

LESSON
11.1**Study Guide**

For use with pages 720–726

GOAL Find areas of triangles and parallelograms.**Vocabulary**

The **bases of a parallelogram** are either pair of the parallel sides.

The **height of a parallelogram** is the perpendicular distance between the bases.

Postulate 24 Area of a Square Postulate: The area of a square is the square of the length of its side.

Postulate 25 Area Congruence Postulate: If two polygons are congruent, then they have the same area.

Postulate 26 Area Addition Postulate: The area of a region is the sum of the areas of its nonoverlapping parts.

Theorem 11.1 Area of a Rectangle: The area of a rectangle is the product of its base and height.

Theorem 11.2 Area of a Parallelogram: The area of a parallelogram is the product of a base and its corresponding height.

Theorem 11.3 Area of a Triangle: The area of a triangle is one half the product of a base and its corresponding height.

EXAMPLE 1 Use a formula to find area

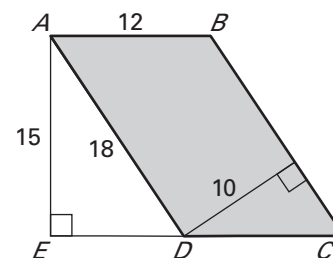
Find the area of $\square ABCD$.

Solution

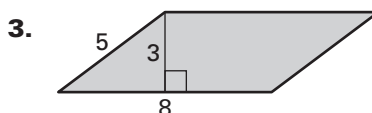
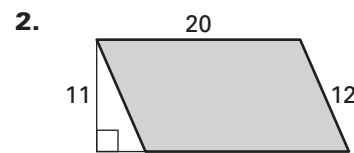
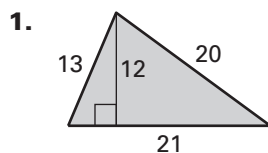
To find the area of the parallelogram, you can use either \overline{AB} or \overline{AD} as the base. If base \overline{AB} is used, then the height is the perpendicular distance to the other base \overline{DC} . So, $b = 12$ and $h = 15$.

$$A = bh = 12(15) = 180$$

The area of $\square ABCD$ is 180 square units.

**Exercises for Example 1**

Find the area of the polygon.



LESSON
11.1**Study Guide** *continued*
For use with pages 720–726**EXAMPLE 2** Solve for unknown measure

A triangle has an area of 126 square feet and a height of 14 feet. What is the length of the base?

Solution

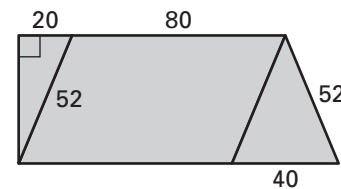
$$126 = \frac{1}{2}b(14) \quad \text{Substitute 126 for } A \text{ and 14 for } h \text{ into the formula for the area of a triangle.}$$

$$18 = b \quad \text{Solve for } b.$$

The length of the base of triangle is 18 feet.

EXAMPLE 3 Solve a multi-step problem

Grass Seed How many pounds of grass seed should you buy to cover the lawn shown at the right? A pound of Kentucky bluegrass seed covers 1650 square feet.

**Solution**

You can use a right triangle, a parallelogram, and a triangle to approximate the area of the lawn.

STEP 1 Find the height of the right triangle. The hypotenuse of the the right triangle has the same measure as the 52 foot side of the parallelogram.

$$52^2 = 20^2 + h^2 \quad \text{Pythagorean Theorem}$$

$$48 = h \quad \text{Solve for the positive value of } h.$$

STEP 2 Find the approximate area of the lawn.

$$\begin{aligned} \text{Area} &= \text{Area of right triangle} + \text{Area of parallelogram} + \text{Area of triangle} \\ &= \frac{1}{2}(20)(48) + (80)(48) + \frac{1}{2}(40)(48) = 5280 \text{ ft}^2 \end{aligned}$$

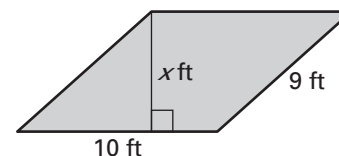
STEP 3 Determine how many pounds of seed you need.

$$5280 \text{ ft}^2 \cdot \frac{1 \text{ lb}}{1650 \text{ ft}^2} = 3.2 \text{ lb} \quad \text{Use unit analysis.}$$

You need to buy 4 pounds of grass seed so you will have enough.

Exercises for Examples 2 and 3

4. The parallelogram shown at the right has an area of 70 square feet. Find the value of x .



5. In Example 3, suppose a 10 foot by 35 foot rectangular driveway is constructed on a portion of the lawn. What is the approximate area you need to seed?