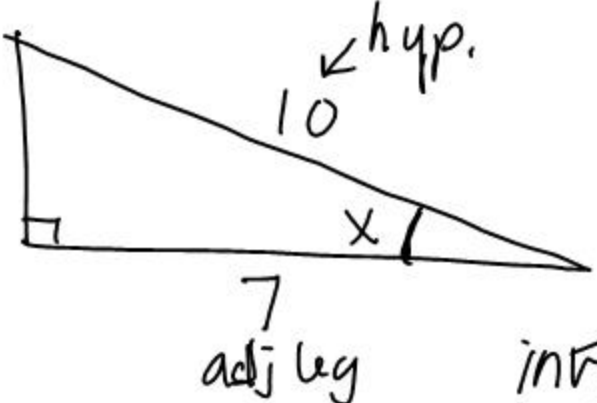


Two kinds of trig problems from Geometry

- ① Given 2 sides of a right triangle,
find the acute angles.

Ex.



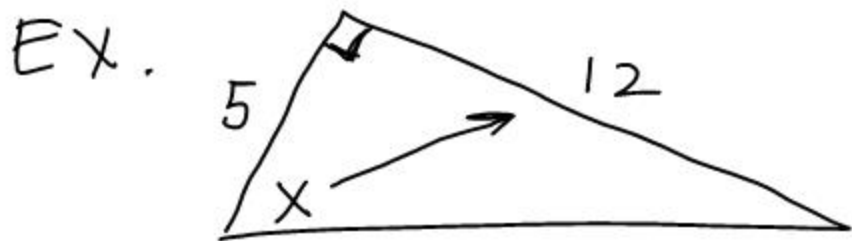
$\cos x = \frac{7}{10}$

$x = \cos^{-1}\left(\frac{7}{10}\right)$

$= \underline{\underline{45.6^\circ}}$

inverse cosine

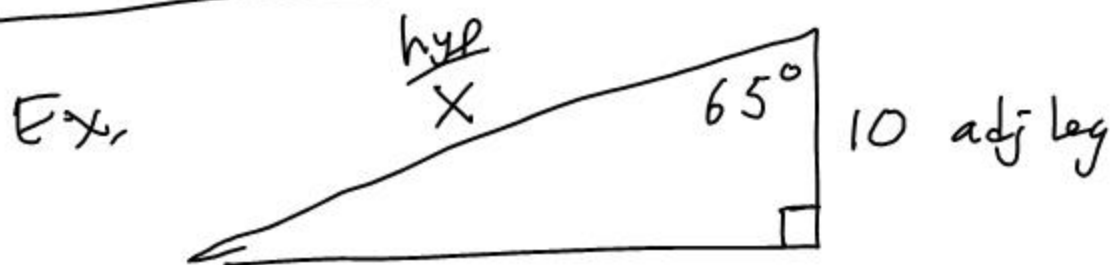
$\text{sine} = \frac{\text{opposite leg}}{\text{hypotenuse}}$	<u>S</u> <u>O</u> <u>H</u>
$\text{cosine} = \frac{\text{adjacent leg}}{\text{hypotenuse}}$	<u>C</u> <u>A</u> <u>H</u>
$\text{tangent} = \frac{\text{opposite leg}}{\text{adjacent leg}}$	<u>T</u> <u>O</u> <u>A</u>



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

$$x = 67.4^\circ$$

② Given 1 side and an acute angle in a right triangle, find the other sides.

