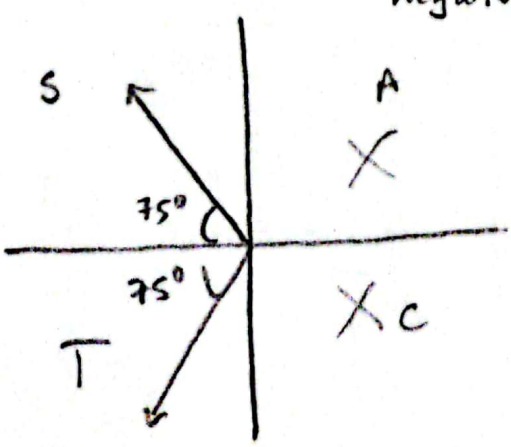
$\theta_R = 52°$

$\theta_1 = \underline{\underline{52°}}$

$\theta_2 = 180 - 52° = \underline{\underline{128°}}$

11. Given $\cos\theta = -0.2588$, find the values of $\theta$ over $\boxed{360 \le x \le 720.}$

negative




$\theta_R = \cos^{-1}(0.2588) = 75°$

Watch the domain! It's the second spin around the origin!

$\theta_1 = 180 - 75 = 105° + 360 = \underline{465°}$

$\theta_2 = 180 + 75 = \underline{255°} + 360 = \underline{615°}$

$\frac{\pi}{180^\circ} = \frac{\theta \text{ rad}}{\pi \text{ rad}}$

**Radians and Arc Length**

**12. Express each of the following angle measures in radians. Express each answer in terms of $\pi$.**

a) 350°

$\frac{350^\circ}{180^\circ} = \frac{\theta \text{ rad}}{\pi \text{ rad}}$

$\boxed{\frac{35\pi}{18} \text{ rad}}$

b) 5°

$\frac{5^\circ}{180^\circ} = \frac{\theta \text{ rad}}{\pi \text{ rad}}$

$\boxed{\frac{\pi}{36} \text{ rad}}$

c) 140°

$\frac{140^\circ}{180^\circ} = \frac{\theta \text{ rad}}{\pi \text{ rad}}$

$\boxed{\frac{7\pi}{9} \text{ rad}}$

d) 25°

$\frac{25^\circ}{180^\circ} = \frac{\theta \text{ rad}}{\pi \text{ rad}}$

$\boxed{\frac{5\pi}{36} \text{ rad}}$

e) 70°

$\frac{70^\circ}{180^\circ} = \frac{\theta \text{ rad}}{\pi \text{ rad}}$

$\boxed{\frac{7\pi}{18} \text{ rad}}$

f) −10° = 350°

$\frac{350^\circ}{180^\circ} = \frac{\theta \text{ rad}}{\pi \text{ rad}}$

$\boxed{\frac{35\pi}{18} \text{ rad}}$

**13. Express each of the following angle measures in degrees.**

a) $\frac{\pi}{6}$ *rad*

$\frac{n^\circ}{180^\circ} = \frac{\frac{\pi}{6} \text{ rad}}{\pi \text{ rad}}$

$\frac{n}{180} = \frac{1}{6}$

$\boxed{n = 30^\circ}$

b) $\frac{5\pi}{12}$ *rad*

$\frac{n^\circ}{180^\circ} = \frac{5\pi}{12\pi}$

$\boxed{n^\circ = 75^\circ}$

c) $\frac{3\pi}{20}$ *rad*

$\frac{n^\circ}{180^\circ} = \frac{3\pi}{20\pi}$

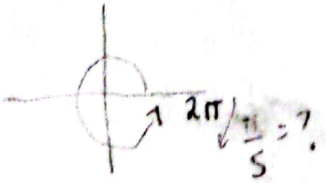
$\boxed{n^\circ = 27^\circ}$

d) 7 *rad*

1 rad = 57.30°

7 rad = $\boxed{401.1^\circ}$

e) $-\frac{\pi}{5}$ *rad*




$2\pi - \frac{\pi}{5}$

$\frac{10\pi}{5} - \frac{\pi}{5} = \frac{9\pi}{5}$

$\frac{n^\circ}{180^\circ} = \frac{9\pi}{5\pi}$

$\boxed{n^\circ = 324^\circ}$

f) −2 *rad*

2 rad = 114.6°


360° − 114.6°

$\boxed{= 245.4^\circ}$

14. In which quadrant will the arc representing each real number terminate?

a) $-0.5$

