

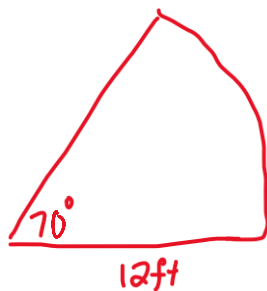
Arcs & Sectors (Solution)

Complete the following exercises without using a calculator.

1. A water sprinkler sprays water up to 30 feet while rotating through an angle of 100° . What area of the lawn receives water?

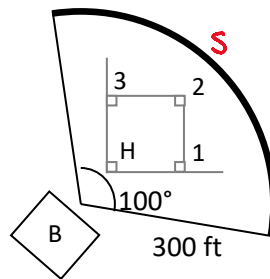
$$\begin{aligned}
 100^\circ \times \frac{\pi}{180} &= \frac{10\pi}{18} = \frac{5\pi}{9} \\
 A = \frac{1}{2} r^2 \theta &= \frac{1}{2} (30 \text{ ft})^2 \left(\frac{5\pi}{9} \right) \\
 &= \frac{900}{2} \cdot \frac{5\pi}{9} \\
 &= \frac{100}{2} \cdot 5\pi = \boxed{250\pi \text{ ft}^2}
 \end{aligned}$$

2. Candace wants to put a new flower bed in the corner of her back yard, which forms a 70° angle. She needs to purchase some edging to line the flower bed. The edging should lie along a circular arc of radius 12 feet. How much edging will she need, rounded to two decimals using appropriate units?



$$\begin{aligned}
 s &= r\theta \\
 &= (12 \text{ ft}) \left(70^\circ \times \frac{\pi}{180} \right) \\
 &= \frac{12 \cdot 70\pi}{180} = \frac{12 \cdot 7\pi}{18} = \boxed{\frac{14\pi}{3} \text{ ft}}
 \end{aligned}$$

3. Ralph is constructing a baseball field and wants the backstop behind home plate to have a measurement of 100° . The outfield fence should fit along a circular path centered at the backstop at a distance of 300 feet, as illustrated below.



- a) What length of fence will be required in the outfield (bold curve)?

$$\begin{aligned}
 s &= r\theta = (300 \text{ ft}) \left(100^\circ \times \frac{\pi}{180} \right) \\
 &= 300 \cdot \frac{10\pi}{18} = 300 \cdot \frac{5\pi}{9} = 100 \cdot \frac{5\pi}{3} = \boxed{\frac{500\pi}{3} \text{ ft}}
 \end{aligned}$$

- b) What is the area of the enclosed field?

$$\begin{aligned}
 A &= \frac{1}{2} r^2 \theta = \frac{1}{2} (300 \text{ ft})^2 \left(100^\circ \times \frac{\pi}{180} \right) \\
 &= \frac{1}{2} (90000) \left(\frac{5\pi}{9} \right) = \frac{50000}{2} \cdot \frac{5\pi}{9} = \boxed{25000\pi \text{ ft}^2}
 \end{aligned}$$