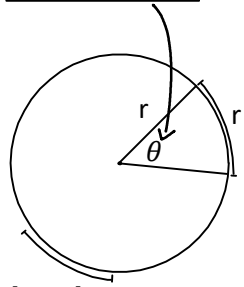
C12 - 4.1 - Degree/Radian Notes

"One radian is equal to the length of the arc of a circle with radius = 1.

1 Radian is the central angle whose arc is equal to the radius

$1\ rad = 57.3^o$



Arc length

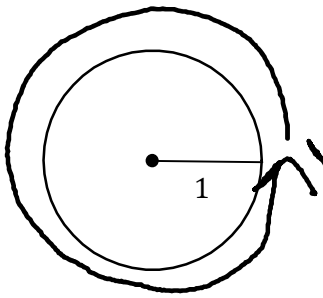
$1\ rad = 57.3^o$
$1\ inch = 2.54\ cm$

One Radian equals 57.3^o

$\theta_{rad} = \frac{a}{r}$

$\theta_{rad} = \frac{r}{r}$

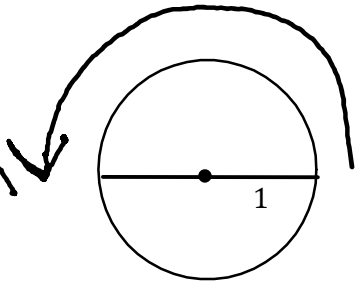
$\theta_{rad} = 1\ rad$



$\theta = 360^o = 2\pi_{rad}$

$C = 2\pi r$
$C = 2\pi(1)$

$C = 2\pi$
$C = 6.28$

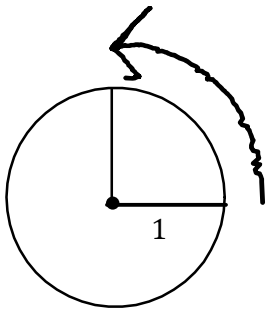


$\theta = 180^0 = \pi_{rad}$

$C = 2\pi r$
$C = 2\pi(1)$
$C = 2\pi$

$\frac{C}{2} = \frac{2\pi}{2}$

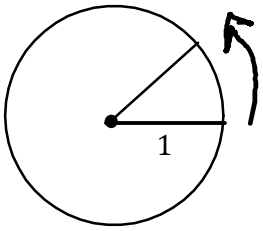
$C = \pi$



$\theta = 90^0 = \frac{\pi}{2_{rad}}$

$C = 2\pi r$
$C = 2\pi(1)$
$C = 2\pi$

$\frac{C}{4} = \frac{2\pi}{4}$
$C = \frac{\pi}{2}$



$\theta = 45^0 = \frac{\pi}{4_{rad}}$

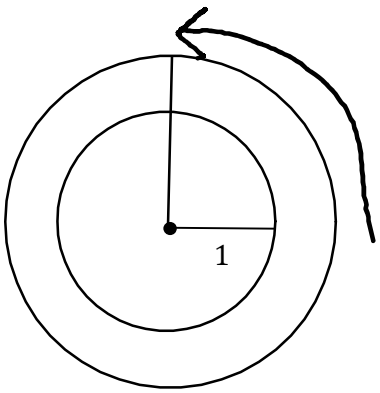
$C = 2\pi r$
$C = 2\pi(1)$
$C = 2\pi$

$\frac{C}{8} = \frac{2\pi}{8}$

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

Notice the size of the circle does not matter.

$90^0 = \frac{\pi}{2}$



$\theta = 90^0 = \frac{\pi}{2_{rad}}$

C12 - 4.1 - Degree/Radian Conversion Notes

Degrees to Radians: **Radians to Degrees:**

$\boxed{\frac{180^o}{\pi_{rad}}}$ $\boxed{\frac{\pi_{rad}}{180^o}}$ $\times \frac{\pi}{180^o}$ $\times \frac{180^0}{\pi}$

π *and* 180^o *are the same thing, just in different units*

Find θ *in radians*

$30^0 =?$ $30^0 \times \frac{\pi}{180^o} = \frac{30\pi}{180} = \frac{\pi}{6} = 0.52$

$120^0 =?$ $120^0 \times \frac{\pi}{180^o} = \frac{120\pi}{180} = \frac{2\pi}{3}$

$99^0 =?$ $99^0 \times \frac{\pi}{180^o} = \frac{99\pi}{180} = \frac{11\pi}{20}$

Find θ *in degrees*

$\frac{\pi}{3}_{rad} =?$ $\frac{\pi}{3}_{rad} \times \frac{180^0}{\pi} = \frac{180\pi}{3\pi} = 60^0$

$\frac{2\pi}{5}_{rad} =?$ $\frac{2\pi}{5}_{rad} \times \frac{180^0}{\pi} = \frac{360\pi}{5\pi} = 72^0$

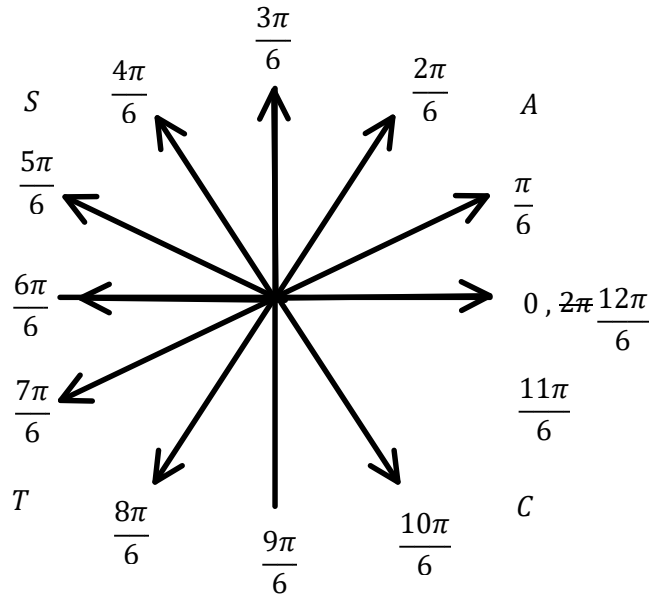
$1.57_{rad} =?$ $1.57_{rad} \times \frac{180^0}{\pi} = 90^0$

$3 =?$ $3_{rad} \times \frac{180^0}{\pi} = \frac{540}{\pi} = 171.89^0$

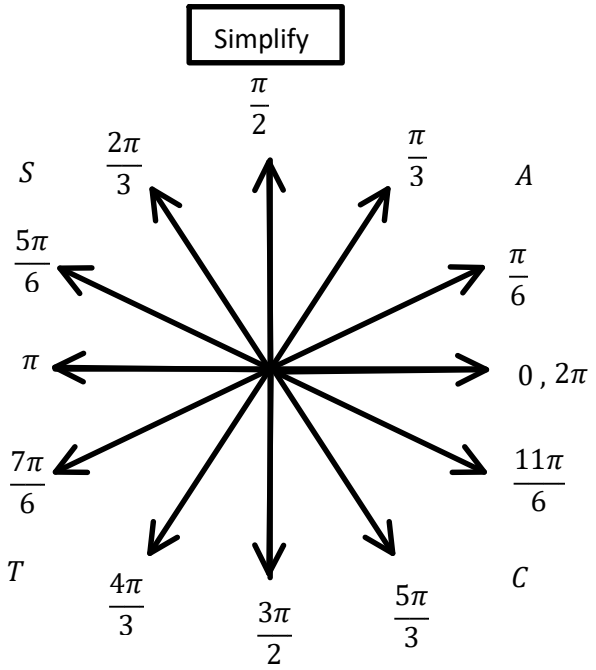
If there are no units it is in radians.

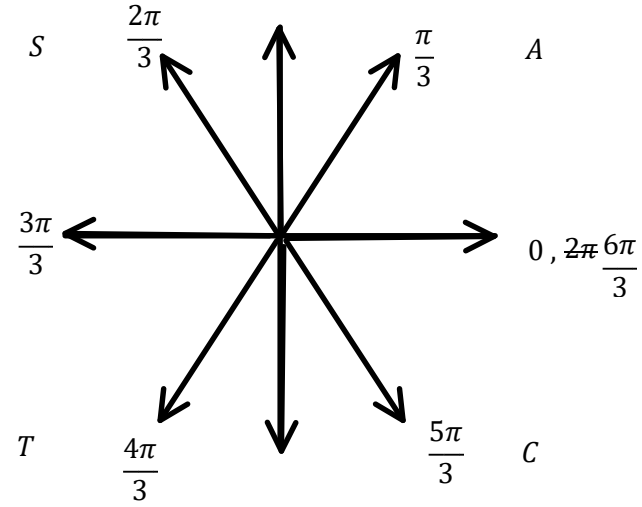
Degrees	*Radians*	*Radians*	*Radians*
0^0	0_{rad}	0_{rad}	0_{rad}
15^0	$\frac{\pi}{12}_{rad}$	$\frac{\pi}{12}_{rad}$	0.26_{rad}
30^0	$\frac{2\pi}{12}_{rad}$	$\frac{\pi}{6}_{rad}$	0.52_{rad}
45^0	$\frac{3\pi}{12}_{rad}$	$\frac{\pi}{4}_{rad}$	0.79_{rad}
60^0	$\frac{4\pi}{12}_{rad}$	$\frac{\pi}{3}_{rad}$	1.05_{rad}
75^0	$\frac{5\pi}{12}_{rad}$	$\frac{5\pi}{12}_{rad}$	1.31_{rad}
90^0	$\frac{6\pi}{12}_{rad}$	$\frac{\pi}{2}_{rad}$	1.57_{rad}
180^0	$\frac{12\pi}{12} = \pi_{rad}$	π_{rad}	3.14_{rad}
270^0	$\frac{3\pi}{2}_{rad}$	$\frac{3\pi}{2}_{rad}$	4.71_{rad}
360^0	$2\pi_{rad}$	$2\pi_{rad}$	6.28_{rad}
720^0	$4\pi_{rad}$	$4\pi_{rad}$	12.56_{rad}

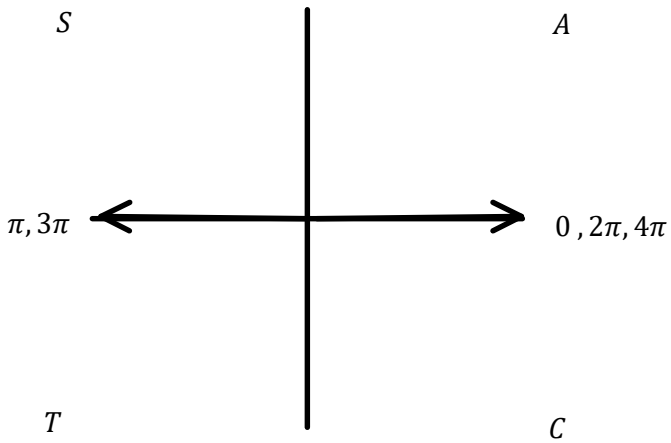
C12 - 4.1 - $\frac{\#\pi}{\#}$ *Notes*

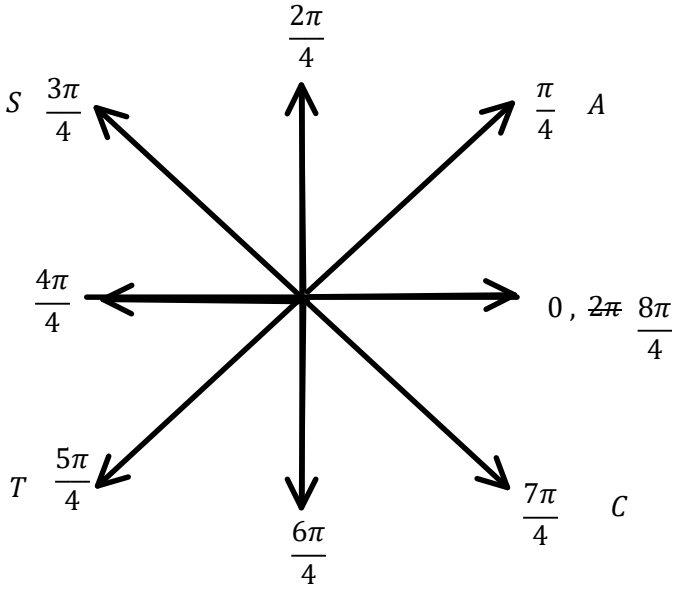


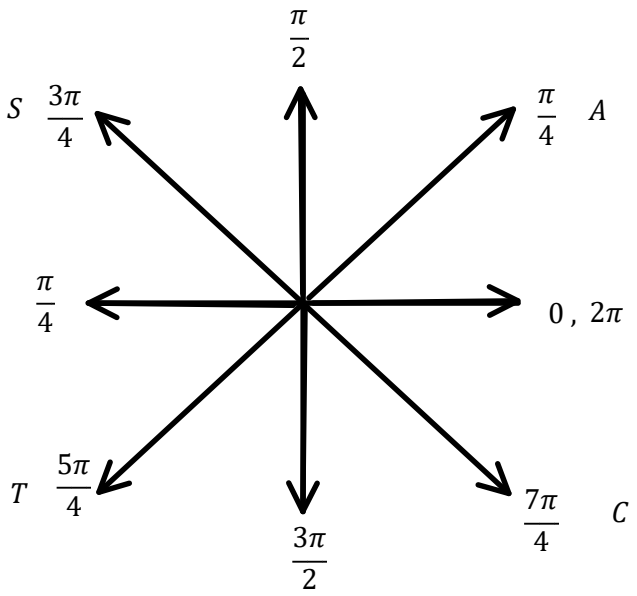
Simplify









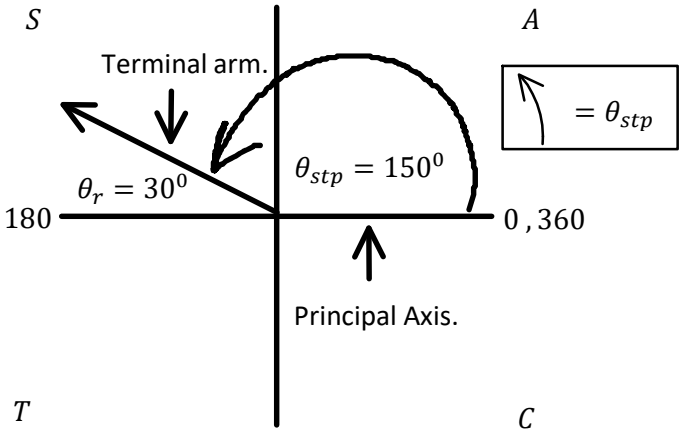


C12 - 4.2 - θ_r, θ_{stp} Notes

(always positive, between 0 $and \pi/2$)

θ_r: the "reference angle"is the angle between the terminal arm and the x-axis .

θ_{stp}: the "angle in standard position" from the principal axis (+ x-axis) to the terminal arm.

