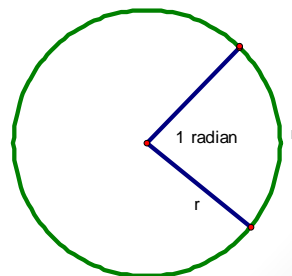


13-3 Radian Measure

Algebra 2
Mr. Gallo

Radian

- Another way to measure a central angle
- The intercepted arc has a length equal to the radius of the circle
- Measures the amount of rotation from the initial side to the terminal side of an angle
- The radian measure of a circle is 2π radians and a semicircle is π radians.



Converting Between Radians and Degrees

- To convert degrees to radians, multiply degrees by:

$$\frac{\pi \text{ radians}}{180^\circ}$$

- To convert radians to degrees, multiply radians by:

$$\frac{180^\circ}{\pi \text{ radians}}$$

1. What is the degree measure of an angle of $-\frac{7\pi}{30}$ radians?

$$-\frac{7\pi}{30} \cdot \frac{180}{\pi} = -42^\circ$$

2. What is the radian measure of an angle of 81° ?

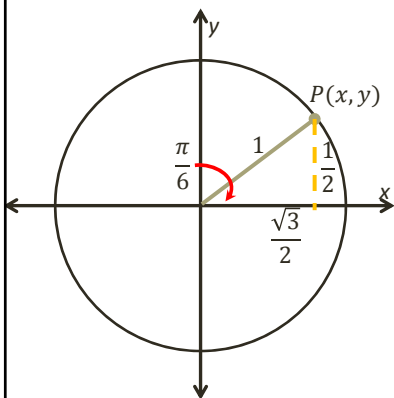
$$81 \cdot \frac{\pi}{180} = \frac{9\pi}{20} \text{ radians}$$

Complete Got It? #1 p.845

$$a. 90^\circ \quad b. \frac{5\pi}{4} \text{ radians} \quad c. \frac{360}{\pi} \approx 114.59^\circ \quad d. \frac{5\pi}{6} \text{ radians}$$

Finding Cosine and Sine of a Radian Measure

What are the exact values of $\cos \frac{\pi}{6}$ and $\sin \frac{\pi}{6}$?



To find the coordinates of P :

1. Change radians to degrees.

$$\frac{\pi}{6} \cdot \frac{180}{\pi} = 30^\circ$$

2. Draw height of triangle back to x-axis (creates reference angle, 30°)

3. Hypotenuse has length of 1 unit, height = y and base = x

4. Use 30-60-90 triangle to find x and y

5. Rewrite the coordinates of P as:

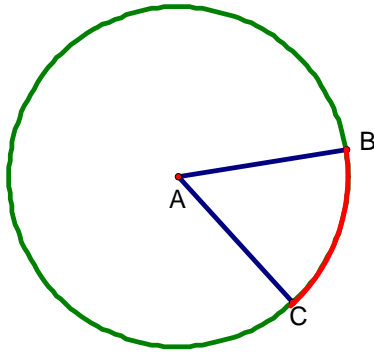
$$P\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$$

Homework: Radian Measure and Arc Length WS #1-16

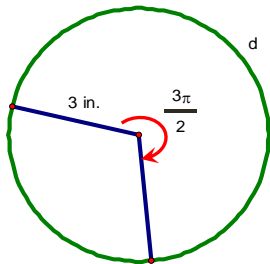
Arc Length

- For a circle of radius r and a central angle of measure θ (in radians), the length s of the intercepted arc is:

$$s = r\theta$$



What is length d to the nearest tenth?

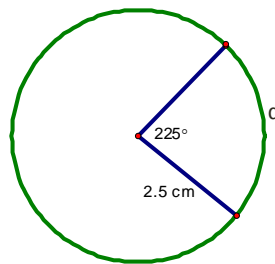


$$s = r\theta$$

$$s = 3\left(\frac{3\pi}{2}\right)$$

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

$$s \approx 14.1 \text{ in.}$$



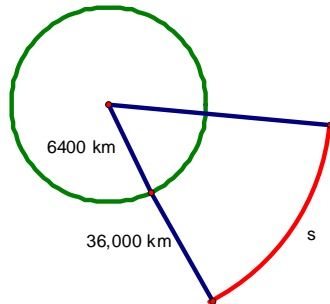
$$s = r\theta$$

$$s = 2.5\left(225 \cdot \frac{\pi}{180}\right) = 2.5\left(\frac{5\pi}{4}\right)$$

$$s = \frac{12.5\pi}{4}$$

$$s \approx 9.8 \text{ cm}$$

A satellite in geosynchronous orbit travels one Earth circumference in a full day. From a point on the ground. The satellite appears stationary overhead. The orbital height for a geosynchronous satellite is about 36,000 km. The radius of Earth is 6400 km. About how far does the satellite travel in 8 hours? Assume the length of an Earth day is exactly 24 hours.



$$\theta = 8 \left(\frac{2\pi}{24} \right)$$

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

$$s = r\theta$$

$$s = 42,400 \left(\frac{2\pi}{3} \right)$$

$$s = 88,802.35$$

$$s \approx 89,000 \text{ km}$$

Homework: p.848 #18-34