

1. Write the standard equation of a circle with center (2, -3) and radius 6.  $(x-2)^2 + (y+3)^2 = 36$

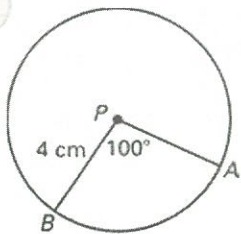
2. Find the value of c that completes the square. Then write the expression in factored form.  $x^2 + 8x + c$

$x^2 + 8x + 16$

Expression:  $x^2 + 8x + 16$

Factored form:  $(x+4)^2$

3. Find the length of  $\widehat{AB}$ . Round to the nearest hundredth or give the answer in terms of  $\pi$ .



$C = 8\pi \text{ cm}$

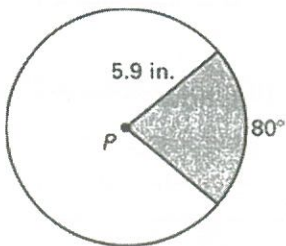
$$\frac{\widehat{AB}}{8\pi} = \frac{100}{360}$$

$$360\widehat{AB} = 800\pi$$

$$\widehat{AB} = \frac{800\pi}{360}$$

$$\widehat{AB} = 6.98 \text{ cm}$$

4. Find the area of the shaded region. Round to the nearest hundredth.



$A_{\odot} = 34.8\pi$

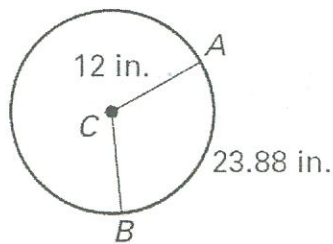
$$\frac{A_s}{34.8\pi} = \frac{80}{360}$$

$$A_s(360) = 80(34.8\pi)$$

$$A_s = 24.3 \text{ in}^2$$

Level 2:

5. Find the measure of  $\widehat{AB}$ . Round to the nearest degree.



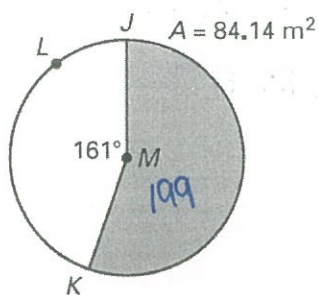
$$\frac{m\widehat{AB}}{360} = \frac{23.88}{24\pi}$$

$$m\widehat{AB}(24\pi) = 23.88(360)$$

$$m\widehat{AB} = \frac{23.88(360)}{24\pi}$$

$$m\widehat{AB} = 114.0$$

6. Find the radius. Round to the nearest hundredth.



$$\frac{84.14 \text{ m}^2}{\pi r^2} = \frac{199}{360}$$

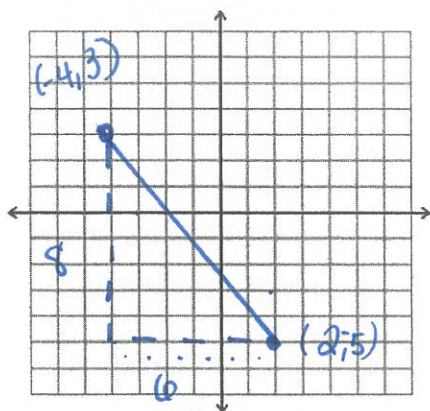
$$\pi r^2 = \frac{360(84.14)}{199}$$

$$\pi r^2 = 152.21$$

$$r^2 = \frac{152.21}{\pi}$$

$$r \approx 6.94$$

7. What is the equation of the circle with center  $(-4, 3)$  that passes through the point  $(2, -5)$ ?



$$r = \sqrt{(2 - (-4))^2 + (-5 - 3)^2}$$

$$r = \sqrt{6^2 + (-8)^2}$$

$$r = \sqrt{36 + 64}$$

$$r = \sqrt{100} \approx 10$$

$$(x + 4)^2 + (y - 3)^2 = 100$$

8. The tires of an automobile have a diameter of 24 inches. If the wheels make 8 revolutions, how far does the automobile move? (Round the result to the nearest hundredth of an inch.)

