Trig 6.1

Change from radian to degree measure
Change from degree to radian measure
Find the length of an arc given the
measure of the central
angle
Find the area of a sector

reference angles
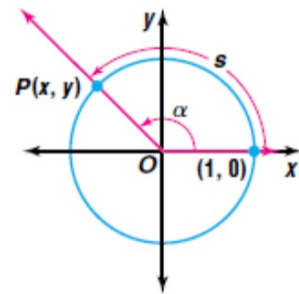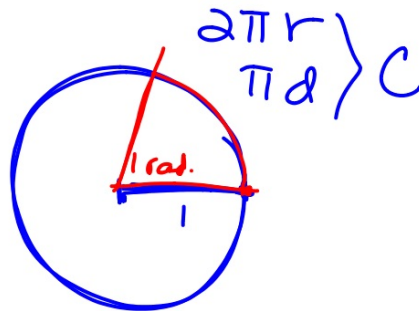
proportion $2\pi = 360°$
$\pi = 180°$

unit circle

handy angles

**radian (new)

circular arc

central angle

$\left.\begin{matrix} 2\pi r \\ \pi d \end{matrix}\right\} C$

1 rad.

1

$P(x, y)$

α

s

y

O $(1, 0)$ x

measure in inches ( )
measure in cm ( )

circles and radii
1 complete circle = $360° = 2\pi$

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

proportion: radians $\boxed{\dfrac{\pi}{180^\circ}} = \dfrac{x \ \text{rad}}{120 \ \text{deg}}$

degrees

$$\frac{180x}{180} = \frac{120\pi}{180} = \frac{2\pi}{3}$$

Proportion

1 a. Change 330° to radian measure in terms of π. _____

$$\frac{\pi}{180°} = \frac{x}{330°}$$

$$\frac{180x}{180} = \frac{330\pi}{180}$$
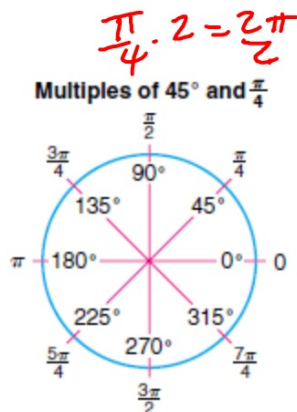
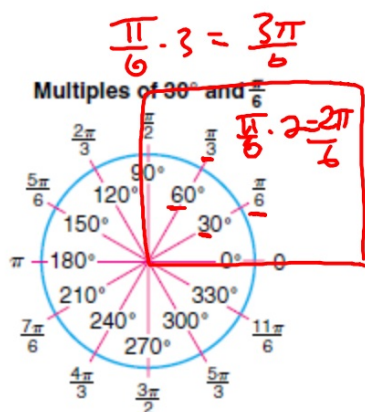$$x = \frac{11}{6}\pi = \frac{11\pi}{6}$$

b. Change $\dfrac{2\pi}{3}$ radians to degree measure.

$120°$

$$\dfrac{\pi}{180°} = \dfrac{\frac{2}{3}\pi}{x}$$

$$x \cdot \pi = 180 \cdot \frac{2}{3}\pi$$

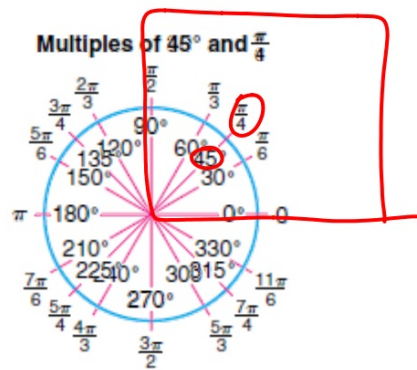$$\dfrac{x \cdot \pi}{\pi} = \dfrac{120\pi}{\pi}$$

$$\frac{\pi}{6} \cdot 3 = \frac{3\pi}{6}$$

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

$$\frac{\pi}{180} = \frac{x}{45}$$

Multiples of 30° and $\frac{\pi}{6}$

$$\frac{\pi}{6} \cdot 2 = \frac{2\pi}{6}$$

Multiples of 45° and $\frac{\pi}{4}$

$$45\pi = 180x$$
$$\frac{45\pi}{180} = \frac{180x}{180}$$

Patterns?