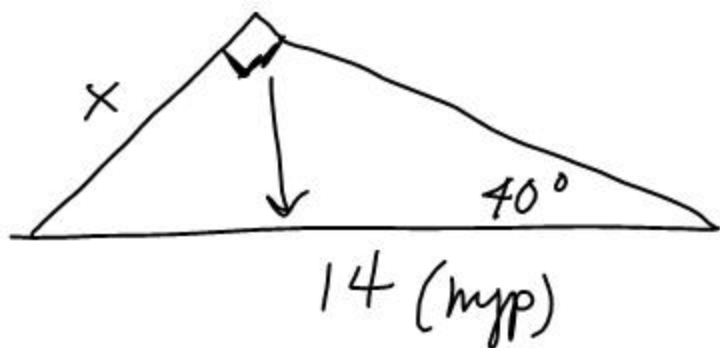


$$\cos 65^\circ = \frac{10}{x}$$

$$x \cdot \cos 65^\circ = 10$$

$$x = \frac{10}{\cos 65^\circ} = 23.7$$

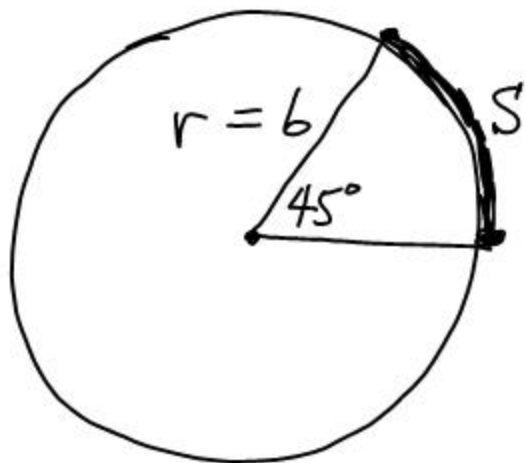
Ex.



$$\sin 40^\circ = \frac{x}{14}$$

$$x = 14 \cdot \sin 40^\circ = 9.0$$

Radian Measure for Angles



$$\text{Circumference} = 2\pi r$$

Convert the 45° angle measure to radian measure.

$$s = \text{arc length}$$

$$= \frac{45}{360} \cdot \underbrace{2\pi \cdot 6}_C$$

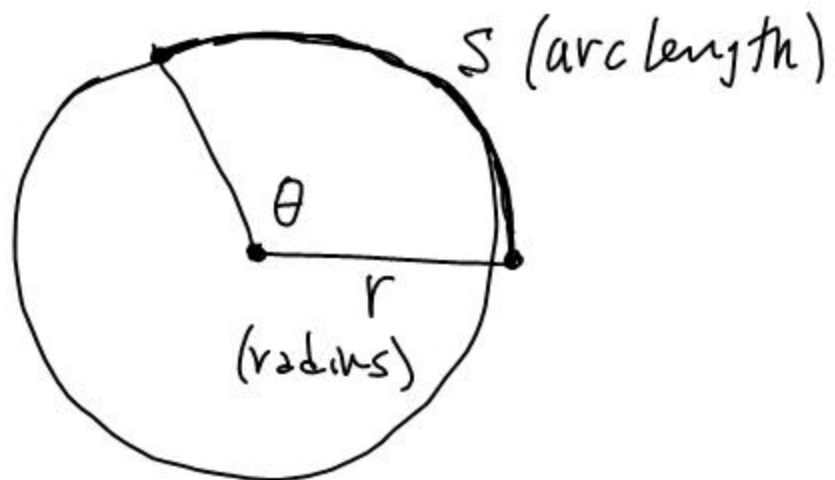
fraction
of the circumference

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

The radian measure of the 45° angle is

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

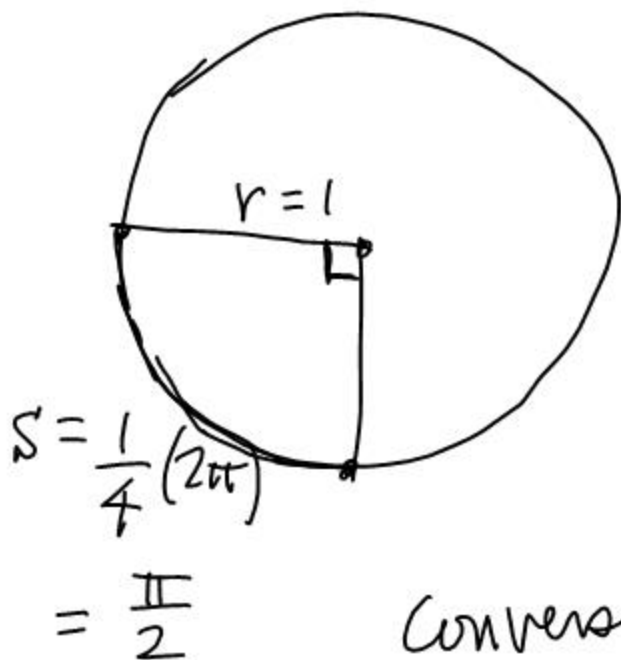
$$\frac{\frac{3}{2}\pi}{6}$$



θ theta
 α alpha
 β beta
 γ gamma

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

EX. Convert 90° to radians.



