Lesson 6.2 Math Lab: Assess Your Understanding, pages 485–486

1. As a fraction of π, determine the length of the arc that subtends each central angle in the unit circle.

a) 180°

Arc length: $\dfrac{180}{360}(2\pi) = \pi$

b) 135°

Arc length: $\dfrac{135}{360}(2\pi) = \dfrac{3}{4}\pi$

c) 150°

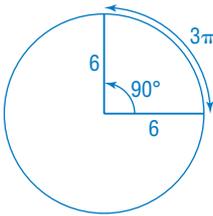Arc length: $\dfrac{150}{360}(2\pi) = \dfrac{5}{6}\pi$

d) $-45°$

Arc length: $\dfrac{45}{360}(2\pi) = \dfrac{1}{4}\pi$

2. As a fraction of π, determine the length of the arc that subtends each central angle in a circle with radius r. Include a labelled sketch of the arc on the circle.
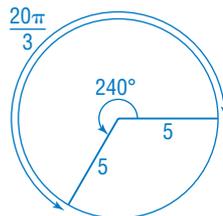
a) 90°; $r = 6$ units
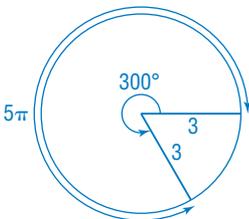
Arc length: $\dfrac{90}{360}(2\pi)(6) = 3\pi$

b) 240°; $r = 5$ units

Arc length: $\dfrac{240}{360}(2\pi)(5) = \dfrac{20}{3}\pi$

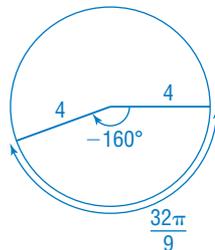**c)** 300°; $r = 3$ units

Arc length: $\dfrac{300}{360}(2\pi)(3) = 5\pi$

d) $-160°$; $r = 4$ units

Arc length: $\dfrac{160}{360}(2\pi)(4) = \dfrac{32}{9}\pi$

3. A bicycle wheel has radius 30 cm. Suppose a positive angle of rotation corresponds to the wheel moving forward. Determine the distance and the direction the wheel will roll when it turns through each angle. Express the exact distance in terms of π.

a) 30°

The distance in centimetres is:
$\frac{30}{360}(2\pi)(30) = 5\pi$
The wheel travels 5π cm forward.

b) 60°

The angle is double the angle in part a so the distance travelled will be double. The wheel travels 10π cm forward.

c) 315°

The distance in centimetres is:
$\frac{315}{360}(2\pi)(30) = 52.5\pi$
The wheel travels 52.5π cm forward.

d) −225°

The distance in centimetres is:
$\frac{225}{360}(2\pi)(30) = 37.5\pi$
The wheel travels 37.5π cm backward.

4. A winch has diameter 10 cm. As the winch rotates, it pulls in a cable. Exactly how much cable is pulled in when the winch turns through each angle?

a) 720°

The length in centimetres is:
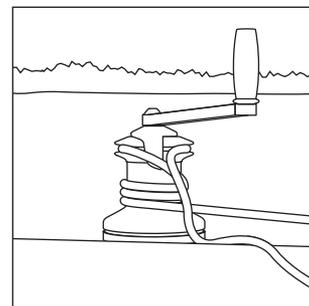$\frac{720}{360}(\pi)(10) = 20\pi$
The winch pulls in 20π cm of cable.

b) 480°

The length in centimetres is:
$\frac{480}{360}(\pi)(10) = \frac{40}{3}\pi$
The winch pulls in $\frac{40}{3}\pi$ cm of cable.

c) 432°

The length in centimetres is:
$\frac{432}{360}(\pi)(10) = 12\pi$
The winch pulls in 12π cm of cable.

d) 2000°

The length in centimetres is:
$\frac{2000}{360}(\pi)(10) = \frac{500}{9}\pi$
The winch pulls in $\frac{500}{9}\pi$ cm of cable.