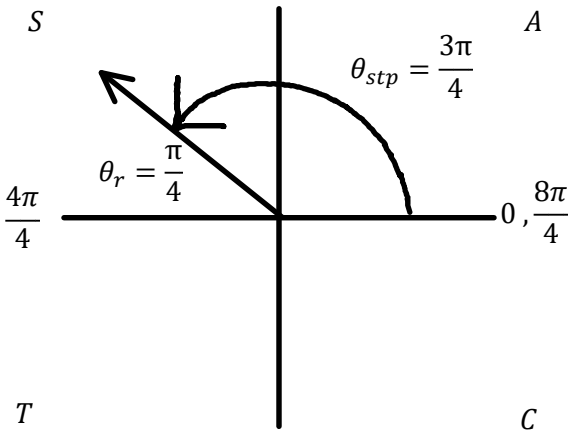


$\theta_r = 180 - 150$

$\theta_r = 30^0$

$\theta_{stp} = 180 - 30$

$\theta_{stp} = 150^0$



LCD

$\theta_r = \pi - \theta_{stp}$

$\theta_r = \pi - \frac{3\pi}{4}$

$\theta_r = \frac{4\pi}{4} - \frac{3\pi}{4}$

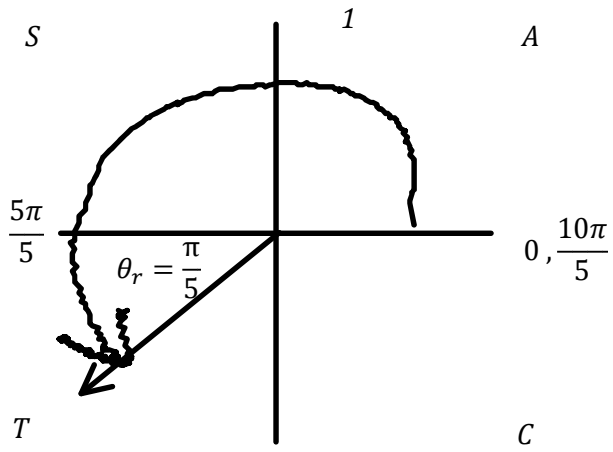
$\theta_r = \frac{\pi}{4}$

$\theta_{stp} = \pi - \theta_r$

$\theta_{stp} = \pi - \frac{\pi}{4}$

$\theta_{stp} = \frac{4\pi}{4} - \frac{\pi}{4}$

$\theta_{stp} = \frac{3\pi}{4}$



$\theta_r = \pi + \theta_{stp}$

$\theta_r = \pi + \frac{6\pi}{5}$

$\theta_r = \frac{5\pi}{5} + \frac{6\pi}{5}$

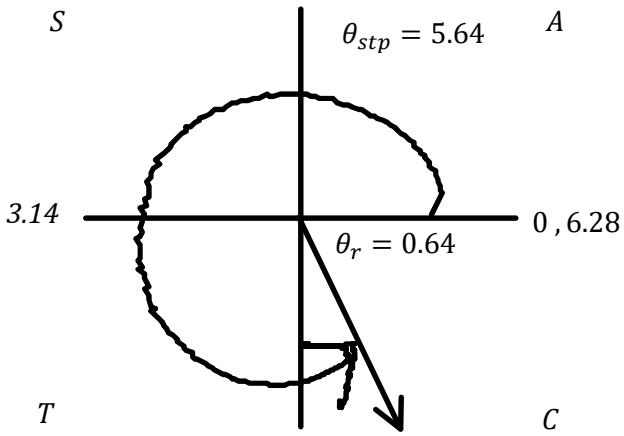
$\theta_r = \frac{\pi}{5}$

$\theta_{stp} = \pi + \theta_r$

$\theta_{stp} = \pi + \frac{\pi}{5}$

$\theta_{stp} = \frac{5\pi}{5} + \frac{\pi}{5}$

$\theta_{stp} = \frac{6\pi}{5}$



$\theta_r = 2\pi - \theta_{stp}$

$\theta_r = 2\pi - 5.64$

$\theta_r = 0.64$

$\theta_{stp} = 2\pi - \theta_r$

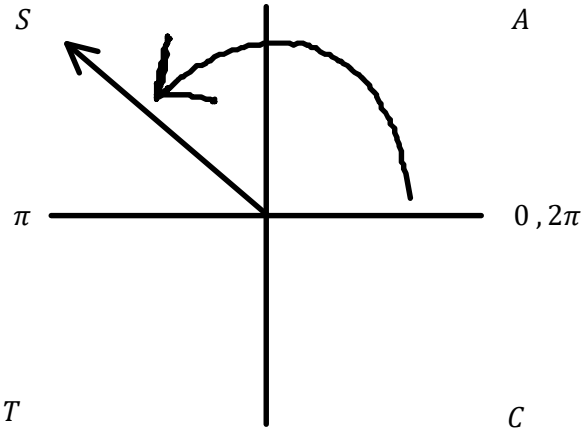
$\theta_{stp} = 2\pi - 0.64$

$\theta_{stp} = 5.64$

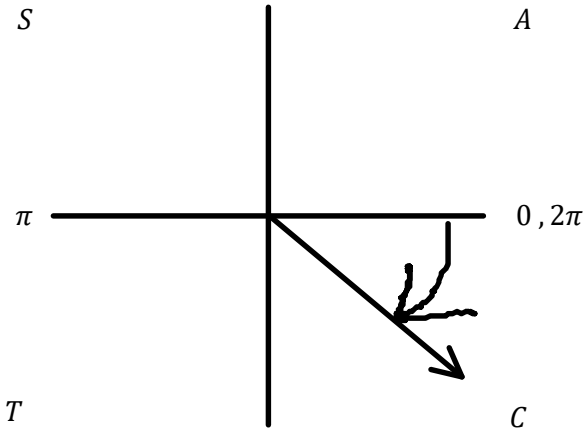
$\theta_{cot} = \theta_{stp} \pm 2\pi n, nEI$

C12 - 4.2 - $\pm\,\theta_{stp}, \theta_{cot}, \theta_{gen}$ Notes

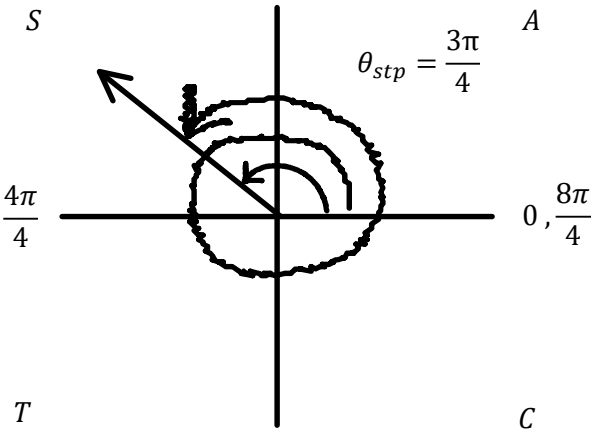
Counter-clockwise rotation is a positive θ_{stp}



Clockwise rotation is a negative θ_{stp}



θ_{cot}: the "co-terminal angle"is any angle with the same terminal arm.



$\theta_{cot} = \theta_{stp} \pm 2\pi$

$\theta_{cot} = \frac{3\pi}{4} + 2\pi$

$\theta_{cot} = \frac{3\pi}{4} + \frac{8\pi}{4}$

$\theta_{cot} = \frac{11\pi}{4}$

$\theta_{cot} = \theta_{stp} \pm 2\pi$

$\theta_{cot} = \frac{3\pi}{4} - 2\pi$

$\theta_{cot} = \frac{3\pi}{4} - \frac{8\pi}{4}$

$\theta_{cot} = -\frac{5\pi}{4}$

θ_{gen}: the "general solution"is all angles with the same terminal arm.

$\theta_{gen} = \theta_{stp} \pm 2\pi n, nEI$

$\theta_{gen} = \frac{3\pi}{4} \pm 2\pi n, nEI$

Basic logic will calculate $\theta_{stp}\ and\ \theta_r$ much more easily than using these formulas.

$\frac{9\pi}{2}$

$\frac{9\pi}{2} - 2\pi$

$\frac{9\pi}{2} - \frac{4\pi}{2}$

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

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

$\frac{5\pi}{2} - \frac{4\pi}{2}$

$\frac{\pi}{2}$

OR

$\frac{9\pi}{2} \div 2\pi$

$\frac{9\pi}{2} \times \frac{1}{2\pi}$

$\frac{9}{4} = 2.25$

$\frac{9\pi}{2} - 2(2\pi)$

$\frac{9\pi}{2} - 4\pi$

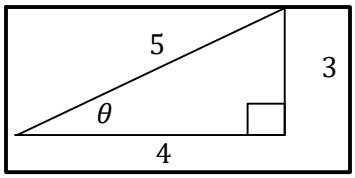
$\frac{9\pi}{2} - \frac{8\pi}{2}$

$\frac{\pi}{2}$

You may need to add or subtract 2π more than once.

OR $0.25 \times 2\pi = \frac{\pi}{2}$

C12 - 4.3 - Find Ratio/Type in Calc Notes



Degrees are for children, unless you are taking physics.

$sin\theta = \frac{O}{H}$ $csc\theta = \frac{H}{O}$

$sin\theta = \frac{3}{5}$ $csc\theta = \frac{5}{3}$

The first letters switch s<->c

$cos\theta = \frac{A}{H}$ $sec\theta = \frac{H}{A}$ $sec\theta = \frac{1}{cos\theta}$

$cos\theta = \frac{4}{5}$ $sec\theta = \frac{5}{4}$ $sec\theta = \frac{1}{\left(\frac{4}{5}\right)}$

The first letters switch c<->s

$sec\theta = 1 \times \frac{5}{4}$

No one would do this! $sec\theta = \frac{5}{4}$

$tan\theta = \frac{O}{A}$ $cot\theta = \frac{A}{O}$

$tan\theta = \frac{3}{4}$ $cot\theta = \frac{4}{3}$

The ones with the t's

Type in Calculator (Degrees or Radians)

$sin25^0 = 0.42$

$cos180^0 = -1$

$sin30^0 = \frac{1}{2}$

$\tan(-980^0) = -5.67$

$csc140^0 =$

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

$csc140^0 = \frac{1}{sin140^0}$

$csc140^0 = -1.56$

$csc140 \neq \frac{1}{\sin\left(\frac{1}{140}\right)}$

$sec65^0 =$

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

$sec65^0 = \frac{1}{cos65^0}$

$sec\theta = 2.37$

$cot25^0 =$

$cot\theta = \frac{1}{tan\theta}$

$cot25^0 = \frac{1}{tan25^0}$

$cot25^0 = 2.14$

$sin2.5 = 0.60$

$\cos\frac{\pi}{3} = \frac{1}{2}$

$\tan(5\pi) = 0$

$cos\pi = -1$

$csc3.4 =$

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

$csc3.4 = \frac{1}{sin3.4}$

$csc3.4 = -3.91$

$\sec\left(\frac{3}{5}\right) =$

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

$\sec\left(\frac{3}{5}\right) = \frac{1}{\cos\left(\frac{3}{5}\right)}$

$\sec\left(\frac{3}{5}\right) = 1.21$

$\sec\left(\frac{3}{5}\right) \neq \cos\left(\frac{5}{3}\right)$

$\sec\left(\frac{3}{5}\right) \neq \frac{1}{\cos\left(\frac{5}{3}\right)}$

$cot250 =$

$cot\theta = \frac{1}{tan\theta}$

$cot250 = \frac{1}{tan250}$

$cot250 = -0.25$

Find θ in Degrees

$sin\theta = \frac{3}{5}$

$\theta = \sin^{-1}\left(\frac{3}{5}\right)$

$\theta = 36.9^0$

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

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

$\theta = \cos^{-1}\left(\frac{1}{2}\right)$

$\theta = 60^0$

$sec\theta = \frac{H}{A}$

$cos\theta = \frac{A}{H}$

Find θ in Radians

$cos\theta = \frac{3}{5}$

$\theta = \cos^{-1}\left(\frac{3}{5}\right)$

$\theta = 0.93$

$cot\theta = 3$

$cot\theta = \frac{3}{1}$

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

$\theta = \tan^{-1}(\frac{1}{3})$

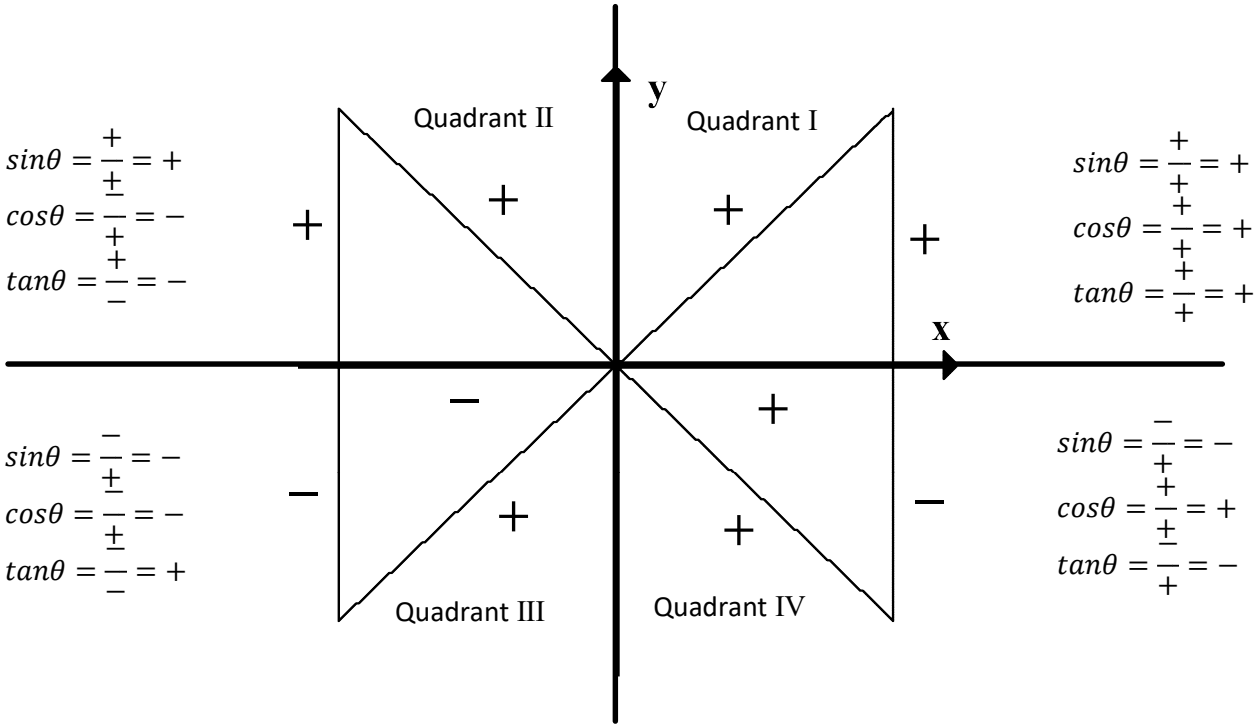
$\theta = 0.32$

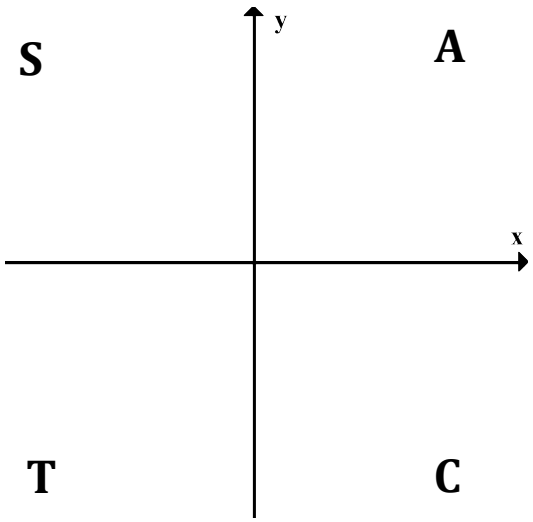
$cot\theta = \frac{A}{O}$

$tan\theta = \frac{O}{A}$

C12 - 4.3 - ASTC Notes

$(+)^2+(-)^2=+$	Remember: the hypotenuse is always positive.	$(+)^2+(+)^2=+$
$\sqrt{+}=+$		$\sqrt{+}=+$





Students

Only **S**in positive.

