

CIRCUMFERENCE AND AREA OF CIRCLES AND CIRCLE SECTORS

Circles are all around us. Look around the room and find a few circular objects. In our study of circles we will first review the names of the parts of a circle.

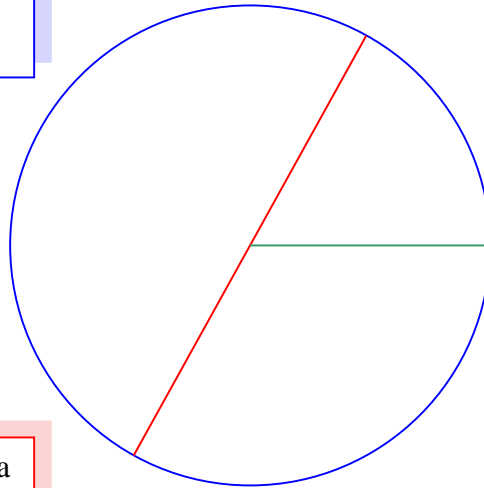
Circumference is the distance around a circle. Imagine being a centipede and crawling around the edge of a circle. When the centipede reaches the point on the circle where he started, he has traveled the circumference of the circle. To calculate the circumference of a circle, we use the formula, circumference equals two times "pi" times radius.

We will also examine finding the area of a circle. Area measures the amount of coverage the circle makes. The formula for finding the area of a circle is area equals "pi" times radius squared.

Circle sectors are parts of circles. We find the area of a circle sector by first finding the area of the entire circle, and then find the area of the fractional part of the circle given.

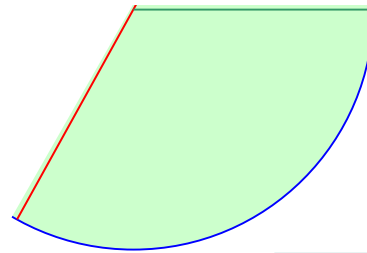
Parts of a Circle

Circumference is the distance around a circle.



Radius is the length of a line segment going from the center to the edge of a circle.

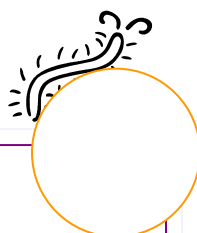
Diameter is the length of a line segment that goes across a circle passing through the center point. The diameter is twice the radius.



Sector is a section of the circle.

Circumference of a Circle

In the formulas below find two ways to calculate circumference, the distance around a circle.



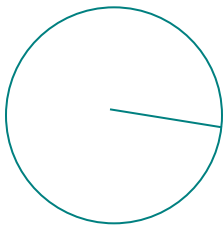
Pi (π) is the ratio of the circumference of a circle to its diameter ($\frac{C}{d}$).

π is approximately equal to 3.14.

$C = \pi \times d$ \longrightarrow $C = \pi \times (2 \times r)$ or $C = 2 \times \pi \times r$

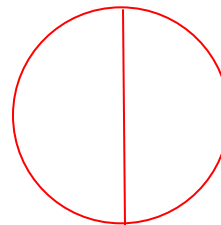
Find the circumference for each of the circles.

Radius = 6 in



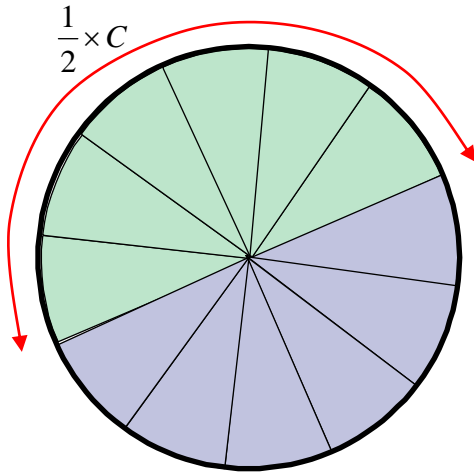
$$\begin{aligned}C &= 2 \times \pi \times r \\C &= 2 \times 3.14 \times 6 \\C &= 37.68 \text{ in}\end{aligned}$$

