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

1. As a fraction of $\pi$, determine the length of the arc that subtends each central angle in the unit circle.
   
   a) $180^\circ$ 
   
   Arc length: $\frac{180}{360} (2\pi) = \pi$ 
   
   b) $135^\circ$ 
   
   Arc length: $\frac{135}{360} (2\pi) = \frac{3}{4} \pi$ 
   
   c) $150^\circ$ 
   
   Arc length: $\frac{150}{360} (2\pi) = \frac{5}{6} \pi$ 
   
   d) $-45^\circ$ 
   
   Arc length: $\frac{45}{360} (2\pi) = \frac{1}{4} \pi$

2. As a fraction of $\pi$, 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) $90^\circ$; $r = 6$ units 
   
   Arc length: $\frac{90}{360} (2\pi)(6) = 3\pi$ 
   
   b) $240^\circ$; $r = 5$ units 
   
   Arc length: $\frac{240}{360} (2\pi)(5) = \frac{20}{3} \pi$ 
   
   c) $300^\circ$; $r = 3$ units 
   
   Arc length: $\frac{300}{360} (2\pi)(3) = 5\pi$ 
   
   d) $-160^\circ$; $r = 4$ units 
   
   Arc length: $\frac{160}{360} (2\pi)(4) = \frac{32}{9} \pi$
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 $\pi$.

a) $30^\circ$  
   The wheel travels $5\pi$ cm forward.

b) $60^\circ$  
   The wheel travels $10\pi$ cm forward.

c) $315^\circ$  
   The wheel travels $52.5\pi$ cm forward.

d) $-225^\circ$  
   The wheel travels $37.5\pi$ 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) $720^\circ$  
   The winch pulls in $20\pi$ cm of cable.

b) $480^\circ$  
   The winch pulls in $\frac{40}{3}\pi$ cm of cable.

c) $432^\circ$  
   The winch pulls in $12\pi$ cm of cable.

d) $2000^\circ$  
   The winch pulls in $\frac{500}{9}\pi$ cm of cable.