All

All (sin, cos, tan) positive

Only **T**an positive.

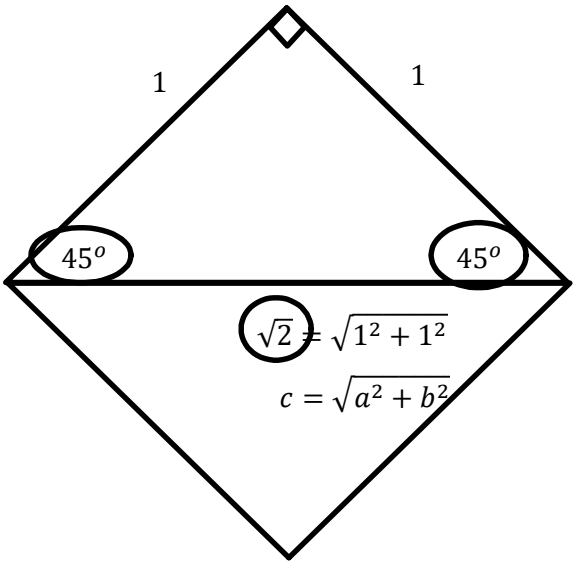
Take

Calculus

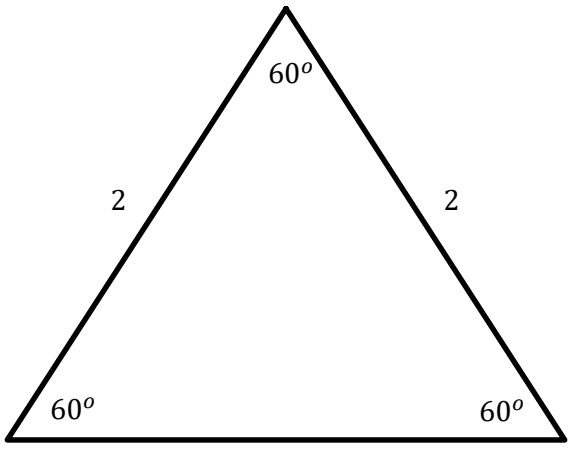
Only **C**os positive.

C12 - 4.3 - Special Triangles 30,45,60 sin/cos/tan Notes

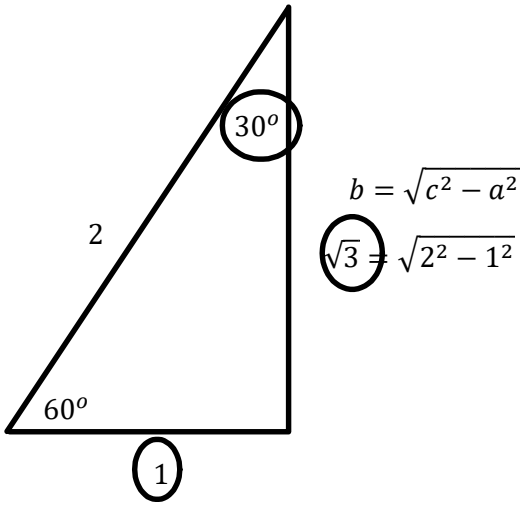
Right Isosceles, with sides =1

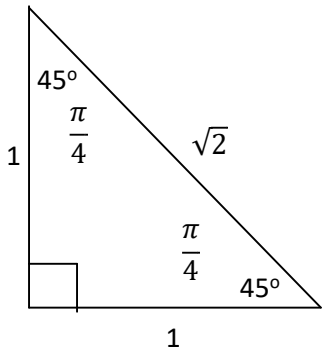


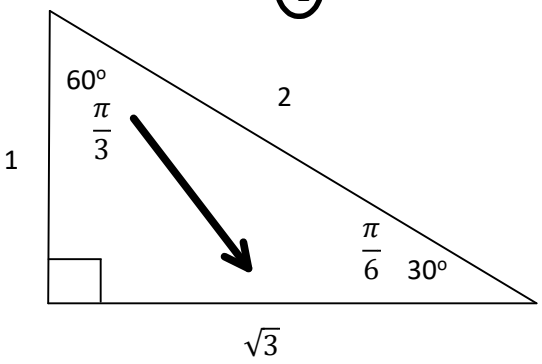
Half an equilateral with sides 2



Diagonal of a square with sides lengths of 1







$60 > 30$

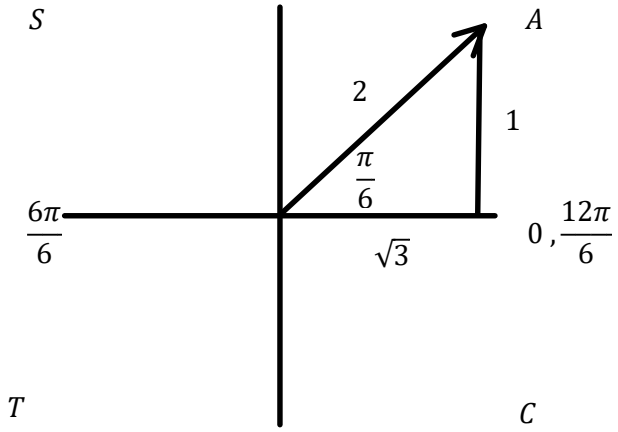
$\sqrt{3} > 1$

60 must open up to the root 3. And Vice Versa

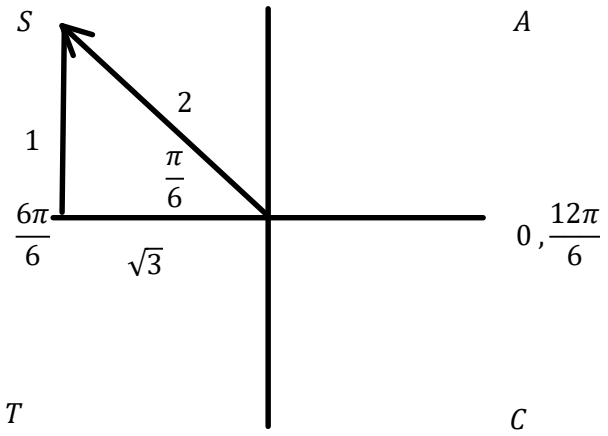
$\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}$	$\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$	$\sin\frac{\pi}{6} = \frac{1}{2}$
$\cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}$	$\cos\frac{\pi}{3} = \frac{1}{2}$	$\cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$
$\tan\frac{\pi}{4} = \frac{1}{1}$	$\tan\frac{\pi}{3} = \frac{\sqrt{3}}{1}$	$\tan\frac{\pi}{6} = \frac{1}{\sqrt{3}}$

C12 - 4.3 - $sin\theta = ?$ *Notes*

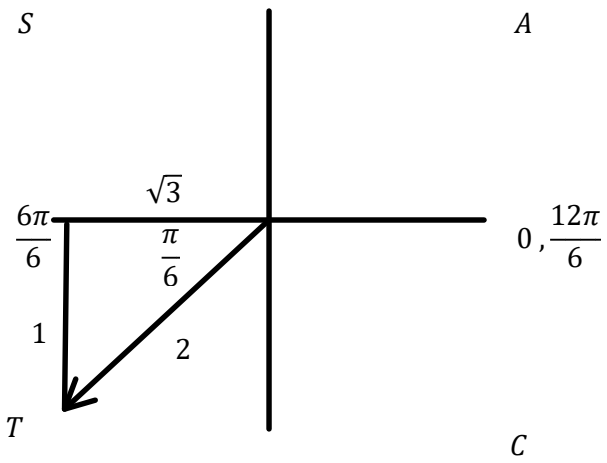
$\sin\frac{\pi}{6} = ?$ $\sin\frac{\pi}{6} = \frac{1}{2}$



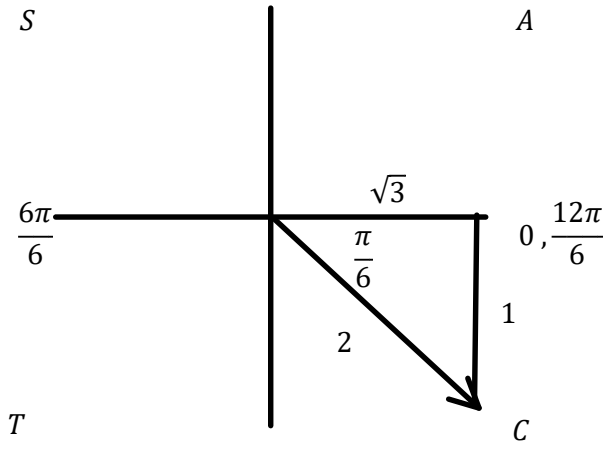
$\sin\frac{5\pi}{6} = ?$ $\sin\frac{5\pi}{6} = \frac{1}{2}$



$\sin\frac{7\pi}{6} = ?$ $\sin\frac{7\pi}{6} = -\frac{1}{2}$



$\sin\frac{11\pi}{6} = ?$ $\sin\frac{11\pi}{6} = -\frac{1}{2}$



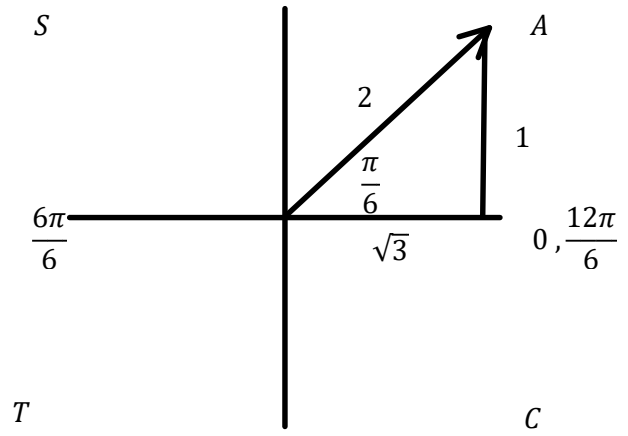
SOH - CAH - TOA

$$sin\theta = \frac{O}{H} \qquad cos\theta = \frac{A}{H} \qquad tan\theta = \frac{O}{A}$$

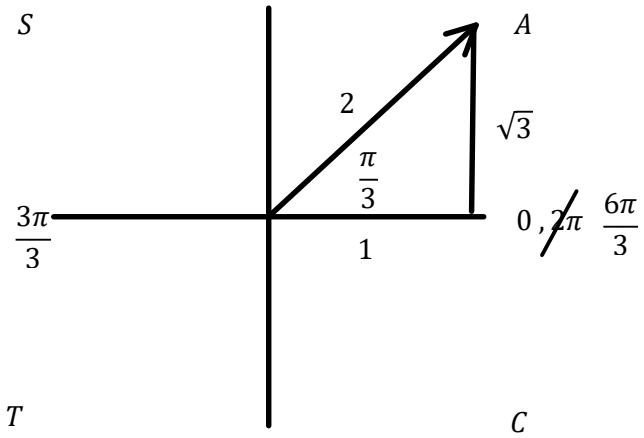
$$csc\theta = \frac{1}{sin\theta} = \frac{H}{O} \qquad sec\theta = \frac{1}{cos\theta} = \frac{H}{A} \qquad cot\theta = \frac{1}{tan\theta} = \frac{A}{O}$$

C12 - 4.3 - $sin\theta, cos\theta, tan\theta = ?$ Notes

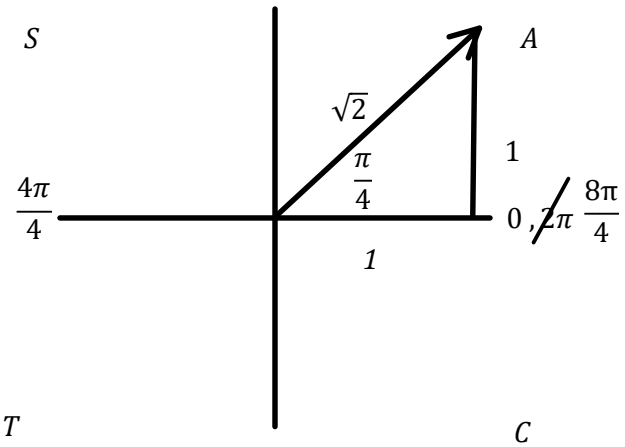
$\cos\frac{\pi}{6} = ?$ $\cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$



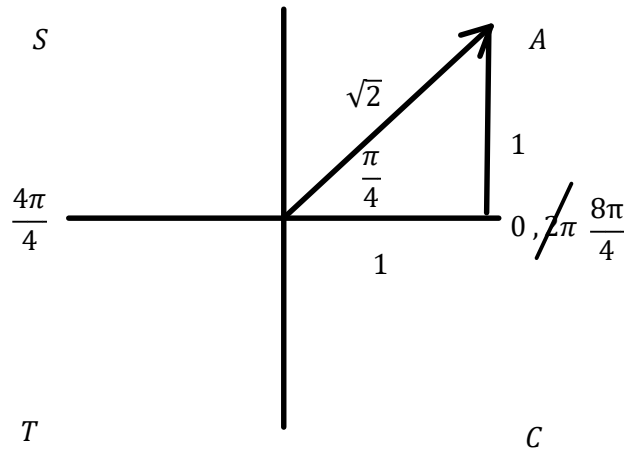
$\sin\frac{\pi}{3} = ?$ $\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$



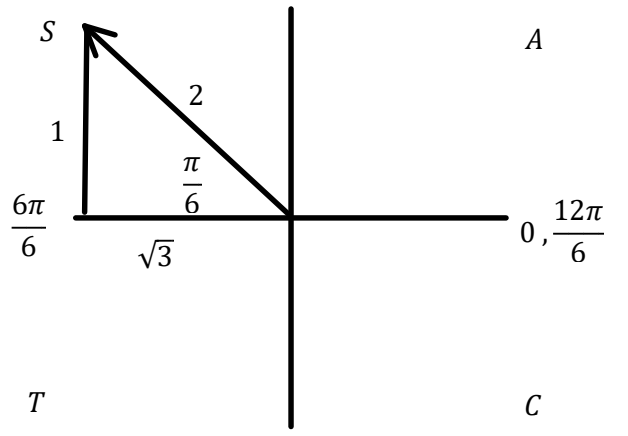
$\sin\frac{\pi}{4} = ?$ $\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}$