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

Degrees	0	30	45	60	90	120	135	150	180	210	225	240	270	300	315	330
Radians	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$

Handy angles

Multiples of 45° and $\frac{\pi}{4}$

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

$\frac{3\pi}{4}$ $\frac{\pi}{4}$

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

90°

120° 60° 45°

135° 30°

150°

π 180° 0° 0

210° 330°

225° 315°

240° 300°

$\frac{7\pi}{6}$ 270° $\frac{11\pi}{6}$

$\frac{5\pi}{4}$ $\frac{7\pi}{4}$

$\frac{4\pi}{3}$ $\frac{3\pi}{2}$ $\frac{5\pi}{3}$
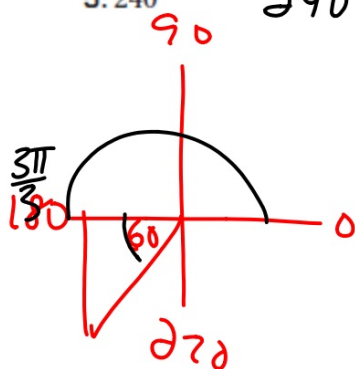
$$\frac{\pi}{180}$$

Proportion

$$120 = \frac{2\pi}{3}$$

Change each degree measure to radian measure in terms of π.

5. $240°$

$$240 = \frac{4\pi}{3}$$

6. $570°$ $= 210°$
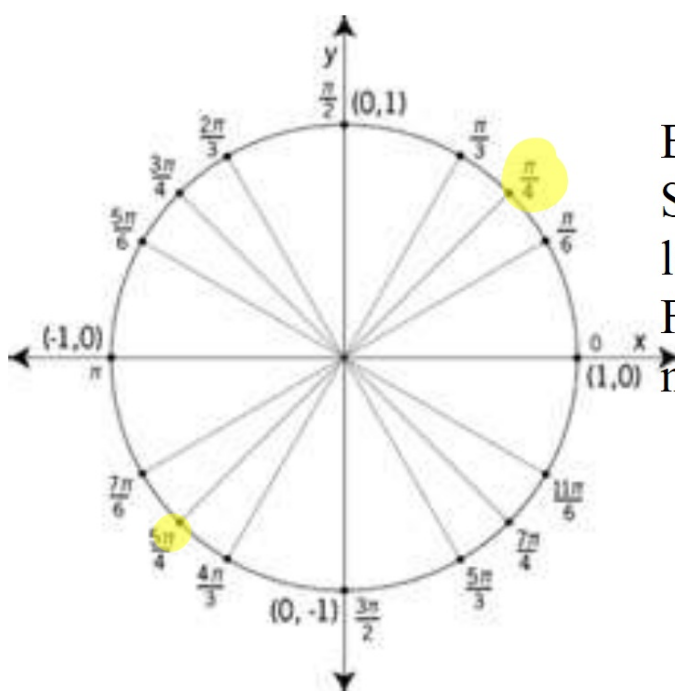
$$\frac{\pi}{180} = \frac{x}{240}$$

$$\frac{\pi}{180} = \frac{x}{210}$$

$$\frac{180x}{180} = \frac{210\pi}{180}$$

$$= \frac{7}{6}\pi$$

$\frac{\pi}{2}$ (0,1)

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

$\frac{3\pi}{4}$

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

$\frac{\pi}{3}$

$\frac{\pi}{4}$

$\frac{\pi}{6}$

(-1,0) π

0 x

(1,0)

$\frac{7\pi}{6}$

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

$\frac{4\pi}{3}$

$\frac{11\pi}{6}$

$\frac{7\pi}{4}$

$\frac{5\pi}{3}$

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

17-51 odd

6.1

Blank unit circle
Start by adding
landmarks (x,y)
Fill in with radian
measurements

Change each radian measure to degree measure. Round to the nearest tenth, if necessary.

7. $\dfrac{3\pi}{2}$

8. -1.75

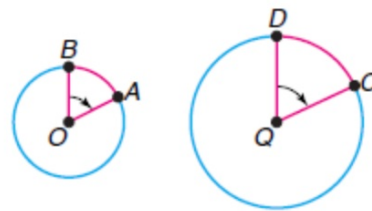**Example** **2** Evaluate cos $\frac{4\pi}{3}$.

reference angle?

reference angle?

Evaluate each expression.

9. $\sin \dfrac{3\pi}{4}$

10. $\tan \dfrac{11\pi}{6}$

Radian measure can be used to find the length of a **circular arc.** A circular arc is a part of a circle. The arc is often defined by the **central angle** that intercepts it. A central angle of a circle is an angle whose vertex lies at the center of the circle.

What fraction of the circle is it?

What is the circumference? What fraction of the circle is it?

Length of an Arc	The length of any circular arc s is equal to the product of the measure of the radius of the circle r and the radian measure of the central angle θ that it subtends. $$s = r\theta$$

3 Given a central angle of 128°, find the length of its intercepted arc in a circle of radius 5 centimeters. Round to the nearest tenth.

Given the measurement of a central angle, find the length of its intercepted arc in a circle of radius 15 inches. Round to the nearest tenth.

11. $\dfrac{5\pi}{6}$

12. 77°