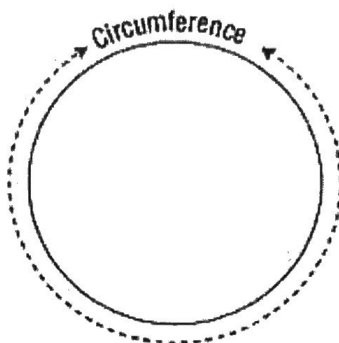


Arc Length

In 7th grade, you learned how to calculate the circumference of a circle. You also learned that the circumference of a circle divided by the diameter is equal to pi. The circumference of a circle is the distance around the circle.



Circumference

$$C = 2\pi r \text{ or } C = \pi d$$

Practice reviewing how to calculate the circumference or radius/diameter of a circle below. Leave your answers in terms of pi. Find the circumference, radius, or diameter.

A. $r = 6 \text{ ft}$

$$C = 2\pi(6) = 12\pi$$

$$\text{diam} = 2(6) = 12$$

B. $d = 15 \text{ in}$

$$C = 15\pi$$

$$r = \frac{15}{2} = 7.5$$

C. $C = 16\pi \text{ cm}$

$$\frac{16\pi}{2\pi} = \frac{2\pi}{2\pi} r$$

$$8 = r$$

$$\text{diam} = 16$$

D. $C = 40\pi \text{ m}$

$$\frac{40\pi}{2\pi} = \frac{2\pi}{2\pi} r$$

$$20 = r$$

$$\text{diam} = 40$$

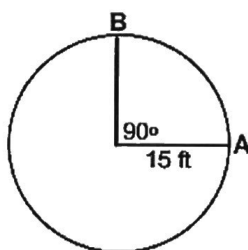
Calculating Arc Length

Arc Length is a fraction of the circle's circumference and is measured in linear units.

Arc Length

$$2\pi r \cdot \frac{\theta}{360} = \frac{2\pi r \theta}{360}, \text{ where } \theta \text{ is the central angle (or intercepted arc measure)}$$

Example: Find the length of arc BA.

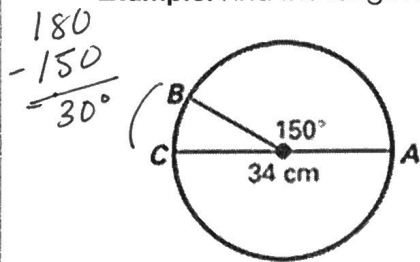


$$\theta = 90$$

$$r = 15$$

$$Arc = 2\pi(15)\left(\frac{90}{360}\right) = \frac{15\pi \text{ ft}}{2}$$

Example: Find the length of arc BC.

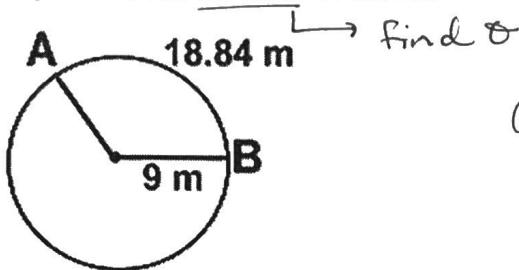


$$r = \frac{34}{2} = 17$$

$$\text{Not } A_L = 2\pi(17)\left(\frac{150}{360}\right) = \frac{85}{6}\pi \text{ cm}$$

$$A_L = 2\pi(17)\left(\frac{30}{360}\right) = \frac{17\pi}{6} \text{ m}$$

Example: Find the measure of arc AB.



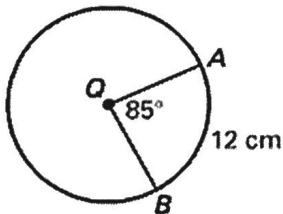
$$A_L = 2\pi r \frac{\theta}{360}$$

$$(360)18.84 = 2\pi(9) \cdot \frac{\theta}{360} (360)$$

$$\frac{6782.4}{18\pi} = \frac{18\pi \theta}{18\pi}$$

$$\theta \approx 119.94^\circ$$

Example: Find the circumference of Circle Q.



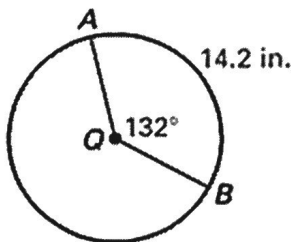
$$C = 2\pi r$$

$$A_L = 2\pi r \cdot \frac{\theta}{360}$$

$$\left(\frac{360}{85}\right)12 = \frac{2\pi r \cdot 85}{360} (360)$$

$$50.8 = 2\pi r = C$$

Example: Find the radius of Circle Q.



$$A_L = 2\pi r \cdot \frac{\theta}{360}$$

$$360 \cdot 14.2 = 2\pi r \left(\frac{132}{360}\right) \cdot 360$$

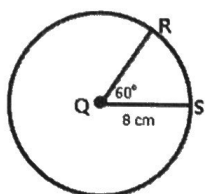
$$\frac{5112}{264\pi} = \frac{264\pi r}{264\pi}$$

$$6.2 \approx r$$

Day 6 - Arc Length

Find the arc lengths for problems ¹⁻³ 2 and 3.