$0.5\text{ rad} = 28.65^\circ$


$= 331.35^\circ$

$\boxed{\text{Quad 4}}$

b) $\frac{\pi}{6}$

$\boxed{\text{Quad 1}}$

$\left(\frac{\pi}{6}, 57.30^\circ\right)$

$= 30^\circ$

c) $\frac{2\pi}{3}$

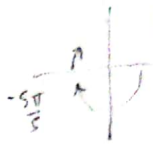
$\boxed{\text{Quad 2}}$

$\frac{2\pi}{3}$ rads

$= 120^\circ$

d) $\frac{-7\pi}{5}$

$\boxed{\text{Quad 2}}$




$= 108^\circ$

e) 2

$2\text{ rad} = 114.6^\circ$

$\boxed{\text{Quad 2}}$

f) 8

8 rad

$\sim 458.4^\circ$

$458 - 360 = 98.4$

$\boxed{= \text{Quad 2}}$

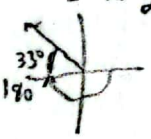
g) $-10$

10 rad

$\approx -573^\circ$

$+360$

$= -213^\circ$




$\boxed{\text{Quad 2}}$

h) $-17.8$

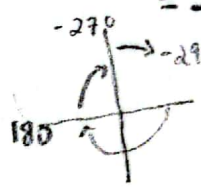
$17.8\text{ rad} = 1019.94^\circ$

$-1019.94 + 360$

$= -659.94$

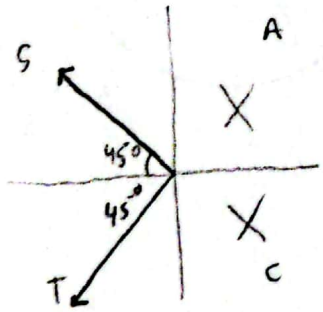
$+360$

$= -299.94$




$\boxed{\text{Quad 1}}$

15. Given $\cos\theta = \frac{-\sqrt{2}}{2}$, find the values of $\theta$ over $0 \le \theta \le 2\pi$.




$\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right) = 45^\circ$

Negative #!

$\theta_R = 45^\circ$

$\theta_1 = 180 - 45^\circ = 135^\circ$

$\theta_2 = 180 + 45^\circ = 225^\circ$

Domain in rads.

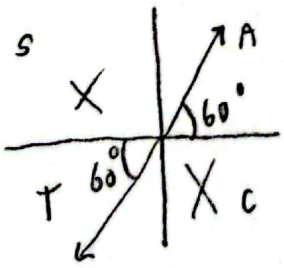
$\frac{135^\circ}{180^\circ} = \frac{\theta\text{ rad}}{\pi\text{ rad}} = \boxed{\frac{3\pi}{4}}$

$\frac{225^\circ}{180^\circ} = \frac{\theta\text{ rad}}{\pi\text{ rad}} = \boxed{\frac{5\pi}{4}}$

16. Given $\tan\theta = \sqrt{3}$, find the values of $\theta$ over $\pi \le \theta \le 2\pi$.

$\tan^{-1}(\sqrt{3}) = 60^\circ$

POSITIVE




$\theta_R = \theta_1 = 60^\circ$

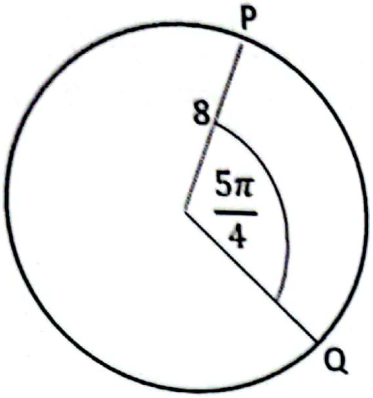
$\theta_2 = 180 + 60 = 240^\circ$

Domain in rads:

$\frac{60}{180} = \frac{\theta\text{ rad}}{\pi\text{ rad}} = \boxed{\frac{\pi}{3}}$

$\frac{240^\circ}{180^\circ} = \frac{\theta\text{ rad}}{\pi\text{ rad}} = \boxed{\frac{4\pi}{3}}$

**17. What is the arc length of PQ**



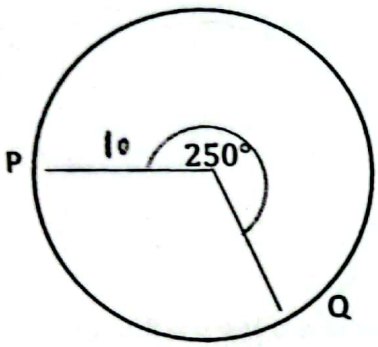

arc length $= \theta r$

$= \left(\frac{5\pi}{4}\right)(8)$

$= \frac{40\pi}{4}$

$= 10\pi$ units.

**18. What is the arc length of PQ**




$\frac{250^\circ}{360^\circ} = \frac{\text{arc length}}{2\pi(r)}$

uh oh I forgot a radius in the picture.

Use 10 just to finish it.

$\frac{250}{360} = \frac{\text{arc}}{2\pi(10)}$

$\frac{500(10)\pi}{360} = \text{arc}$

$= \frac{125\pi}{9}$ units