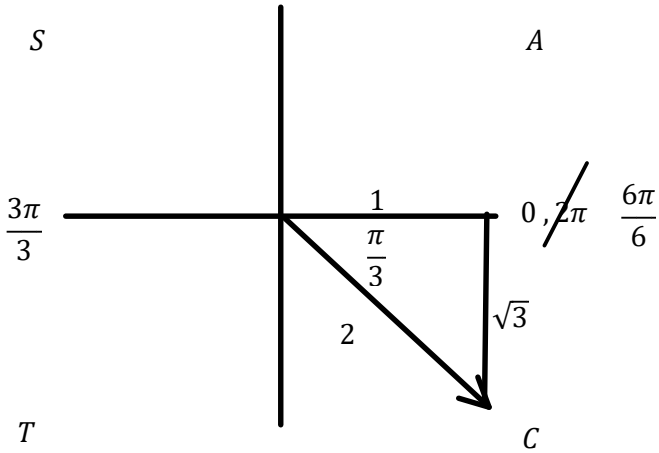
$\tan\frac{\pi}{4} = ?$ $\tan\frac{\pi}{4} = 1$



$\cos\frac{5\pi}{6} = ?$ $\cos\frac{5\pi}{6} = -\frac{\sqrt{3}}{2}$



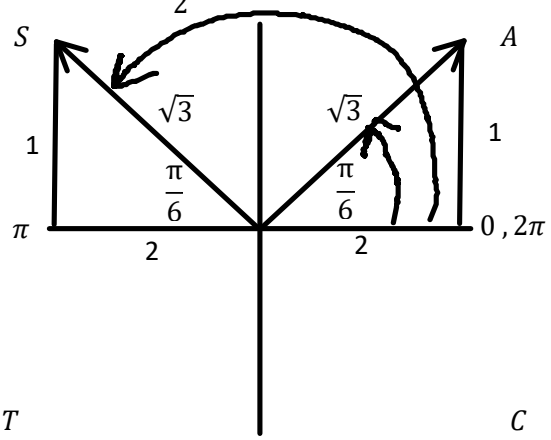
$\tan\frac{5\pi}{3} = ?$ $\tan\frac{5\pi}{3} = -\sqrt{3}$



C12 - 4.3 - $sin\theta = \frac{1}{2}$ Notes

Solve for $\theta, 0^o \leq \theta < 2\pi$.

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



$\theta_{stp} = \frac{\pi}{6}$

$\theta_{stp} = \pi - \frac{\pi}{6}$

$= \frac{6\pi}{6} - \frac{\pi}{6}$

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

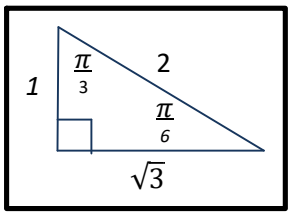
$\theta_{stp} = \frac{\pi}{6}, \frac{5\pi}{6}$

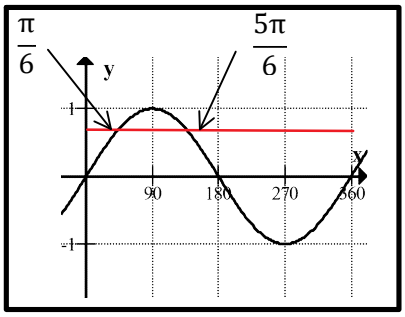
Solve for the arrows θ_{stp}

Draw two triangles where $\sin\theta$ is positive: ASTC Quadrant I, II

Label triangles based on special triangles/SOH CAH TOA
Label the reference angle according to special triangles.

Draw an arrow from the principal axis to:
The first and second terminal arm.

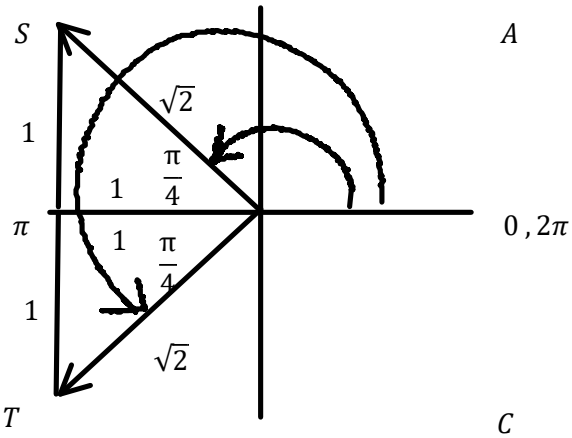




Check your answer: $\sin(\frac{\pi}{6}) = \frac{1}{2}$ $\sin(\frac{5\pi}{6}) = \frac{1}{2}$

Solve for $\theta, 0^o \leq \theta < 2\pi$ *and state the General Solution*.

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



$\theta_{stp} = \pi - \frac{\pi}{4}$

$\theta_{stp} = \frac{4\pi}{4} - \frac{\pi}{4}$

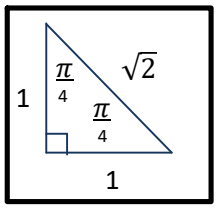
$\theta_{stp} = \frac{3\pi}{4}$

$\theta_{stp} = \pi + \frac{\pi}{4}$

$\theta_{stp} = \frac{4\pi}{4} + \frac{\pi}{4}$

$\theta_{stp} = \frac{5\pi}{4}$

$\theta_{stp} = \frac{3\pi}{4}, \frac{5\pi}{4}$



General Solution: $\theta = \theta_{stp} \pm pn, n \in I$

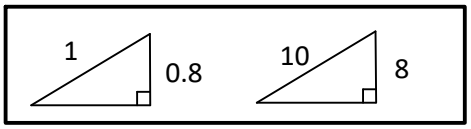
$\theta = \frac{3\pi}{4} \pm 2\pi n, n \in I$ $\theta = \frac{5\pi}{4} \pm 2\pi n, n \in I$

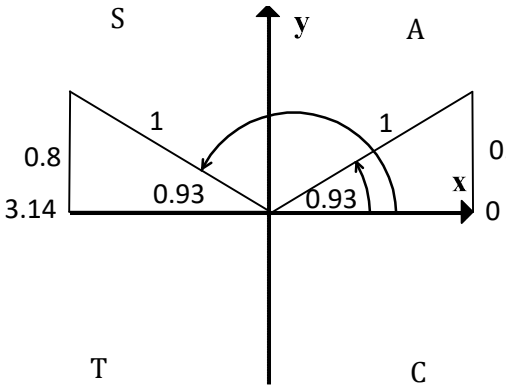
C12 - 4.3 - $sin\theta = .8$ & *Point* Notes

Solve for $\theta, 0^o \leq \theta < 2\pi$ and general solution

$\sin\theta = 0.8$

$sin\theta = \frac{0.8}{1} = \frac{8}{10}$





Draw two triangles where $\sin\theta$ is positive:
ASTC Quadrant I, II

Label the triangles according to SOH CAH TOA

$sin\theta = \frac{0.8}{1}$

$\theta_r = \sin^{-1}\left(+\frac{0.8}{1}\right)$

$\theta_r = 0.93$

Solve for θ_r: $\theta_r = \sin^{-1}(+\frac{O}{H})$

Draw an arrow from the principal axis to the first terminal arm,
draw an arrow from the principal axis to the second terminal arm.

Only inverse positives $= \theta_r$

Solve for the arrows θ_{stp}

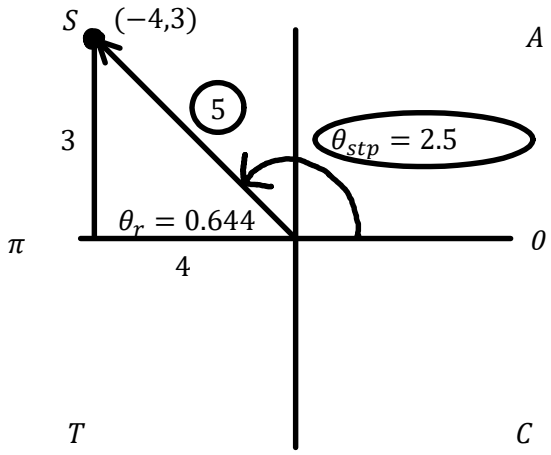
$\theta_{stp} = 0.93 \quad \theta_{stp} = \pi - 0.93 = 2.21$

Check your answer: $sin0.93 = 0.8 \quad sin2.21 = 0.8$

$\theta_{stp} = 0.93, 2.21$

General Solution: $\theta = \theta_{stp} \pm pn, n \in I$ $\quad \theta = 0.93 \pm 2\pi n, n \in I$ $\quad \theta = \theta_{stp} \pm pn, n \in I$ $\quad \theta = 2.21 \pm 2\pi n, n \in I$

Find sinx, cox, tanx, cscx, secx, and cotx for the following point. Find θ_{stp}



$sin\theta = +\frac{3}{5}$ $\quad cscx = +\frac{5}{3}$

$cos\theta = -\frac{4}{5}$ $\quad secx = -\frac{5}{4}$

$tan\theta = -\frac{3}{4}$ $\quad cotx = -\frac{4}{3}$

$a^2 + b^2 = c^2$
$3^2 + 4^2 = c^2$
$9 + 16 = c^2$
$25 = c^2$
$\sqrt{25} = \sqrt{c^2}$
$5 = c$

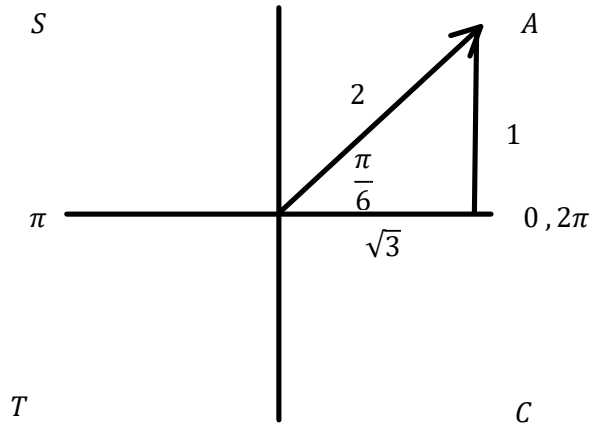
$tan\theta = \frac{O}{A}$
$tan\theta = \frac{3}{-4}$
$tan\theta = -0.75$
$\theta = \tan^{-1}(+0.75)$
$\theta = 0.644$
$\pi - 0.644 = 2.50$

Only inverse positives $= \theta_r$

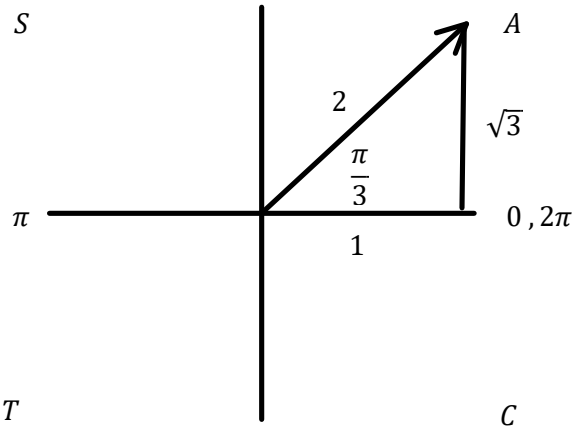
$\theta_{stp} = 2.50$

C12 - 4.3 - $csc\theta, sec\theta, cot\theta = ?$ *Notes*

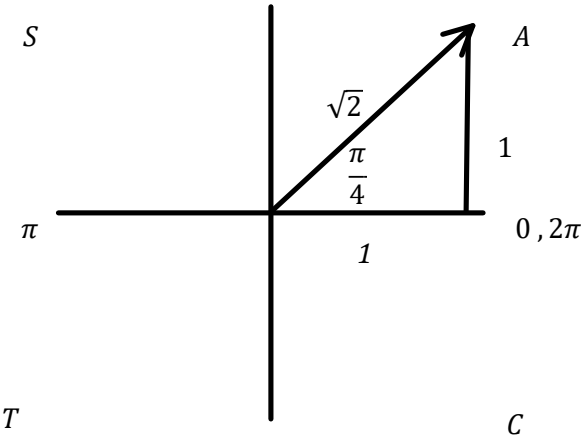
$\sec\frac{\pi}{6} = ?$ $\sec\frac{\pi}{6} = \frac{2}{\sqrt{3}}$ $\sec\frac{\pi}{6} \neq \cos\left(\frac{6}{\pi}\right)$



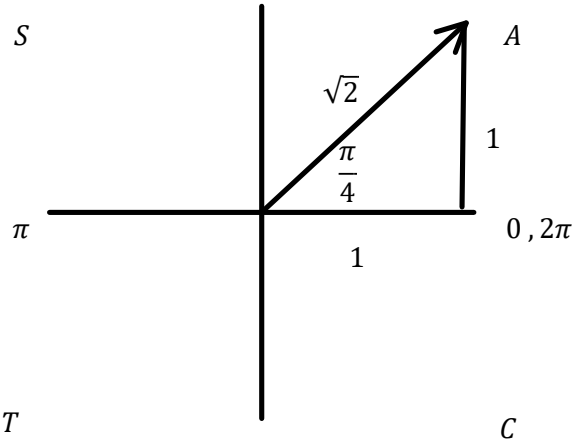
$\csc\frac{\pi}{3} = ?$ $\csc\frac{\pi}{3} = \frac{2}{\sqrt{3}}$



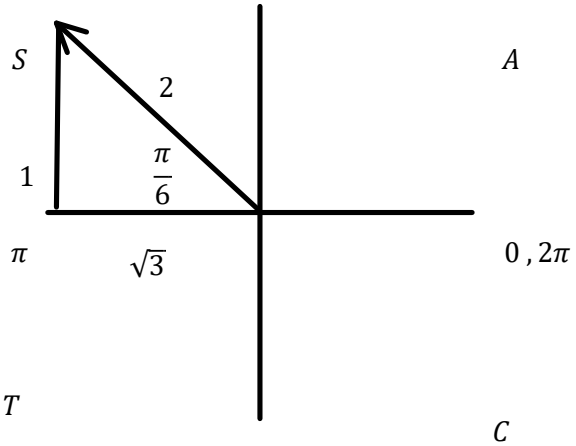
$\csc\frac{\pi}{4} = ?$ $\csc\frac{\pi}{4} = \sqrt{2}$



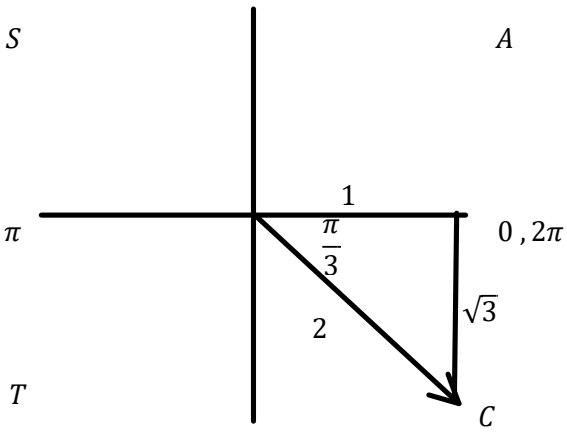
$\cot\frac{\pi}{4} = ?$ $\cot\frac{\pi}{4} = 1$



$\sec\frac{5\pi}{6} = ?$ $\sec\frac{5\pi}{6} = -\frac{2}{\sqrt{3}}$



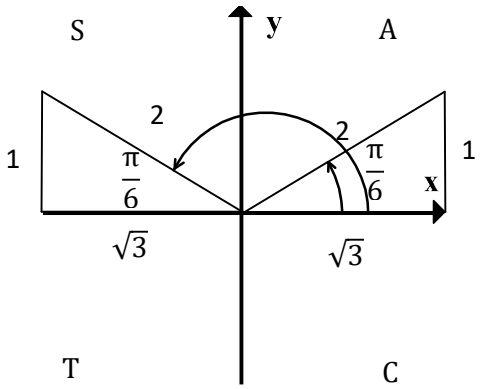
$\cot\frac{5\pi}{3} = ?$ $\cot\frac{5\pi}{3} = -\frac{1}{\sqrt{3}}$



C12 - 4.3 - $csc\theta = 2$ Notes

Solve for $\theta, 0^o \leq \theta < 2\pi$.