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

$$180^\circ = \pi$$

Conversion factors: $\frac{180^\circ}{\pi}$ or $\frac{\pi}{180^\circ}$

Convert 15° to radians.

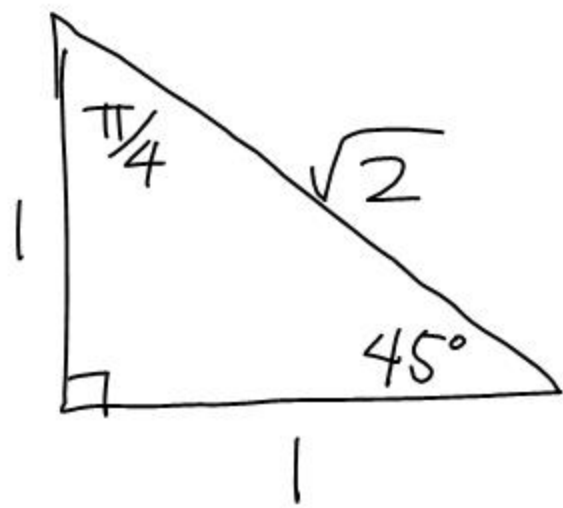
$$15^\circ \cdot \frac{\pi}{180^\circ} = \frac{\pi}{12}$$

Convert $\frac{5\pi}{6}$ to degrees.

$$\frac{5\pi}{6} \cdot \frac{180^\circ}{\pi} = 150^\circ$$

degrees	radians	degrees	radians
0°	0	180°	π
30°	$\pi/6$	210°	$7\pi/6$
45°	$\pi/4$	225°	$5\pi/4$
60°	$\pi/3$	240°	$4\pi/3$
90°	$\pi/2$	270°	$3\pi/2$
120°	$2\pi/3$	300°	$5\pi/3$
135°	$3\pi/4$	315°	$7\pi/4$
150°	$5\pi/6$	330°	$11\pi/6$

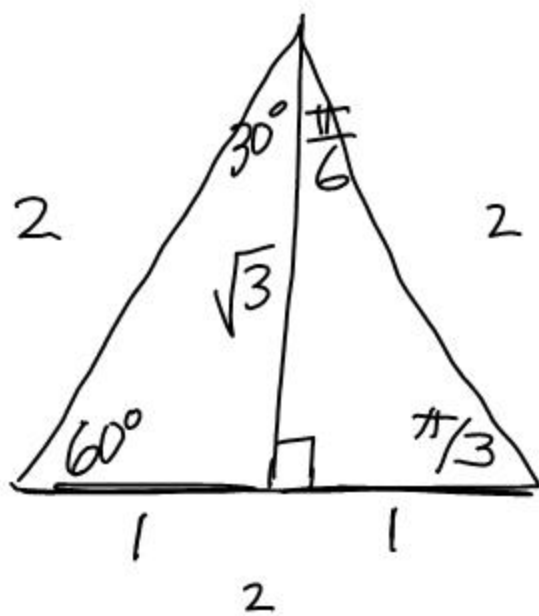
2 Special right triangles



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

$$\cos \frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

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



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

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

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 60^\circ = \frac{1}{2}$$

$$\tan 60^\circ = \sqrt{3}$$

The "Missing" Trig Ratios

$$\cot \theta = \frac{\text{adjacent leg}}{\text{opposite leg}}$$

reciprocal
of tangent

$$\sec \theta = \frac{\text{hypotenuse}}{\text{adjacent leg}}$$

reciprocal
of cosine

$$\csc \theta = \frac{\text{hypotenuse}}{\text{opposite leg}}$$

reciprocal
of sine

$$\bullet \cot \frac{\pi}{3} = \frac{1}{\sqrt{3}}$$

$$\bullet \sec \frac{\pi}{4} = \sqrt{2}$$

$$\bullet \csc \frac{\pi}{6} = 2$$