Diameter = 14 ft



$$\begin{aligned}C &= \pi \times d \\C &= 3.14 \times 14 \\C &= 43.96 \text{ ft}\end{aligned}$$

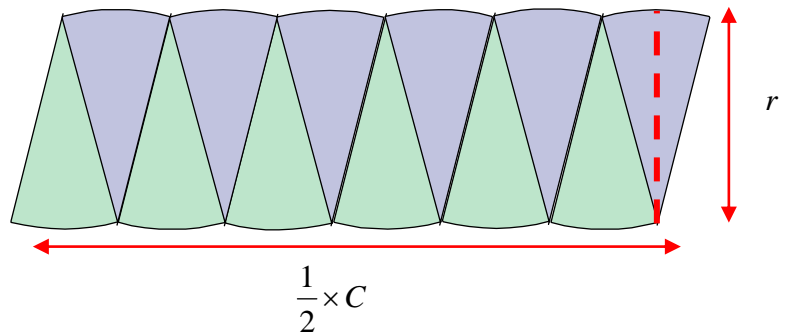
Area of a Circle



Reminder: The area of a circle is the area that the circle covers.

A circle's area can be rearranged into a shape that approximates a parallelogram.

The length of the parallelogram is the same length as half the circle's circumference. The height of the parallelogram would be the same as the radius of the circle.



Statement

$$A = B \times H$$

$$A = \left(\frac{1}{2} \times C\right) \times r$$

$$A = \left(\frac{1}{2} \times 2 \times \pi \times r\right) \times r$$

$$A = 1 \times (\pi \times r) \times r$$

$$A = (\pi \times r) \times r$$

$$A = \pi \times (r \times r)$$

$$A = \pi \times r^2$$

Reason

Formula for area of parallelogram

$$\text{Base} = \frac{1}{2} \times C \quad \text{Height} = r$$

$$C = 2 \times \pi \times r$$

$$\frac{1}{2} \times 2 = 1$$

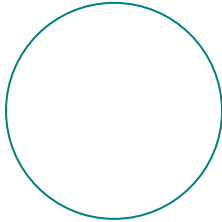
Identity Property (Any number times 1 is the number.)

Associative Property (Regrouping is allowed in multiplication.)

$$r \times r = r^2$$

Find the area for each of the circles.

Radius = 5 in



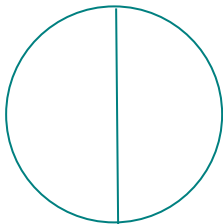
$$A = \pi \times r^2$$

$$A = 3.14 \times 5^2$$

$$A = 3.14 \times 25$$

$$A = 78.5 \text{ square inches}$$

Diameter = 20 ft



$$A = \pi \times r^2$$

$$A = 3.14 \times 10^2$$

$$A = 3.14 \times 100$$

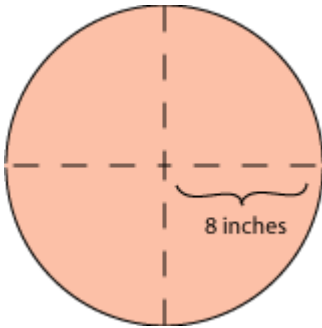
$$A = 314 \text{ square feet}$$

*Note: Since the diameter is given as 20 feet, we must find the radius, which is half the diameter, and then substitute into the formula. ($\frac{1}{2}$ of 20 is 10)

Remember, **area** is a measurement of **coverage**; thus, area calculations result in **square units**.

Area of Circle Sectors

To find the area of a sector of a circle, first determine the area of the whole circle, and then find the fractional part that represents the circle.



Find the area.

$$A = \pi \times r^2$$

$$A = 3.14 \times 8 \times 8$$

$$A = 3.14 \times 64$$

$$A = 200.96 \text{ square inches}$$



Find the area of this sector.

Since the sector is $\frac{3}{4}$ the area of the entire circle,

the area of the sector would be $\frac{3}{4}$ of 200.96 square inches.

$$\frac{3}{4} \times \frac{200.96}{1} = \frac{602.88}{4} = 150.72 \text{ square inches}$$