Chapter 6   Trigonometric Functions
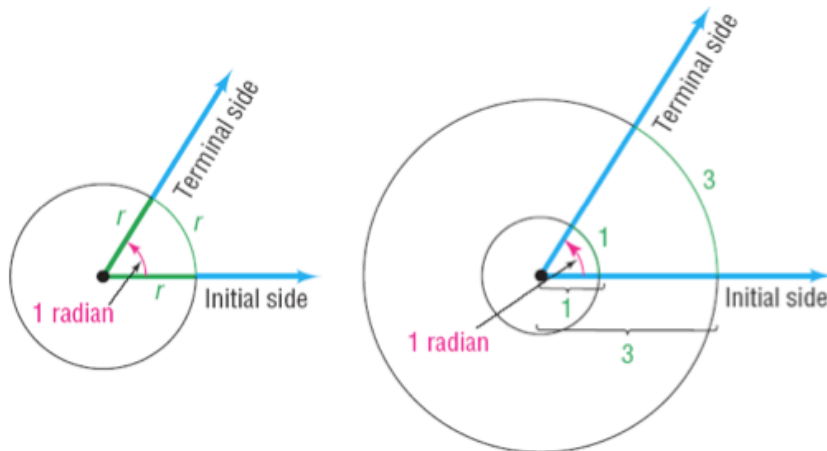
6.1   Angles and Their Measures   Day 2

Radians

2 **Find the Length of an Arc of a Circle**

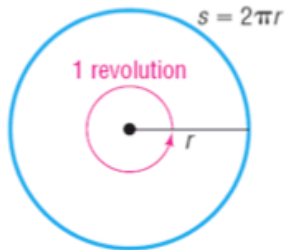**THEOREM**

Arc Length

For a circle of radius r, a central angle of θ radians subtends an arc whose length s is

$$s = r\theta$$

(EXAMPLE)   **Finding the Length of an Arc of a Circle**

Find the length of the arc of a circle of radius 4 meters
subtended by a central angle of 0.5 radian.

3 Convert from Degrees to Radians and from Radians to Degrees

$s = 2\pi r$

1 revolution

r

$$1 \text{ revolution} = 2\pi \text{ radians}$$

$$180° = \pi \text{ radians}$$

$$1 \text{ degree} = \frac{\pi}{180} \text{ radian} \qquad 1 \text{ radian} = \frac{180}{\pi} \text{ degrees}$$

EXAMPLE | **Converting from Degrees to Radians**

Convert each angle in degrees to radians.

(a) 30°   (b) 120°   (c) −60°   (d) 270°   (e) 104 °

EXAMPLE   **Converting from Degrees to Radians**

Convert each angle in radians to degrees.

(a) $\dfrac{\pi}{3}$ radian   (b) $-\dfrac{\pi}{2}$ radian   (c) $\dfrac{5\pi}{6}$ radians   (d) 5 radians

Degrees	0°	30°	45°	60°	90°	120°	135°	150°	180°
Radians	0	$\dfrac{\pi}{6}$	$\dfrac{\pi}{4}$	$\dfrac{\pi}{3}$	$\dfrac{\pi}{2}$	$\dfrac{2\pi}{3}$	$\dfrac{3\pi}{4}$	$\dfrac{5\pi}{6}$	π
Degrees		210°	225°	240°	270°	300°	315°	330°	360°
Radians		$\dfrac{7\pi}{6}$	$\dfrac{5\pi}{4}$	$\dfrac{4\pi}{3}$	$\dfrac{3\pi}{2}$	$\dfrac{5\pi}{3}$	$\dfrac{7\pi}{4}$	$\dfrac{11\pi}{6}$	2π

EXAMPLE   **Finding the Distance between Two Cities**

See Figure 13(a). The latitude of a location L is the angle formed by a ray drawn from the center of Earth to the Equator and a ray drawn from the center of Earth to L. See Figure 13(b). Glasgow, Montana, is due north of Albuquerque, New Mexico. Find the distance between Glasgow (48°9′ north latitude) and Albuquerque (35°5′ north latitude). Assume that the radius of Earth is 3960 miles.