You can find the area of a triangle by using the base and height.

**The base of a triangle can be any of its sides.**

**The height is the perpendicular distance from the vertex opposite the base to the line containing the base.**

**Area of a Triangle**

<table>
<thead>
<tr>
<th>Words</th>
<th>The area $A$ of a triangle equals half the product of its base $b$ and height $h$.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbols</td>
<td>$A = \frac{1}{2}bh$</td>
</tr>
</tbody>
</table>

**EXAMPLE**

Find the area of the triangle shown.

**Estimate** $A = \frac{1}{2}(10)(7)$ or 35

$A = \frac{1}{2}bh$  
**Area of a triangle**

$A = \frac{1}{2}(10)(6.5)$  
Replace $b$ with 10 and $h$ with 6.5.

$A = 32.5$  
**Multiply.**

The area of the triangle is 32.5 square meters.

**Check for Reasonableness** $32.5 \approx 35 \checkmark$
### Reading Math

**Subscripts**
Read $b_1$ as $b$ sub 1. Read $b_2$ as $b$ sub 2. The subscripts mean that $b_1$ and $b_2$ represent different variables.

---

**CHECK Your Progress**

Find the area of each triangle. Round to the nearest tenth if necessary.

a. 

![Triangle A](image1)

b. 

![Triangle B](image2)

---

A trapezoid has two bases, $b_1$ and $b_2$. The bases are always the two sides that are parallel. The height of a trapezoid is the perpendicular distance between the bases.

### Area of a Trapezoid

**Key Concept**

**Words**
The area $A$ of a trapezoid equals half the product of the height $h$ and the sum of the bases $b_1 + b_2$.

**Symbols**

$$A = \frac{1}{2}h(b_1 + b_2)$$

---

**EXAMPLE**

**Find the Area of a Trapezoid**

1. Find the area of the trapezoid.

   The bases are 5 inches and 12 inches. The height is 7 inches.

   $$A = \frac{1}{2}h(b_1 + b_2)$$

   $$A = \frac{1}{2}(7)(5 + 12)$$

   Replace $h$ with 7, $b_1$ with 5, and $b_2$ with 12.

   $$A = \frac{1}{2}(7)(17)$$

   Add 5 and 12.

   $$A = 59.5$$

   Multiply.

   The area of the trapezoid is 59.5 square inches.

---

**CHECK Your Progress**

Find the area of each trapezoid. Round to the nearest tenth if necessary.

c. 

![Trapezoid C](image3)

d. 

![Trapezoid D](image4)
GEOGRAPHY The shape of Iron County, Michigan, resembles a trapezoid. Find the approximate area of this county.

\[
A = \frac{1}{2}h(b_1 + b_2) \quad \text{Area of a trapezoid}
\]

\[
A = \frac{1}{2}(42)(22 + 34) \quad \text{Replace } h \text{ with 42, } b_1 \text{ with 22, and } b_2 \text{ with 34.}
\]

\[
A = \frac{1}{2}(42)(56) \quad \text{Add 22 and 34.}
\]

\[
A = 1,176 \quad \text{Multiply.}
\]

The area of Iron County is approximately 1,176 square miles.

Check Your Progress

e. GEOGRAPHY The shape of the state of Arkansas resembles a trapezoid. Find the approximate area of Arkansas.

CHECK Your Understanding

Examples 1, 2 (pp. 578–579)

Find the area of each figure. Round to the nearest tenth if necessary.

1.  
2.  
3.  

Example 3 (p. 580)

4. HOCKEY In the National Hockey League, goaltenders can play the puck behind the goal line only in a trapezoid-shaped area, as shown at the right. Find the area of the trapezoid.
Find the area of each figure. Round to the nearest tenth if necessary.

5.  

6.  

7.  

8.  

9.  

10.  

11. **GEOGRAPHY** The shape of Idaho is roughly triangular with a base of 380 miles and a height of 500 miles. Find the approximate area of Idaho.

12. **ALGEBRA** Find the area of a trapezoid with bases 13 inches and 15 inches and a height of 7 inches.

**ALGEBRA** Find the height of each figure.

13.  

14.  

Draw and label each figure. Then find the area.

15. a triangle with no right angles and an area less than 12 square centimeters
16. a trapezoid with a right angle and an area greater than 40 square meters
17. a trapezoid with no right angles and an area less than 25 square feet

18. **TENTS** A play tent is shown at the right. How much fabric was used to make the front and back of the play tent?

19. What is the area of the lawn?
20. If one bag of grass seed covers 2,000 square feet, how many bags are needed to seed the lawn?
21. **CHALLENGE** Triangle $ABC$ has a base of 4 units and a height of 8 units. Triangle $DEF$ has twice the base and height. Describe how the ratio of the bases is related to the ratio of the areas.

22. **REASONING** Apply what you know about rounding to explain how to estimate the height $h$ of the trapezoid shown if the area is 235.5 in$^2$.

23. **WRITING IN MATH** Describe the relationship between the area of a parallelogram and the area of a triangle with the same height and base.

### Test Practice

24. $\triangle FGH$ and $\triangle JKM$ are similar.

![Diagram of triangles FGH and JKM with side lengths labeled.]

Which choice shows the equations that can be used to find the area of $\triangle FGH$?

- A $\frac{18}{24} = \frac{12}{x}$ and then $\frac{1}{2}(18x)$
- B $\frac{18}{24} = \frac{x}{12}$ and then $18x$
- C $\frac{18}{24} = \frac{x}{12}$ and then $\frac{1}{2}(18x)$
- D $\frac{18}{24} = \frac{12}{x}$ and then $18x$

25. **SHORT RESPONSE** Randy was hired to put in sod on a piece of land shaped like a trapezoid as shown. How many square feet of sod are needed?

![Diagram of a trapezoid with dimensions labeled.]  

### Spiral Review

26. **MEASUREMENT** Find the area of a parallelogram having a base of 2.3 inches and a height of 1.6 inches. Round to the nearest tenth. (Lesson 11-1)

27. **GEOMETRY** Graph $\triangle JLK$ with vertices $J(-1, -4)$, $L(3, -2)$ and $K(1, 1)$, and its reflection over the $x$-axis. Write the ordered pairs for the vertices of the new figure. (Lesson 10-10)

Find each number. Round to the nearest tenth if necessary. (Lesson 7-2)

- 28. What number is 56% of 600?
- 29. 24.5 is what percent of 98?
- 30. 72 is 45% of what number?
- 31. 62.5% of 250 is what number?

### GET READY for the Next Lesson

**PREREQUISITE SKILL** Use a calculator to find each product to the nearest tenth. (Lesson 1-4)

- 32. $\pi \cdot 13$
- 33. $\pi \cdot 29$
- 34. $\pi \cdot 16^2$
- 35. $\pi \cdot 4.8^2$

**Chapter 11 Measurement: Two- and Three-Dimensional Figures**

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