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

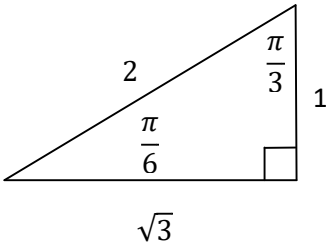


Draw two triangles where csc θ is positive:
ASTC Quadrant I, II

Label the triangles according to special triangles/SOH CAH TOA

Label the reference angle according to special triangles.

Draw an arrow from the principal axis to the first terminal arm
Draw an arrow from the principal axis to the second terminal arm.



$$\theta_{stp} = \frac{\pi}{6} \qquad \theta_{stp} = \pi - \frac{\pi}{6} = \frac{6\pi}{6} - \frac{\pi}{6} = \frac{5\pi}{6}$$

$$\theta_{stp} = \frac{\pi}{6}, \frac{5\pi}{6}$$

Solve for the arrows θ_{stp}

Check your answer:

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

$cot\theta$=0.1

$$cot\theta = \frac{0.1}{1} = \frac{1}{10}$$

$$tan\theta = \frac{1}{0.1} = \frac{10}{1}$$

$$\theta = \tan^{-1}(10)$$

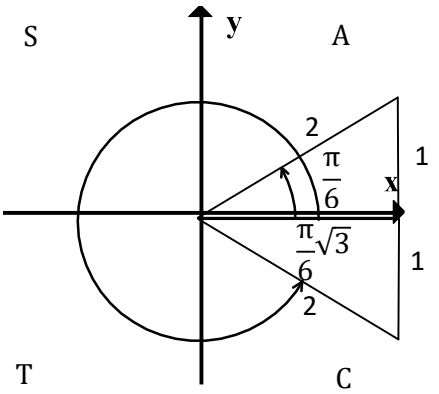
$$\theta = 84.24^0$$

...

$$\theta = 84.24, 264.29^0$$

Solve for $\theta, 0^o \leq \theta < 2\pi$ *and state the General Solution*.

$$secx = \frac{2}{\sqrt{3}} \qquad cos\theta = \frac{\sqrt{3}}{2}$$



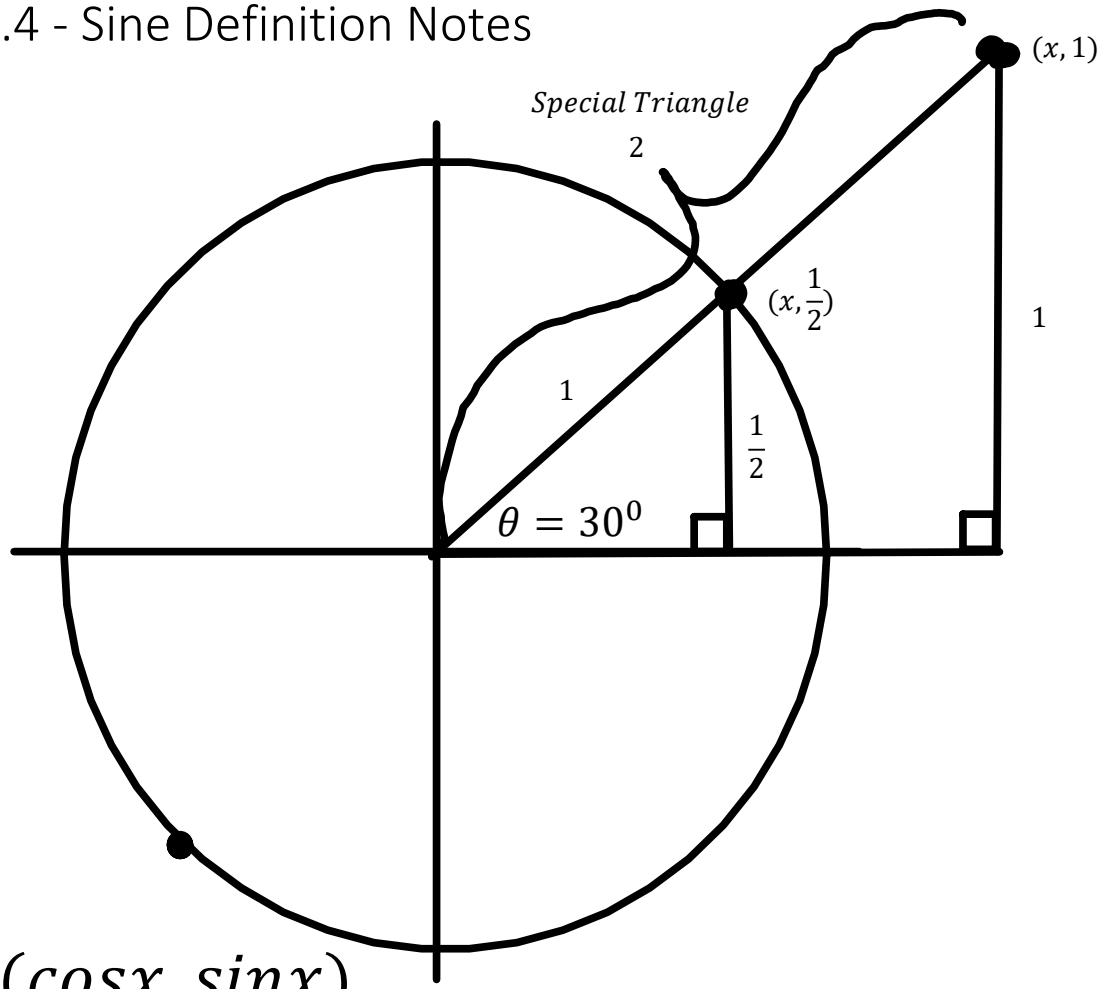
$$\theta_{stp} = \frac{\pi}{6} \qquad \theta_{stp} = 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$$

$$\theta_{stp} = \frac{\pi}{6}, \frac{11\pi}{6}$$

General Solution: $\theta = \theta_{stp} \pm pn, n \in I$

$$\theta = \frac{\pi}{6} \pm 2\pi n, n \in I \qquad \theta = \frac{11\pi}{6} \pm 2\pi n, n \in I$$

C12 - 4.4 - Sine Definition Notes



$(cosx, sinx)$

$sin\theta = \frac{O}{H}$

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

$sin\theta = \frac{O}{H}$

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

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

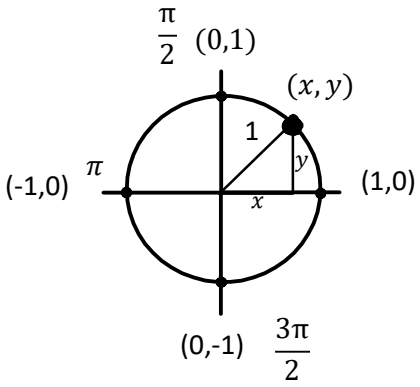
(x, y)

$(cosx, sinx)$

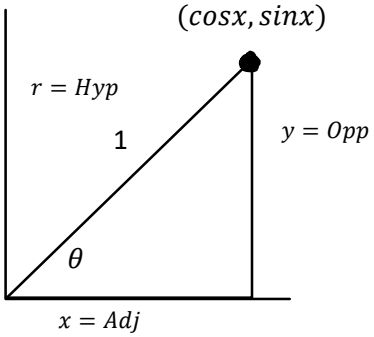
$tanx = m$

$sin\theta = y$

C11 - 4.4 - Unit Circle Quadrantal Angle Notes



$0, 2\pi$



$Radius\ of\ unit\ circle = 1$

$Hyp = 1$

$sin\theta = \frac{Opp}{Hyp}$

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

$\boxed{sin\theta = y}$

$cos\theta = \frac{Adj}{Hyp}$

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

$\boxed{cos\theta = x}$

$tan\theta = \frac{Opp}{Adj}$

$\boxed{tan\theta = \frac{y}{x}}$

$sin0 = \frac{0}{1}$

$sin0 = 0$

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

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

$cos\left(\frac{3\pi}{2}\right) = \frac{0}{1}$

$cos(\frac{3\pi}{2}) = 0$

$cos2\pi = \frac{1}{1}$

$cos2\pi = 1$

$tan0 = \frac{0}{1}$

$tan0 = 0$

$\tan(\frac{3\pi}{2}) = \frac{-1}{0}$

$tan(\frac{3\pi}{2}) = UND$

$csc\theta = \frac{Hyp}{Opp}$

$\boxed{csc\theta = \frac{1}{y}}$

$csc\theta = \frac{1}{0}$

$csc0 = und$

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

$csc0 = \frac{1}{sin0}$

$csc0 = \frac{1}{0}$

$csc\theta = und$

$sec\theta = \frac{Hyp}{Adj}$

$\boxed{sec\theta = \frac{1}{x}}$

$\boxed{sec\theta = \frac{1}{cos\theta}}$

$\sec\left(\frac{\pi}{2}\right) = \frac{1}{\cos\left(\frac{\pi}{2}\right)}$

$\sec\left(\frac{\pi}{2}\right) = \frac{1}{0}$

$\sec\left(\frac{\pi}{2}\right) = und$

$cot\theta = \frac{Adj}{Opp}$

$\boxed{cot\theta = \frac{x}{y}}$

$cot0 = \frac{0}{1}$

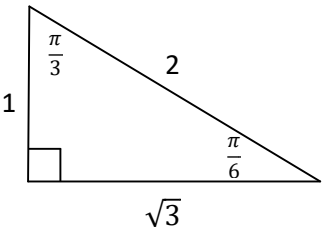
$cot0 = 0$

C12 - 4.5 - $\sin 2\theta$ ASTC Special Triangles Notes

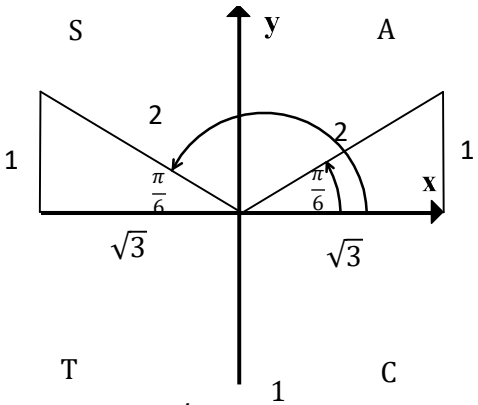
Solve for θ $0^o \le \theta < 2\pi$, *and the general solution*.

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

Let $m = 2\theta$



Draw two triangles where $\sin m$ is positive:
ASTC Quadrant I, II



Label the triangles according to special triangles and SOH CAH TOA

Label the reference angle according to special triangles.

Draw an arrow from the principal axis to the first terminal arm
Draw an arrow from the principal axis to the second terminal arm.

Solve for the arrows θ_{stp}

$sinm = \frac{1}{2}$

$m_{stp} = \frac{\pi}{6}$ $m_{stp} = \pi - \frac{\pi}{6}$

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

$m_{stp} = \frac{\pi}{6}, \frac{5\pi}{6}$

Check your answer: $\sin\frac{\pi}{6} = \frac{1}{2}$ $\sin\frac{5\pi}{6} = \frac{1}{2}$

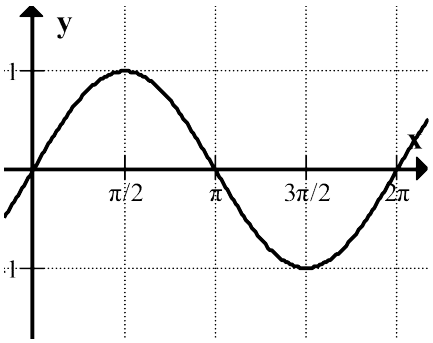
Substitute 2θ back in for m.

$m = \frac{\pi}{6}$ $m = \frac{5\pi}{6}$

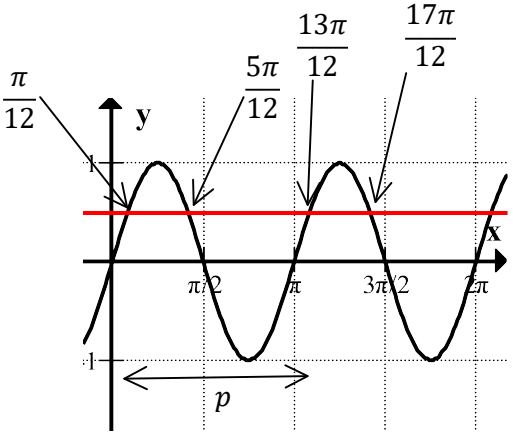
$2\theta = \frac{\pi}{6}$ $2\theta = \frac{5\pi}{6}$

$\theta = \frac{\pi}{6\times 2}$ $\theta = \frac{5\pi}{6\times 2}$

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



$y = sin\theta$



$y = sin2\theta$

$y = \frac{1}{2}$

$p = \frac{2\pi}{b}$

$p = \frac{2\pi}{2}$

$= \pi$

$\theta = \theta_{stp} \pm p$

$\theta = \frac{\pi}{12} + \pi$

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

$\theta = \theta_{stp} \pm p$

$\theta = \frac{5\pi}{12} + \pi$

$\theta = \frac{17\pi}{12}$

$\theta = \frac{13\pi}{12} + \pi$

~~$\theta = \frac{25\pi}{12} > 2\pi$~~

$\theta = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$

Add/Subtract period until outside of the domain.

