CHAPTER 10

Geometry



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10.4

Area and Circumference

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Objectives

- Use area formulas to compute the areas of plane regions and solve applied problems.
- Use formulas for a circle's circumference and area.

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Area of a Rectangle and a Square

The area, *A*, of a rectangle with length *l* and width *w* is given by the formula A = lw.



The area, *A*, of a square with one side measuring *s* linear units is given by the formula $A = s^2$.



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Example: Solving an Area Problem

- You decide to cover the path shown in bricks. Find the area of the path.
- **Solution:** We begin by drawing a dashed line to divide the path into 2 rectangles. Then use the length and width of each rectangle to find its area. The area is found by adding the areas of the two rectangles together.





Area of a Parallelogram

The area, *A*, of a parallelogram with height *h* and base *b* is given by the formula A = bh.

The height of a parallelogram is the perpendicular distance between two of the parallel sides. It is *not* the length of a side.



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Example: Using the Formula for a Parallelogram's Area

Find the area of the parallelogram.

Solution:



The base is 8 centimeters and the height is 4 centimeters. Thus,

$$b = 8$$
 and $h = 4$.
 $A = bh$
 $A = 8$ cm \cdot 4 cm = 32 cm²

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Area of a Triangle

The area, *A*, of a triangle with height *h* and base *b* is given by the formula



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Example: Using the Formula for a Triangle's Area

Find the area of the triangle.

Solution:

The base is 16 meters and the height is 10 meters.

Thus,

$$b = 16 \text{ and } h = 10.$$

 $A = \frac{1}{2} bh$
 $A = \frac{1}{2} \cdot 16 \text{ m} \cdot 10 \text{ m}$
 $= 80 \text{ m}^2$



Area of a Trapezoid

The area, *A*, of a trapezoid with parallel bases *a* and *b* and with height *h* is given by the formula:



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Example: Finding the Area of a Trapezoid

Find the area of the trapezoid.

Solution:

The height is 13 ft. The lower base, *a*, is 46 ft and the upper base, *b*, is 32 ft. Thus,





Circle

A **circle** is a set of points in the plane equally distant from a given point, its center.

The radius, r, is a line segment from the center to any point on the circle. All radii in a given circle have the same length.

The diameter, d, is a line segment through the center whose endpoints both lie on the circle. It is twice the radius. All diameters in a given circle have the same length.

Example: Finding the Distance Around a Circle

Find the circumference of the circle with diameter = 40 yards.

Solution:

 $C = \pi d$

$$= \pi (40 \text{ yd}) = 40\pi \text{ yd} \approx 125.7 \text{ yd}$$



The distance around the circle is approximately 125.7 yards.

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Example: Problem Solving Using the Formula for a Circle's Area

Which is a better buy? A large pizza with a 16-inch diameter for \$15.00 or a medium pizza with an 8-inch diameter for \$7.50?

Solution: The better buy is the pizza with the lower price per square inch. The radius of the large pizza is 8 inches and the radius of the medium pizza is 4 inches.

Large pizza:
$$A = \pi r^2 = \pi (8 \text{ in.})^2 = 64\pi \text{ in.}^2 \approx 201 \text{ in.}^2$$

Medium pizza: $A = \pi r^2 = \pi (4 \text{ in.})^2 = 16\pi \text{ in.}^2 \approx 50 \text{ in.}^2$

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Example continued

For each pizza, the price per square inch is found by dividing the price by the area:

Price per square inch for large pizza = $\frac{\$15.00}{64\pi \text{ in.}^2} \approx \frac{\$15.00}{201 \text{ in.}^2} \approx \frac{\$0.07}{\text{ in.}^2}$ Price per square inch for medium pizza = $\frac{\$7.50}{16\pi \text{ in.}^2} \approx \frac{\$7.50}{50 \text{ in.}^2} \approx \frac{\$0.15}{\text{ in.}^2}$

The large pizza is the better buy!

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