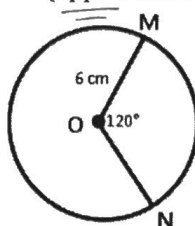
1. Length of arc RS =
(exact answer)



$$A_L = 2\pi(8)\left(\frac{60}{360}\right)$$

$$\boxed{\frac{8\pi}{3} \text{ cm}}$$

2. Length of arc MN =
(approx. answer)

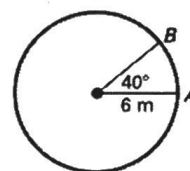


$$A_L = 2\pi(6)\left(\frac{120}{360}\right)$$

$$= 4\pi$$

$$\boxed{A_L \approx 12.57 \text{ cm}}$$

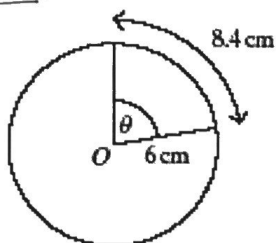
3. Length of arc AB =
(exact answer)



$$A_L = 2\pi(6)\left(\frac{40}{360}\right)$$

$$\boxed{A_L = \frac{4\pi}{3} \text{ m}}$$

4. A circle has a radius of 6 cm. A sector has an arc length of 8.4 cm. The angle at the center of the sector is θ . Calculate the value of θ .

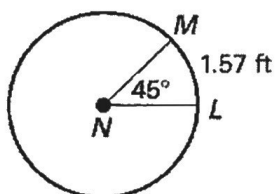


$$8.4 = 2\pi(6)\left(\frac{\theta}{360}\right)$$

$$\frac{3024}{12\pi} = \frac{12\pi \cdot \theta}{12\pi}$$

$$\boxed{\theta \approx 80.2^\circ}$$

5. Find the radius of circle N.

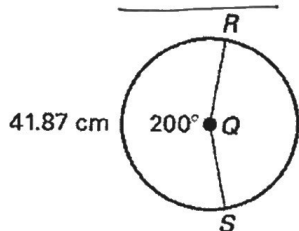


$$1.57 = 2\pi r \left(\frac{45}{360}\right)$$

$$\frac{565.2}{90\pi} = \frac{90\pi r}{90\pi}$$

$$\boxed{r \approx 2 \text{ ft}}$$

6. Find the circumference of circle Q.

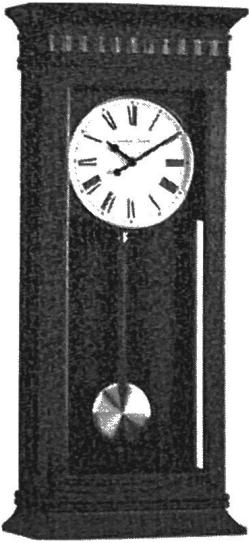


$$41.87 = \frac{C}{2\pi r} \left(\frac{200}{360}\right)$$

$$\frac{15073.2}{200} = 2\pi r \left(\frac{200}{360}\right)$$

$$\boxed{2\pi r = C \approx 75.4 \text{ cm}}$$

7. A clock has a pendulum 22 centimeters long. If it swings through an angle of 32 degrees, how far does the bottom of the pendulum travel in one swing?



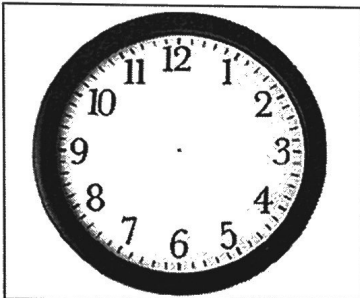
$$r = 22$$

$$\theta = 32$$

$$A_L = 2\pi(22)\left(\frac{32}{360}\right)$$

$$\frac{176\pi}{45} \approx 12.3 \text{ cm}$$

For questions 8-9, use the figure below:



8) How many degrees does the minute hand move in 15 minutes? 40 minutes? 55 minutes?

$$\frac{360}{60} = 6^\circ$$

$$15(6) = 90^\circ$$

$$40(6) = 240^\circ$$

$$55(6) = 330^\circ$$

9) If the minute hand is 4 inches long, what is the arc length covered by the minute hand in 40 minutes?

$$\theta = 240^\circ \quad r = 4$$

$$A_L = 2\pi(4)\left(\frac{240}{360}\right)$$

$$A_L = \frac{16\pi}{3} \approx 16.8 \text{ in}$$