IB Math 1 Sector Area and Arc Length

$180° = \pi$ radians.

$90° = \frac{\pi}{2}$ rad.

$60° = \frac{\pi}{3}$ rad.

$45° = \frac{\pi}{4}$ rad

$30° = \frac{\pi}{6}$ rad.

Example 1

Find the length of the arc with central angle 125° in a circle with radius 40 cm. Give an exact answer and ~~round to 3 decimal places~~.

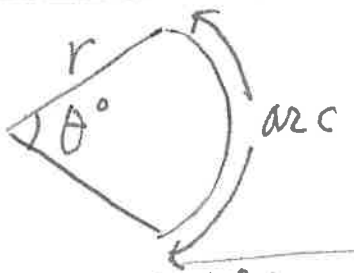
$180° : \pi$ rad

$125° : X$ rad

$180X = 125\pi$

$X \text{ rad} = \frac{125\pi}{180} = \frac{25\pi}{36}$

$\ell = \left(\frac{25\pi}{36}\right)(40) = \frac{250\pi}{9}$ cm



Area $= \left(\frac{\theta°}{360°}\right)(\pi r^2)$

$= \frac{1}{2}\theta r^2$ (θ radians)

Example 2

A sector has radius 6 inches and central angle $\frac{4\pi}{3}$ radians.

Find the area of the sector exactly and ~~rounded to 3 decimal places~~.

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

$= \frac{2 \cdot 36\pi}{3} = 24\pi \text{ in}^2$

Length of an arc.

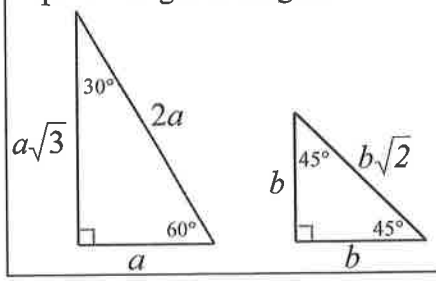
$\ell = \left(\frac{\theta°}{360°}\right)(2\pi r)$

$\ell = \theta r$ (θ radians)

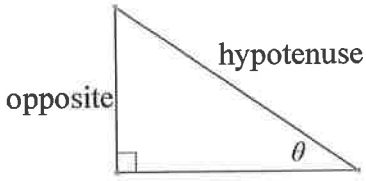
Warm Up: Right Triangles, Degrees and Radians

➔ Copy this information into your notes.

Special Right Triangles



Right Triangle Trigonometry



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

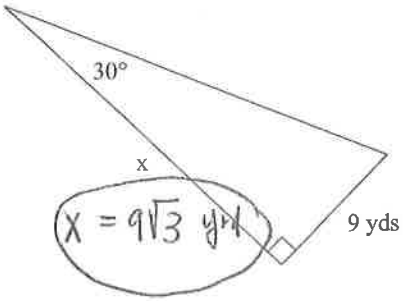
$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

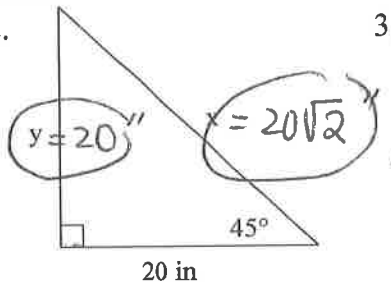
Trigonometric Function	Inverse Trigonometric Function
$y = \sin x$	$x = \sin^{-1} y$ or $x = \arcsin y$
$y = \cos x$	$x = \cos^{-1} y$ or $x = \arccos y$
$y = \tan x$	$x = \tan^{-1} y$ or $x = \arctan y$

Solve for x and y. No Calculator!

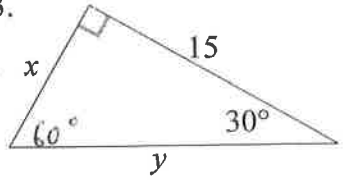
1.



2.



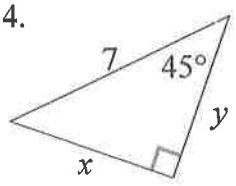
3.



$x = \frac{15}{\sqrt{3}} = 5\sqrt{3}$

$y = 10\sqrt{3}$

4.

