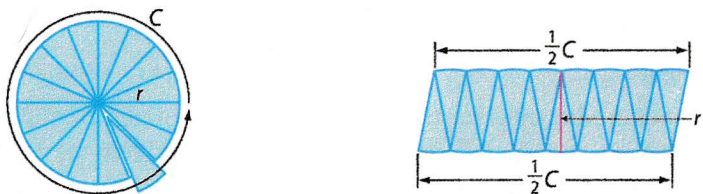


Areas of Circles and Sectors

Areas of Circles In Lesson 10-1, you learned that the formula for the circumference C of a circle with radius r is given by $C = 2\pi r$. You can use this formula to develop the formula for the area of a circle.

Below, a circle with radius r and circumference C has been divided into congruent pieces and then rearranged to form a figure that resembles a parallelogram.

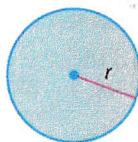


As the number of congruent pieces increases, the rearranged figure more closely approaches a parallelogram. The base of the parallelogram is $\frac{1}{2}C$ and the height is r , so the area is $\frac{1}{2}C \cdot r$. Since $C = 2\pi r$, the area of the parallelogram is also $\frac{1}{2}(2\pi r)r$ or πr^2 .

Key Concept Area of a Circle

Words The area A of a circle is equal to π times the square of the radius r .

Symbols $A = \pi r^2$



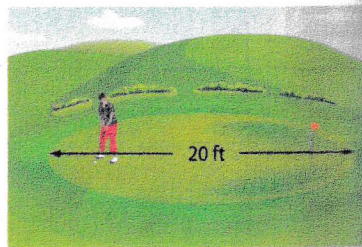
Real-World Example 1 Area of a Circle

SPORTS What is the area of the circular putting green shown to the nearest square foot?

The diameter is 20 feet, so the radius is 10 feet.

$$\begin{aligned} A &= \pi r^2 && \text{Area of a circle} \\ &= \pi(10)^2 && r = 10 \\ &\approx 314 && \text{Use a calculator.} \end{aligned}$$

So, the area is about 314 square feet.



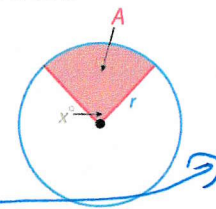
2 Areas of Sectors A slice of a circular pizza is an example of a sector of a circle. A **sector of a circle** is a region of a circle bounded by a central angle and its intercepted major or minor arc. The formula for the area of a sector is similar to the formula for arc length.

Key Concept Area of a Sector

The ratio of the **area A of a sector** to the **area of the whole circle, πr^2** , is equal to the ratio of the **degree measure of the intercepted arc x** to 360.

$$\text{Proportion: } \frac{A}{\pi r^2} = \frac{x}{360}$$

$$\text{Equation: } A = \frac{x}{360} \cdot \pi r^2$$



x is the degree measure

Real-World Example 3 Area of a Sector

PIZZA A circular pizza has a diameter of 12 inches and is cut into 8 congruent slices. What is the area of one slice to the nearest hundredth?

Step 1 Find the arc measure of a pizza slice.

Since the pizza is equally divided into 8 slices, each slice will have an arc measure of $360 \div 8$ or 45. $\leftarrow x$

Step 2 Find the radius of the pizza. Use this measure to find the area of the sector, or slice.

The diameter is 12 inches, so the radius is 6 inches.

$$\begin{aligned} A &= \frac{x}{360} \cdot \pi r^2 && \text{Area of a sector} \\ &= \frac{45}{360} \cdot \pi(6)^2 && x = 45 \text{ and } r = 6 \\ &\approx 14.14 && \text{Use a calculator.} \end{aligned}$$



So, the area of one slice of this pizza is about 14.14 square inches.