$$d = 24 \text{ in}$$

$$r \text{ rev} = 8$$

$$d = C \cdot \text{rev}$$

$$d = (24\pi)(8 \text{ rev})$$

$$d \approx 603.2 \text{ in}$$

9. Determine whether the point lies on the circle described by the equation  $(x - 3)^2 + (y - 8)^2 = 100$ .

$(13, 8)$

$$(13-3)^2 + (8-8)^2 \stackrel{?}{=} 100$$

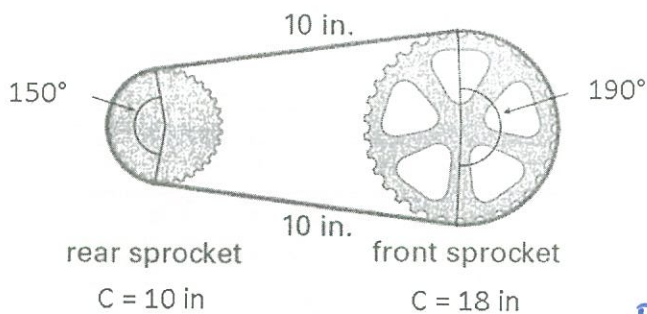
$$10^2 + 0^2 = 100$$

$$100 = 100 \checkmark$$

so  $(13, 8)$  lies on the circle.

Level 3:

- 10 **Bicycles** The chain of a bicycle travels along the front and rear sprockets, as shown. The circumference of each sprocket is given.



Small Arc

$$\frac{A_S}{10 \text{ in}} = \frac{150^\circ}{360}$$

$$360A_S = 1500$$

$$A_S = 4.17$$

Large Arc

$$\frac{A_L}{18} = \frac{190}{360}$$

$$360A_L = 3420$$

$$A_L = 9.5$$

$$P = 4.17 + 10 + 10 + 9.5 = 33.67 \text{ in}$$

- a. About how long is the chain?

11. Find the center and radius of the circle.

$$x^2 + y^2 - 10x + 8y - 23 = 0$$

$$x^2 - 10x + 25 + y^2 + 8y + 16 = 23 + 25 + 16$$

$$\left(\frac{-10}{2}\right)^2 = 25 \quad \left(\frac{8}{2}\right)^2 = 16$$

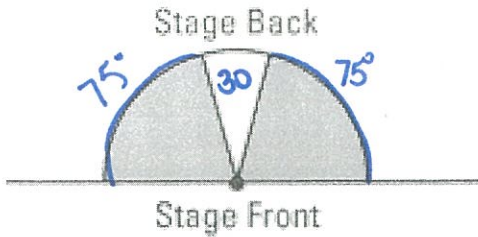
$$x^2 - 10x + 25 + y^2 + 8y + 16 = 64$$

$$(x - 5)^2 + (y + 4)^2 = 64$$

$$(h, k) \rightarrow (5, -4)$$

$$r = \sqrt{64} = 8$$

12. Caroline is in charge of lighting for a semicircular stage. The radius of the stage is 15 feet. There is a light at the center of the semicircle that casts light at a  $30^\circ$  angle. When only that light is on, what is the length on the semicircle that is dark? Explain how you got your answer.



$$r = 15$$

$$C = 2\pi(15)$$

$$\frac{\text{Arc } l}{30\pi} = \frac{150}{360}$$

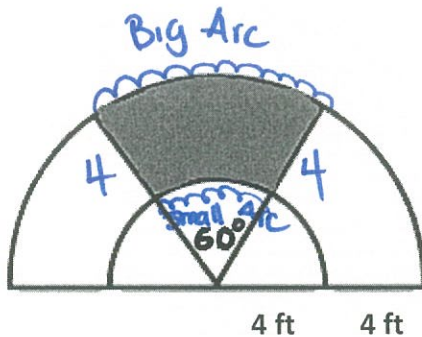
$$\frac{360 \text{ Arc } l}{360} = \frac{150(30\pi)}{360}$$

$$\text{Arc } l = 39.36$$

Level 4:

13. The window shown is in the shape of a semicircle.

Find the perimeter of the glass in the shaded region. Round to the nearest hundredth.



Big Arc

$$\frac{\text{Arc } B}{16\pi} = \frac{60}{360}$$

$$360 \text{ Arc } B = 960\pi$$

$$\text{Arc } B = \frac{960\pi}{360}$$

$$\text{Arc } B = 8.38$$

Small Arc

$$\frac{\text{Arc } S}{8\pi} = \frac{60}{360}$$

$$360 \text{ Arc } S = 480\pi$$

$$\text{Arc } S = \frac{480\pi}{360}$$

$$\text{Arc } S = 4.19$$

Perimeter =

$$4 + 4 + 8.38 + 4.19 = 20.57$$