General Solution:

$\theta = \theta_{stp} \pm pn, n \in I$

$\theta = \frac{\pi}{12} \pm \pi n, n \in I$

$\theta = \theta_{stp} \pm pn, n \in I$

$\theta = \frac{5\pi}{12} \pm \pi n, n \in I$

The usual number of answers in the domain times b.

C12 - 4.5 - Algebra Period Equations Notes

$0 \le \theta < 2\pi$

$2sinx + 1 = 0$
$2sinx = -1$
$sinx = -\frac{1}{2}$

$5 - 3cosx = 4$
$-3cosx = -1$
$cosx = \frac{1}{3}$

$sinx = x - 1$

$y = sinx$
$y = x - 1$

Find Intersection

$x = 1.93$

$\cos\left(\frac{\pi}{2}x\right) = 0$
$cosm = 0$

$let\ m = \frac{\pi}{2}x$

...

$m = \frac{\pi}{2}$
$\frac{\pi}{2}x = \frac{\pi}{2}$

$x = 1$

$m = \frac{3\pi}{2}$
$\frac{\pi}{2}x = \frac{3\pi}{2}$

$x = 3$

$p = \frac{2\pi}{b}$
$p = \frac{2\pi}{\frac{\pi}{2}}$
$p = 2\pi \times \frac{2}{\pi}$
$p = 4$

$x = 1 + 4$

$x = 5$

$x = 3 + 4$

$x = 7$

Reject

$\tan(x - 1) = -0.2$
$tanm = -0.2$

$let\ m = x - 1$

...

$m = 2.94$
$x - 1 = 2.94$

$x = 3.94$

$x = 3.94 - \pi$

$x = 0.80$

$m = 6.09$
$x - 1 = 6.09$

$x = 7.09$

$x = 7.09 - \pi$

$x = 3.94$

Reject

$p = \frac{\pi}{b}$
$p = \frac{\pi}{1}$
$p = \pi$

$\sin\left(\frac{\pi}{4}(x - 6)\right) = \frac{1}{2}$
$sinm = \frac{1}{2}$

$let\ m = \frac{\pi}{4}(x - 6)$

Add/Subtract period until outside of the domain.

...

$m = \frac{\pi}{6}$
$\frac{\pi}{4}(x - 6) = \frac{\pi}{6}$
$x - 6 = \frac{2}{3}$
$x = \frac{20}{3}$

$x = 6.67$

$x = 6.67 - 8$

$x = -1.33$

$m = \frac{5\pi}{6}$
$\frac{\pi}{4}(x - 6) = \frac{5\pi}{6}$
$x - 6 = \frac{10}{3}$
$x = \frac{28}{3}$

$x = 9.33$

$x = 9.33 - 8$

$x = 1.33$

The usual number of answers in the domain times b.

$p = \frac{2\pi}{b}$
$p = \frac{2\pi}{\frac{\pi}{4}}$
$p = 8$

C12 - 4.6 - Equations Algebra Notes

$sinx + sinx = 2sinx$

$5cosx - 3cosx = 2cosx$

Add/Subtract Like Terms

$3tanx = 5 + tanx$

$3m = 5 + m$

$2m = 5$

$m = 2.5$

$tanx = 2.5$

$let\ m = tanx$

....

$1 + sinx = 4sinx$

$1 + m = 4m$

$3m = 1$

$m = \frac{1}{3}$

$sinx = \frac{1}{3}$

$let\ m = sinx$

Algebra

.....

$\frac{cosx}{cosx + 1} = -\frac{1}{3}$

$\frac{m}{m + 1} = -\frac{1}{3}$

$3m = -m - 1$

$m = -\frac{1}{4}$

$cosx = -\frac{1}{4}$

$m = cosx$

$2sinx = 4$

$sinx = 2$

No Solution

$sinx = cosx$

$\frac{sinx}{cosx} = 1$

$tanx = 1$

...

$x = \frac{\pi}{4}, \frac{5\pi}{4}$

Identities

$5 - 2cscx = 0$

$5 - 2 \times \frac{1}{sinx} = 0$

$5 - \frac{2}{m} = 0$

$5 = \frac{2}{m}$

$m = \frac{2}{5}$

$m = 0.4$

$sinx = 0.4$

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

$let\ m = sinx$

....

$sinx - cscx = 0$

$sinx - \frac{1}{sinx} = 0$

$m - \frac{1}{m} = 0$

$\left(m - \frac{1}{m} = 0\right) \times m$

$m^2 - 1 = 0$

$(m + 1)(m - 1) = 0$

Identities

$let\ m = sinx$

Factor

$m = 1$

$sinx = 1$

$m = -1$

$sinx = -1$

$sinx \neq 0$

....

....

C12 - 4.6 - Factoring/Distributing Notes

$cosx(cosx+1)$

$\cos^2 x + cosx$ *Distribution*

$m(m+1)$
m^2+m

$\sin x - \sin^2 x$

$sinx(1-sinx)$ *Factor*

$\sin x - \sin^2 x$
$m - m^2$
$m(1-m)$
$m = sinx$
$sinx(1-sinx)$

$sinxcosx + cosx$

$cosx(sinx+1)$

$nm+m$ $\quad n = sinx$
$m(n+1)$ $\quad m = cosx$

$(cosx+1)(cosx-2)$

$\cos^2 x - cosx - 2$

$(m+1)(m-2)$
$m^2 - m - 2$

$(1+cosx)(1-cosx)$
$1 - cosx + cosx - \cos^2 x$

$1 - \cos^2 x$ *Distribution*

$(m+n)(m-n)$
$m^2 - n^2$

$1 - \sin^2 x$

$(1+sinx)(1-sinx)$

$1 - a^2$
$(1-a)(1+a)$

$\cos^2 x - 1$

$(cosx+1)(cosx-1)$

$a^2 - 1$
$(a+1)(a-1)$

Differences of squares

$\sin^2 x - \cos^2 x$

$(sinx+cosx)(sinx-cosx)$

$m^2 - n^2$
$(m+n)(m-n)$

$\cos^4 x - \sin^4 x$
$(\cos^2 x - \sin^2 x)(\cos^2 x + \sin^2 x)$
$(cos2x)(1)$

$cos2x$

$m^4 - n^4$
$(m^2+n^2)(m^2-n^2)$

Identities

$\sin^2\theta + \cos^2\theta = 1$
$cos2\theta = \cos^2\theta - \sin^2\theta$

$\sin^2 x + sinx - 2$

$(sinx+2)(sinx-1)$ *Factor*

$\sin^2 x + sinx - 2$
$m^2 + m - 2$
$(m+2)(m-1)$
let $m = sinx$
$(sinx+2)(sinx-1)$

$\sin^2\theta + 2sin\theta cos\theta + \cos^2\theta$
$(sin\theta + cos\theta)(sin\theta + cos\theta)$

$(cosx+sinx)^2$

$m^2 + 2mn + n^2$
$(m+n)(m+n)$

$-sinx + 1 = 1 - sinx$

$2 + sinx + \sin^2 x = \sin^2 x + sinx + 2$

Rearange order of Terms

$\sin^2 x + tanx + \cos^2 x = \sin^2 x + \cos^2 x + tanx = 1 + tanx$

C12 - 4.6 - Solving Equations Notes

$\cos^2 x + cosx = 0$

$cosx(cosx + 1) = 0$ *Factor*

$cosx = 0$

....

$x = \frac{\pi}{2}, \frac{3\pi}{2}$

$cosx + 1 = 0$

$cosx = -1$

....

$x = \pi$

$\cos^2 x + \cos x = 0$

let $m = cosx$

$m^2 + m = 0$

$m(m + 1) = 0$

Factor

$m = 0$

$cosx = 0$

...

$x = \frac{\pi}{2}, \frac{3\pi}{2}$

$m = -1$

$cosx = -1$

...

$x = \pi$

$\sin^2 x + sinx - 2 = 0$

let $m = sinx$

$m^2 + m - 2 = 0$

$(m + 2)(m - 1) = 0$

$m = -2$

$sinx = -2$

Reject

$m = 1$

$sinx = 1$

..

$x = \frac{\pi}{2}$

$-1 \leq sinx \leq 1$

$-1 \leq cosx \leq 1$

$2\sin^2 x + sinx - 1 = 0$

let $m = sinx$

$2m^2 + m - 1 = 0$

...

$(2m - 1)(m + 1) = 0$ *Factor*

$m = \frac{1}{2}$

$sinx = \frac{1}{2}$

....

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

...

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

$m = -1$

$sinx = -1$

$3cos^2 x - 8cosx - 5 = 0$

let $m = cosx$

$3m^2 - 8m - 5 = 0$

...

$m = 3.18$

$m = -.52$

Quadform

$cosx = -.52$

...

$x = 2.12$ $x = 4.16$

C12 - 4.6 - Identities Chapter 6 Notes

$$sin2x + cosx = 0$$
$$2sinxcosx + cosx = 0$$
$$cosx(2sinx - 1) = 0$$

Identities

$$sin2\theta = 2sin\theta cos\theta$$

$cosx = 0$

$2sinx - 1 = 0$

$sinx = \frac{1}{2}$

.....

$$sinx - \cos^2 x - 1 = 0$$
$$sinx - (1 - \sin^2 x) - 1 = 0$$
$$sinx - 1 + \sin^2 x - 1 = 0$$
$$\sin^2 x + sinx - 2 = 0$$

Identities

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

$$sinx + cos2x = 0$$
$$sinx - (1 - 2\sin^2 x) = 0$$
$$2\sin^2 x + sinx - 1 = 0$$

....

Identities

$$cos2x = 1 - 2\sin^2 x$$

$$\frac{cosx}{cosx + 1} = -\frac{1}{3}$$
$$\frac{m}{m + 1} = -\frac{1}{3}$$
$$3m = -m - 1$$
$$m = -\frac{1}{4}$$
$$cosx = -\frac{1}{4}$$

$$1 + cosx = sinx$$
$$(1 + cosx)^2 = (sinx)^2$$
$$1 + 2cosx + \cos^2 x = \sin^2 x$$
$$1 + 2cosx + \cos^2 x = 1 - \cos^2 x$$
$$2\cos^2 x + 2cosx = 0$$
$$2cosx(cosx + 1) = 0$$

$cosx = 0$

....

$cosx = -1$

....

$$cosxcos2x - sinxsin2x = -1$$
$$cosxcos2x - sinxsin2x = -1$$
$$\cos(2x + x) = -1$$
$$cos3x = 1$$

....

$$\cos(\alpha + \beta) = cos\alpha cos\beta - sin\alpha sin\beta$$

Identities

Any Denominator ever can't equal zero!

C12 - 4.7 - NPV Trig Notes

$0 \le \theta < 2\pi$ General Solution

$\frac{1}{cos\theta}$ $\frac{tan\theta}{\frac{sin\theta}{cos\theta}}$ $\frac{sec\theta}{\frac{1}{cos\theta}}$ $cos\theta \neq 0$ $\theta \neq \frac{\pi}{2}, \frac{3\pi}{2}$ $\theta \neq \frac{\pi}{2} + \pi n, nEI$ $cos\theta = y$

$p = \frac{3\pi}{2} - \frac{\pi}{2} = \pi$

$\frac{1}{sin\theta}$ $\frac{cot\theta}{\frac{cos\theta}{sin\theta}}$ $\frac{csc\theta}{\frac{1}{sin\theta}}$ $sin\theta \neq 0$ $\theta \neq 0, \pi$ $\theta \neq \pi n, nEI$ $sin\theta = y$

$\frac{1}{tan\theta}$

$\frac{1}{\frac{sin\theta}{cos\theta}}$ $sin\theta \neq 0$, $cos\theta \neq 0$ ...

$\frac{1}{cot\theta}$

$\frac{1}{\frac{cos\theta}{sin\theta}}$ $sin\theta \neq 0$, $cos\theta \neq 0$ ...

Any denominator or any part of a fraction that will make a denominator zero.

$\frac{1}{cos\theta + 1}$ $cos\theta + 1 \neq 0$, $cos\theta \neq -1$ $\theta \neq \pi$ $\theta \neq \pi + 2\pi n, nEI$

$\frac{1}{sin\theta - \frac{1}{2}}$ $sin\theta - \frac{1}{2} \neq 0$, $sin\theta \neq \frac{1}{2}$ ...

$\frac{1}{\cos^2 x - 1}$ $\cos^2 x - 1 \neq 0$, $\sin^2 x \neq 1$, $sinx \neq \pm 1$ ...

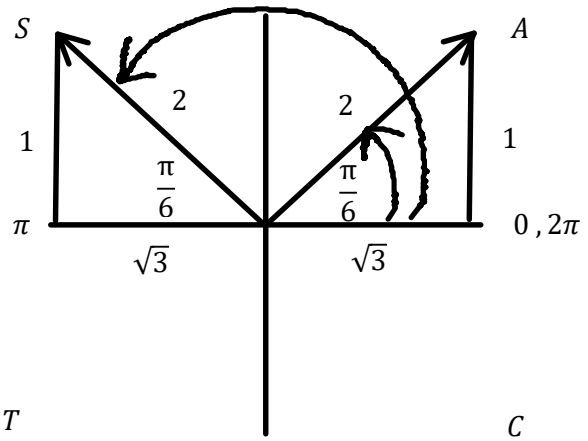
$\frac{1}{\sin^2 x + 1}$ $\sin^2 x + 1 \neq 0$, $\sin^2 x \neq -1$, $sinx \neq \sqrt{-1}$ No Restrictions