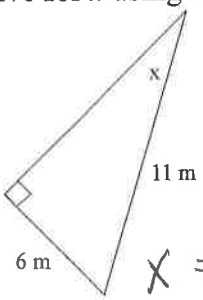


$x = \frac{7}{\sqrt{2}} = \frac{7\sqrt{2}}{2}$

$y = \frac{7}{\sqrt{2}} = \frac{7\sqrt{2}}{2}$

Solve for x using right triangle trigonometry definitions. Calculator Allowed.

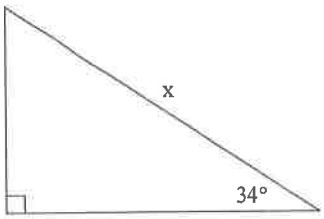
5.



$x = \sin^{-1}\left(\frac{6}{11}\right)$

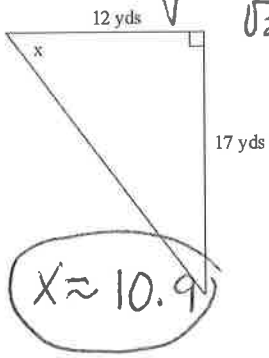
$\approx 33.1°$

6.



$\cos 34° = \frac{9}{x}$

7.

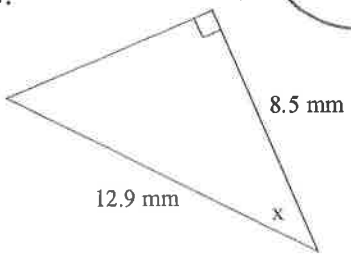


$x \approx 10.9$

$x \approx \tan^{-1}\left(\frac{17}{12}\right)$

$54.8°$

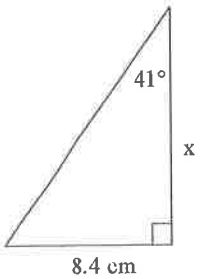
8.



$x = \arccos\left(\frac{8.5}{12.9}\right)$

$\approx 48.8°$

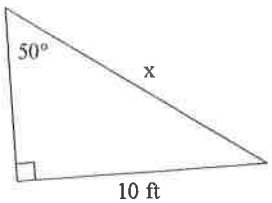
9.



$\tan 41° = \frac{8.4}{x}$

$x = \frac{8.4}{\tan 41°} \approx 9.66\text{ cm}$

10.

