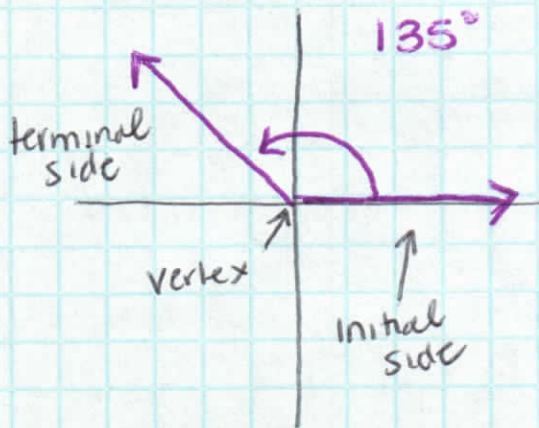


Radian and Degree Measure

Angles in Standard Position



Initial side: starting side of angle, on pos x-axis if in standard position.

Terminal side: ending side of an angle.

counterclockwise (left) - positive
clockwise (right) - negative

Coterminal Angles: angles that share the same terminal side

- separated by a full rotation
• either 360° or 2π

Radian Measure: (rad) is the measure of a central angle θ that intercepts an arc s , equal to the length of the radius r in the circle. Algebraically, this means

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



$$\theta = \frac{s}{r} \quad s = r\theta \quad r = \frac{s}{\theta}$$

θ = angle in radians !!!

Find θ , if $s = 6$ and $r = 2$.

$$\theta = \frac{6}{2}; \quad \theta = 3 \text{ (rad)}$$

Converting from Degrees to Radians

$$\frac{135^\circ}{1} \cdot \frac{\pi}{180^\circ} = \frac{135\pi}{180} \div \frac{5}{5} = \frac{27\pi}{36} \div \frac{9}{9} = \frac{3\pi}{4}$$

* always multiply by $\frac{\pi}{180}$ and reduce fraction

$$\frac{540^\circ}{1} \cdot \frac{\pi}{180} = \frac{540\pi}{180} = \frac{54\pi}{18} \div \frac{18}{18} = 3\pi$$

* never want a decimal if asking for Exact radians !!!

Converting from Radians to Degrees

$$-\frac{5\pi}{6} \cdot \frac{180}{\pi} = -\frac{900}{6} = -150^\circ$$

* you can have a decimal!!!

$$-\frac{11\pi}{7} \cdot \frac{180}{\pi} = -\frac{1980}{7} = -282.9$$

Example 1

A circle has a radius of 4 inches, find the length of the arc intercepted by a central angle of 240°

$$\theta = \frac{s}{r}, \text{ we need } s = r\theta$$

$$\frac{240}{1} \cdot \frac{\pi}{180} = \frac{4\pi}{3} \quad s = \frac{4\pi}{3} \cdot 4 = \frac{16\pi}{3} \text{ or approx } 16.76 \text{ in}$$

Example 2

A circle has an arc length of 18 cm and a central angle of 120° , find the radius.

$$\frac{120}{1} \cdot \frac{\pi}{180} = \frac{2\pi}{3} \quad \theta = \frac{s}{r} \quad r = \frac{s}{\theta}$$

$$r = \frac{18}{\frac{2\pi}{3}} \rightarrow \frac{18}{1} \cdot \frac{3}{2\pi} \rightarrow \frac{18 \cdot 3}{2\pi} = \frac{54}{2\pi} = \frac{27}{\pi} \approx 8.6 \text{ cm}$$