C12 - 4.7 - ASTC General Solutions

$\theta = \theta_{stp} \pm pn, n \in I$

Solve for $\theta, 0 \leq \theta < 2\pi$, *and find general solution.*

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

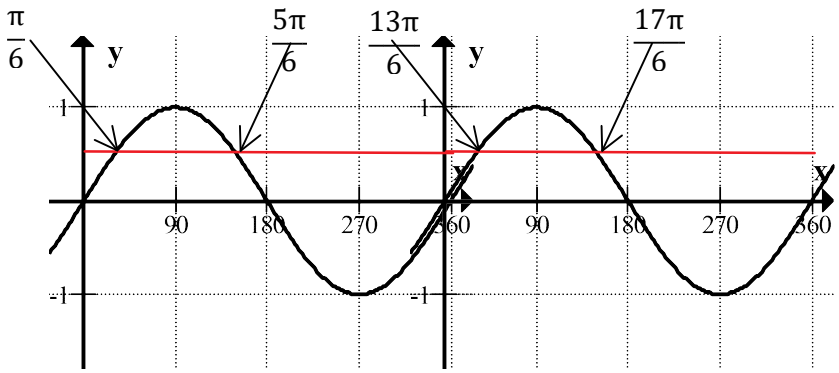


$\theta = \frac{\pi}{6}$

$\theta = \frac{5\pi}{6}$

$\theta = \frac{\pi}{6} + 2\pi n, nEI$

$\theta = \frac{5\pi}{6} + 2\pi n, nEI$



$\theta = \frac{\pi}{6} + 2\pi$

$\theta = \frac{\pi}{6} + \frac{12\pi}{6}$

$\theta = \frac{13\pi}{6}$

$\theta = \frac{5\pi}{6} + 2\pi$

$\theta = \frac{5\pi}{6} + \frac{12\pi}{6}$

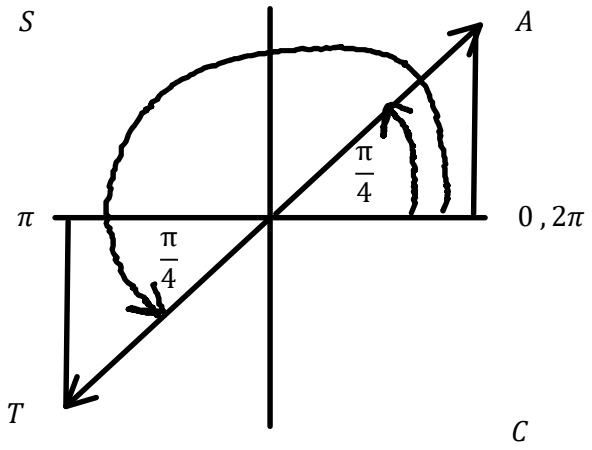
$\theta = \frac{17\pi}{6}$

C12 - 4.7 - ASTC Reject General Solutions

$\theta = \theta_{stp} \pm pn, n \in I$

Solve for $\theta, 0 \leq \theta < 2\pi$, *and find general solution.*

$tan\theta = 1$

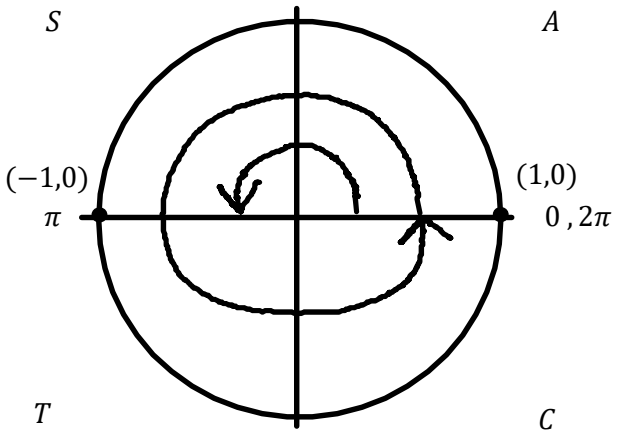


$\theta = \frac{\pi}{4}$ $\theta = \frac{5\pi}{4}$

$\theta = \frac{\pi}{4} + \pi n, nEI$ ~~$\theta = \frac{5\pi}{4} + \pi n, nEI$~~

$\frac{\pi}{4}, \frac{5\pi}{4}, \ldots$ $\frac{\pi}{4} + p + p + p \ldots$

$sin\theta = 0$

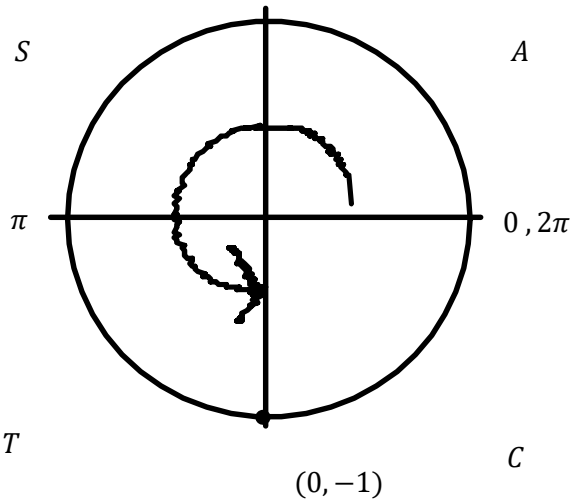


$\theta = 0$ $\theta = \pi$

$\theta = 0 + 2\pi n, nEI$ $\theta = \pi + 2\pi n, nEI$

$\theta = \pi n, nEI$

$sin\theta = -1$

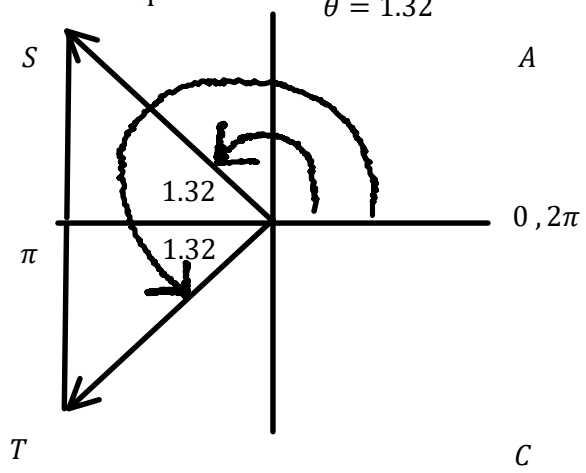


$\theta = \frac{3\pi}{2}$

$\theta = \frac{3\pi}{2} + 2\pi n, nEI$

$cos\theta = -\frac{1}{4}$ $\theta = \cos^{-1}(\frac{1}{4})$

$\theta = 1.32$



$\theta = 1.82$ $\theta = 4.46$

$\theta = 1.82 + 2\pi n, nEI$ $\theta = 4.46 + 2\pi n, nEI$

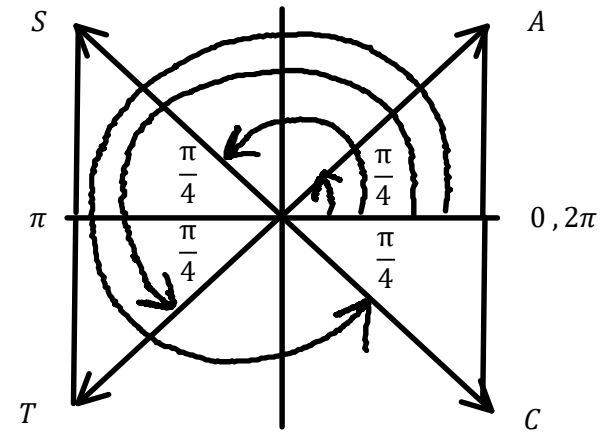
C12 - 4.7 - Square Root General Solutions

$\theta = \theta_{stp} \pm pn, n \in I$

Solve for $\theta, 0 \leq \theta < 2\pi$, *and find general solution.*

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

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



$\theta = \frac{\pi}{4}$ $\theta = \frac{3\pi}{4}$ $\theta = \frac{5\pi}{4}$ $\theta = \frac{7\pi}{4}$

$\theta = \frac{\pi}{4} + \frac{\pi}{2}n, nEI$

$$\tan^2\theta = 1$$

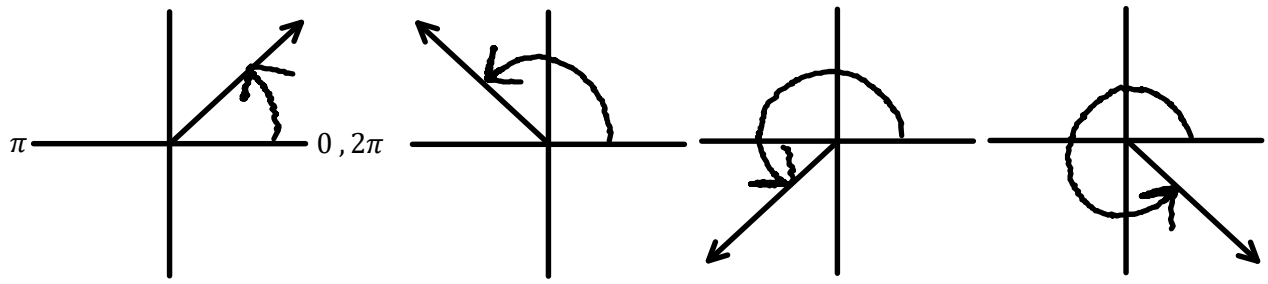
$$\frac{\sin^2\theta}{\cos^2\theta} = 1$$

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

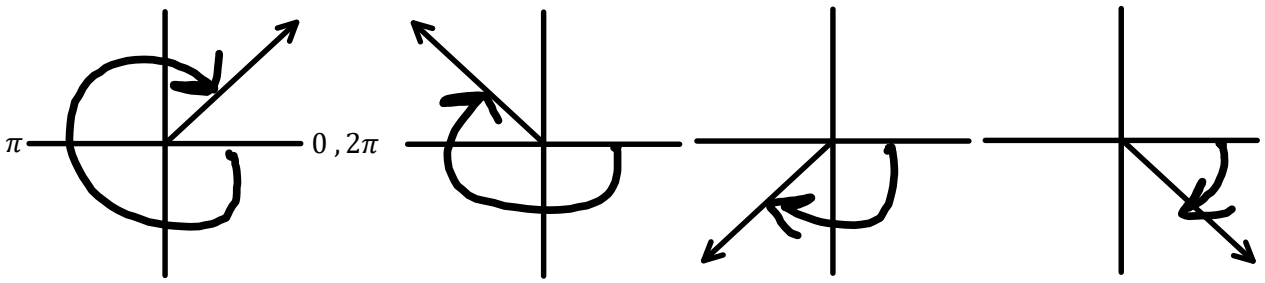
$\theta = \frac{\pi}{4} + \frac{\pi}{2}n, nEI$

C12 - 4.7 - Domain Change Notes

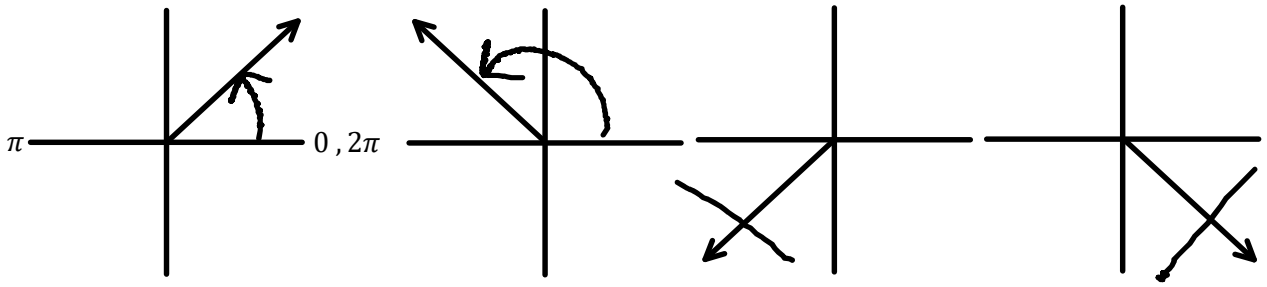
$0 \leq \theta < 2\pi$



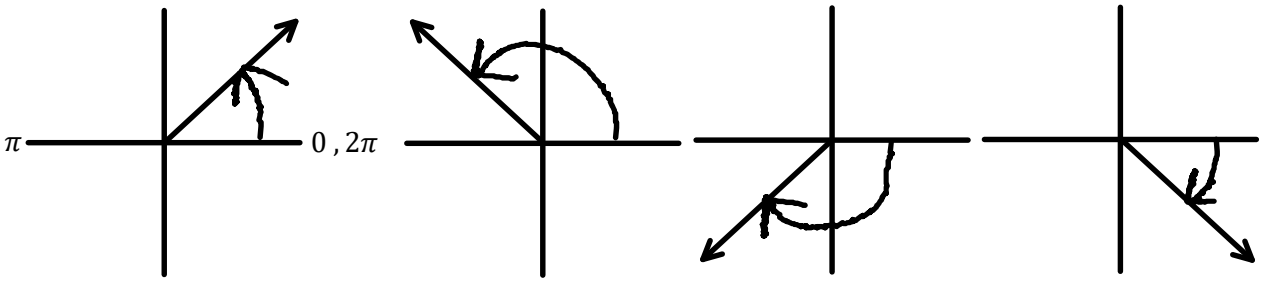
$-2\pi \leq \theta < 0$



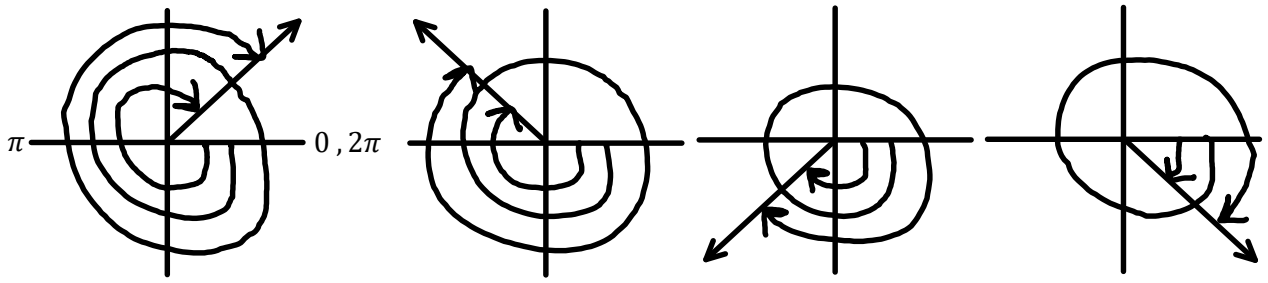
$0 \leq \theta < \pi$



$-\pi \leq \theta < \pi$

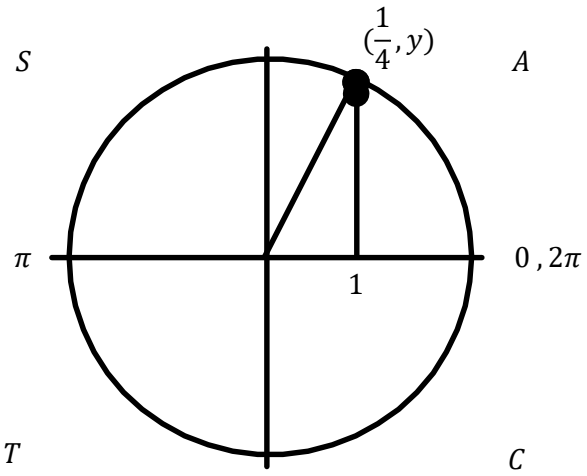


$-4\pi \leq \theta < 0$

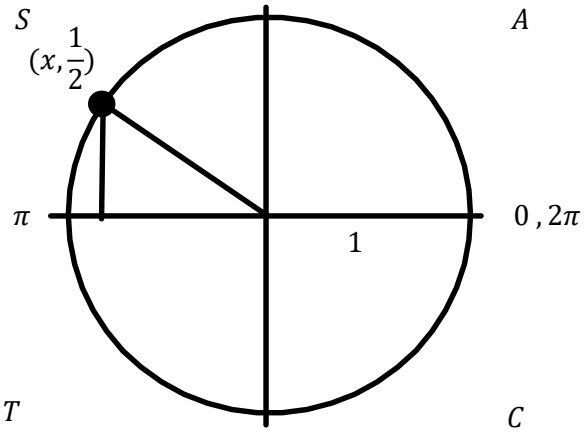


C12 - 4.8 - Solve (x,y) Unit Circle Notes

Solve the point on the unit circle



$$x^2 + y^2 = 1$$
$$\left(\frac{1}{4}\right)^2 + y^2 = 1$$
$$\frac{1}{16} + y^2 = \frac{16}{16}$$
$$y^2 = \frac{15}{16}$$
$$y = \pm\frac{\sqrt{15}}{4} \qquad \left(\frac{1}{4}, \frac{\sqrt{15}}{4}\right)$$



$$x^2 + y^2 = 1$$
$$x^2 + \left(\frac{1}{2}\right)^2 = 1$$
$$x^2 + \frac{1}{4} = \frac{4}{4}$$
$$x^2 = \frac{3}{4}$$
$$x = \pm\frac{\sqrt{3}}{2} \qquad \left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$$