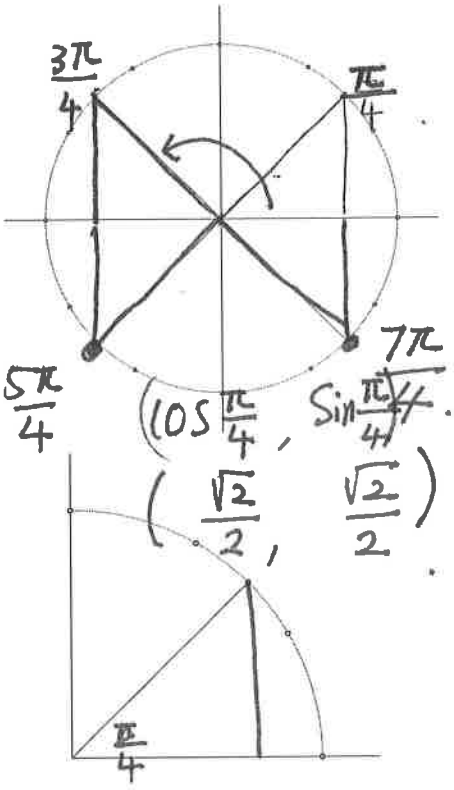


$\sin 50° = \frac{10}{x}$

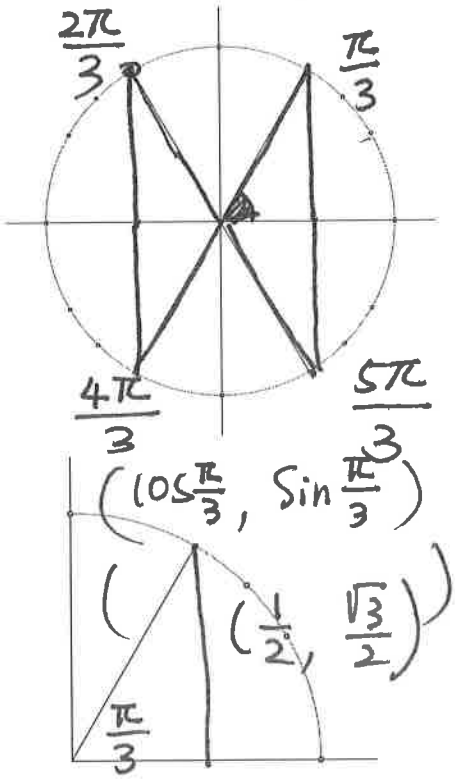
$x \approx 13.1\text{ ft}$

IB Math 1 Creating the Unit Circle Name_____

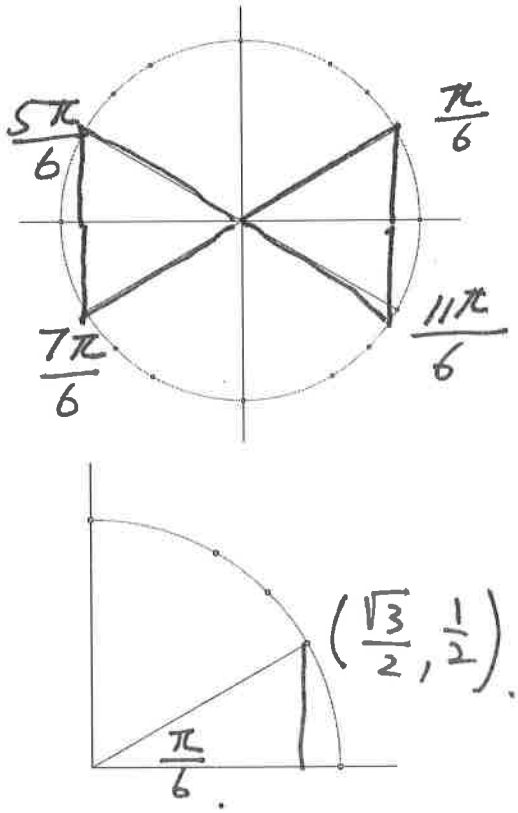
Multiples of $\frac{\pi}{4} = 45^\circ$



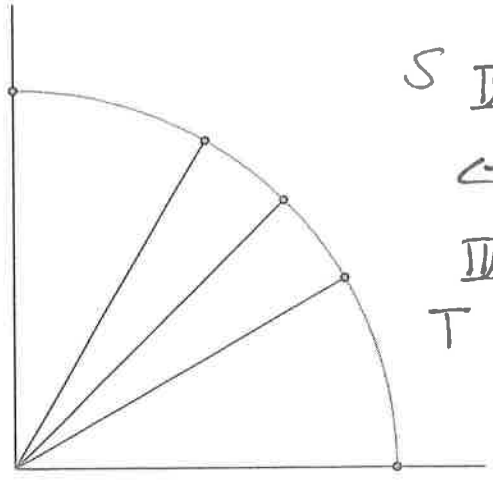
Multiples of $\frac{\pi}{3} = 60^\circ$



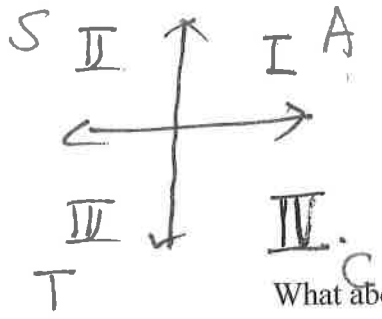
Multiples of $\frac{\pi}{6} = 30^\circ$



Fill in the coordinates for the first quadrant.



List patterns that you notice:



What about the rest of the unit circle?

- Coordinates depend on $(\cos\theta, \sin\theta)$
- Signs depend on Quadrant.

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

Definition for sine, cosine, and tangent:

When θ is drawn in standard position on the unit circle and its terminal ray intersects the unit circle at (x, y), then $\cos\theta = x$, $\sin\theta = y$, $\tan\theta = \frac{y}{x}$.

1. $\sin\frac{5\pi}{6} = \frac{1}{2}$ 2. $\cos\frac{5\pi}{6} = -\frac{\sqrt{3}}{2}$ 3. $\sin\frac{3\pi}{2} = -1$ 4. $\tan\frac{7\pi}{4} = -1$ 5. $\tan\frac{\pi}{2} = \frac{1}{0} =$ undefined

$\tan\left(\frac{\pi}{4}\right) = 1$