Is the point on the unit circle

$(-\frac{3}{4}, \frac{1}{4})$

$$x^2+y^2 = 1$$
$$\left(-\frac{3}{4}\right)^2 + \left(\frac{1}{4}\right)^2 \neq 1$$
$$\frac{9}{16} + \frac{1}{16} \neq 1$$
$$\frac{10}{16} \neq 1$$

Not on Unit Circle

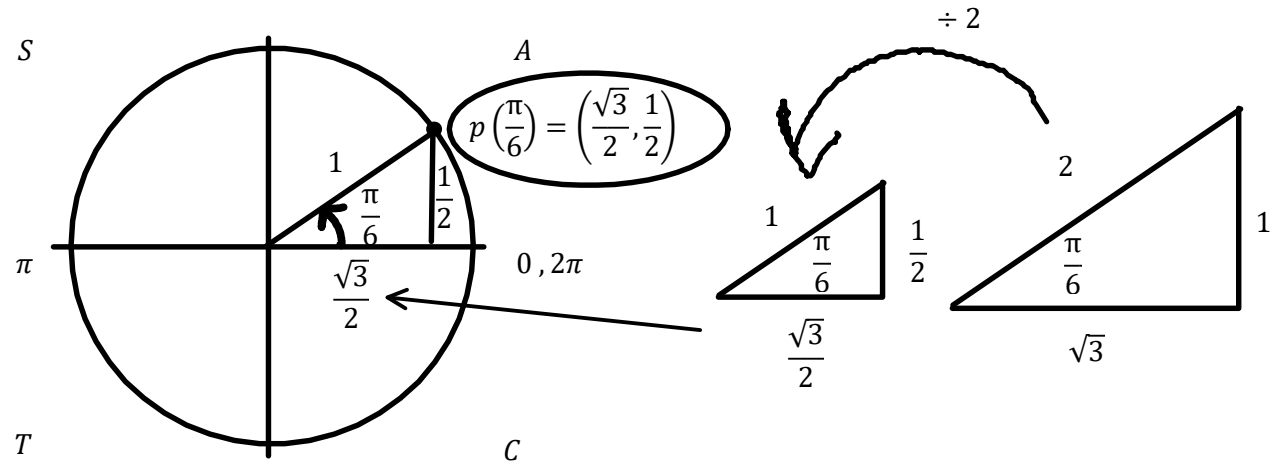
$(-\frac{\sqrt{3}}{2}, -\frac{1}{2})$

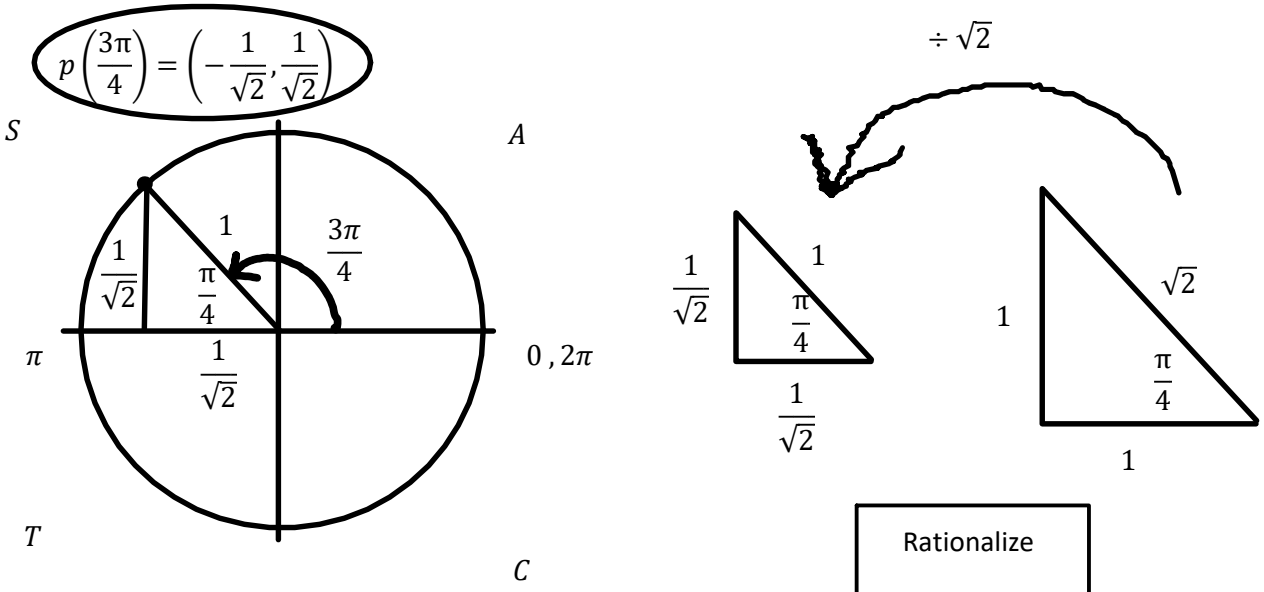
$$x^2+y^2 = 1$$
$$\left(-\frac{\sqrt{3}}{2}\right)^2 + \left(-\frac{1}{2}\right)^2 = 1$$
$$\frac{3}{4} + \frac{1}{4} = 1$$
$$1 = 1$$

On Unit Circle

C12 - 4.8 - Solve p(θ) Unit Circle Notes

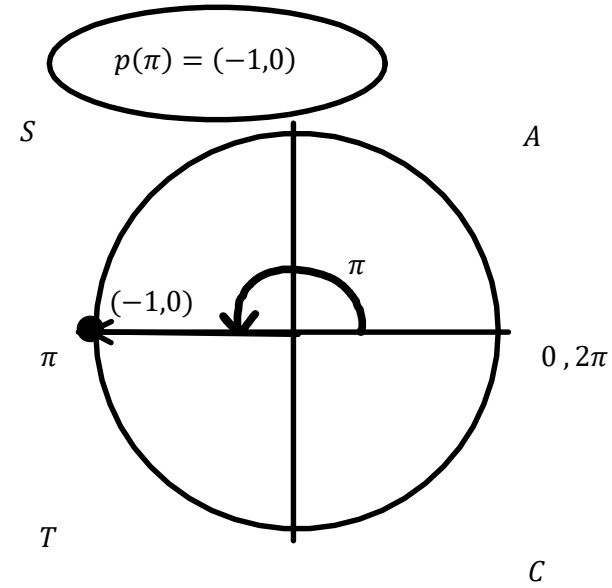
Solve the point on the unit circle





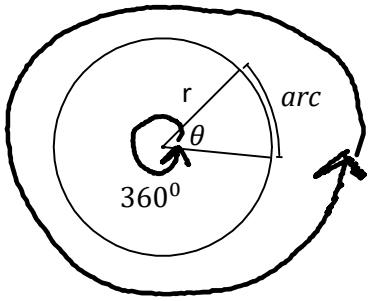
Rationalize

$$\frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$



C12 - 4.9 - Arc Length, Sector Area Notes

θ *in radians*



$Circumference$

$$\frac{arc\ length}{Circumference} = \frac{\theta}{360^o}$$ Grade 8-11

$$\frac{arc\ length}{Circumference} = \frac{\theta}{2\pi}$$

$$\frac{a}{2\pi r} = \frac{\theta}{2\pi}$$

$$\cancel{2\pi} \times \frac{a}{\cancel{2\pi} r} = \frac{\theta}{\cancel{2\pi}} \times \cancel{2\pi}$$

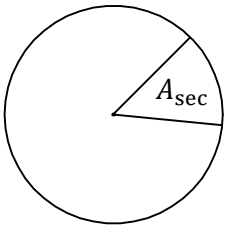
$$\frac{a}{r} = \theta$$

$$\cancel{r} \times \frac{a}{\cancel{r}} = \theta \times r$$

$$a = \theta r$$

$$a = \theta r$$ θ *must be in radians*

Sector Area



$$\frac{Area_{sector}}{Area_{Total}} = \frac{arc\ length}{Circumference}$$

$$\frac{A_{\text{sec}}}{\pi r^2} = \frac{a}{2\pi r}$$

$$A_{sec} = \frac{ar}{2}$$

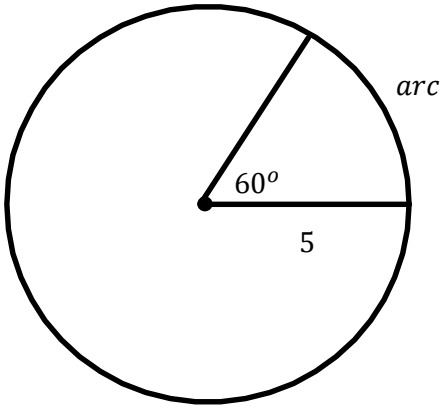
$$A = \frac{\theta r^2}{2}$$

$$A = \frac{ar}{2}$$

$$\frac{A_{\text{sec}}}{\pi r^2} = \frac{a}{2\pi r} = \frac{\theta}{360^o} = \frac{\theta}{2\pi}$$ They are all equal to each other.

C12 - 4.9 - Arc Length Notes

Find the arc length

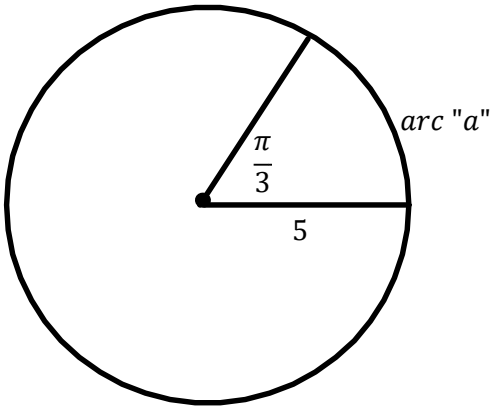


$$\frac{a}{C} = \frac{\theta}{360}$$
$$\frac{a}{2\pi r} = \frac{60}{360}$$
$$a = \frac{\pi(5)}{3}$$
$$a = 5.24$$

$C = 2\pi r$
$C = 2\pi \times 5$
$C = 31.4$

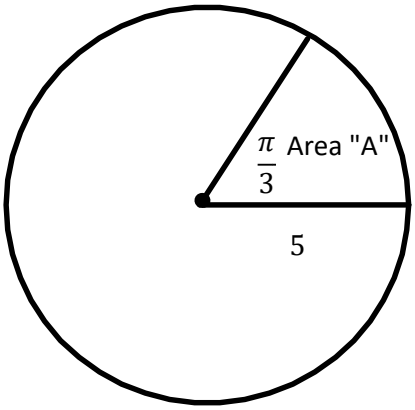
$\frac{60^o}{360^o} = \frac{1}{6}$ *of circle*

$\frac{1}{6} \times 31.4 = 5.2$



$$a = \theta r$$
$$a = \frac{\pi}{3} \times 5$$
$$a = 5.24$$

Find the Area pf the Sector



$$\frac{Area_{sector}}{Area_{Total}} = \frac{\theta}{2\pi}$$
$$\frac{A_{\text{sec}}}{\pi r^2} = \frac{\theta}{2\pi}$$
$$A_{sec} = \frac{\theta r^2}{2}$$
$$A_{sec} = \frac{\left(\frac{\pi}{3} \times 5^2\right)}{2}$$
$$A_{sec} = 13.09$$

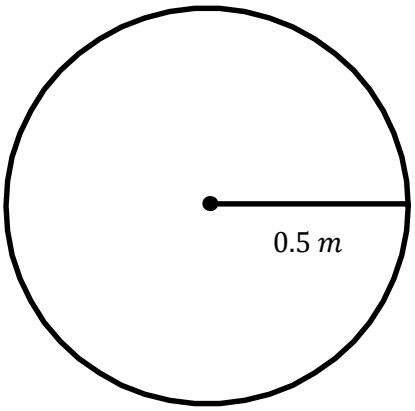
$A = \pi r^2$
$A = \pi(5)^2$

$A = 78.54$

$\frac{1}{6} \times 78.54 = 13.09$

C12 - 4.9 - Angular Velocity Notes

Find the angular velocity of a wheel travelling 25 meters per second if the radius 0.5 meters. Find the arc in 0.1 seconds.



$w = \frac{\theta}{t}$ *Angular Velocity* "w"

$C = 2\pi r$
$C = 2\pi(0.5)$
$C = 3.14\ m$

$1\ Rev = 2\pi$

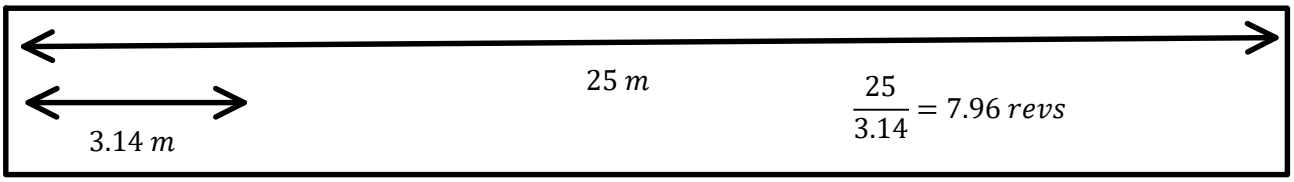
$w = \frac{v}{C} \times 2\pi$

$w = \frac{v}{r}$

$\frac{25m}{s} \times \frac{1\ revolution}{3.14m} = 7.96\frac{Rev}{s}$

$7.96 \times \frac{2\pi}{s} = 15.92\frac{Rad}{s}$

$w = 15.92\pi\frac{Rad}{s}$



$\frac{25}{3.14} = 7.96\ revs$

$25\frac{m}{s} \Rightarrow 0.04\frac{s}{m}$ $\frac{25}{1} \Rightarrow \frac{1}{25} = 0.04$

$15.92\pi\frac{Rad}{s} \times 0.1\ s = 5\ Rad$ $w = \frac{\theta}{t}$

$a = \theta r$
$a = 5(0.5)$

$a = 2.5\ m$

$\frac{25m}{s} \times \frac{1\ revolution}{3.14m} = 7.96\frac{Rev}{s}$ $1\ Rev = 360^0$

$7.96 \times \frac{360^0}{s} = 2865.6\frac{o}{s}$ $w = 2865.6\frac{o}{s}$ $w = \frac{v}{C} \times 360^0$

$25\frac{m}{s} \times 0.1\ s = 2.5\ m$ $d = vt$