

Objective

Determine the area of a trapezoid by dividing it into two triangles whose heights are the same as the height of the trapezoid and whose bases are those of the trapezoid.

Common Core State Standards

- **6.G.1** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
- **6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Geometry

Area of Trapezoids

By the time students reach 7th and 8th grade, they are expected to bring to their study of geometry and measurement an understanding of common figures such as squares, rectangles, and triangles. Also, students at this level are able to analyze new shapes by comparing them to shapes they are already familiar with and by combining previously learned processes. The study of trapezoids affords students the opportunity to build on what they know about triangles and to make the transition from these common figures to more irregular ones.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have students look at the trapezoid and triangles they made on the XY Coordinate Pegboard and drew on the centimeter dot paper. **Ask:** *In what ways are the trapezoid and its internal triangles similar?*
- **Ask:** *If you divide the trapezoid into two different triangles by connecting points (4, 9), (9, 9), and (13, 5), will your answer to the problem be the same? Explain.*
- **Ask:** *What other shapes could you divide the trapezoid into in order to find its area?*

Solve It

Reread the problem with students. Have students write a sentence that states the key to finding the area of a trapezoid. When they have written and discussed this with their classmates, have them propose a formula for finding the area of any trapezoid ($A = \frac{1}{2}h(b_1 + b_2)$, where b_1 and b_2 are the bases).

More Ideas

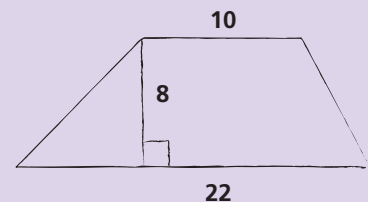
For other ways to teach about the area of trapezoids—

- Have students work in pairs to construct trapezoids from Pattern Blocks. They should then transfer the figures to $\frac{1}{8}$ " dot paper. Have students determine the area of the trapezoid(s) they make. (Note: The sides of all of the Pattern Blocks are 1 or 2 inches long.)
- Have students work in pairs to construct trapezoids from Tangram pieces. Using the square as a unit, have students determine the area of the trapezoid(s) they make. (Note: 2 small triangles = 1 square.) Have students make a right trapezoid from some of the pieces.

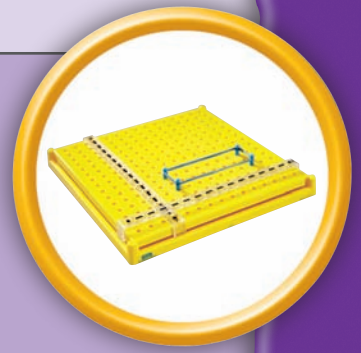
Formative Assessment

Have students try the following problem.

Find the area of the trapezoid shown here.



- A. 52 sq. units B. 128 sq. units C. 176 sq. units D. 256 sq. units



Try It! 35 minutes | Pairs

Here is a problem about finding the area of a trapezoid.

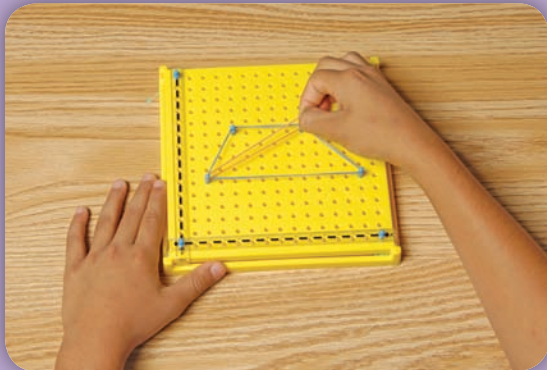
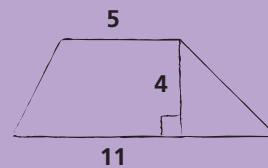
Steven works for a landscaping company that will be installing sod in a customer's backyard. The area to be covered is a trapezoid. One base of the trapezoid is 11 yards long, and the other is 5 yards long. The trapezoid is 4 yards high. How many square yards of sod will Steven need to cover the area?

Introduce the problem. Then have students do the activity to solve the problem. Review with students the features of a trapezoid. Sketch the trapezoid on the board as shown.

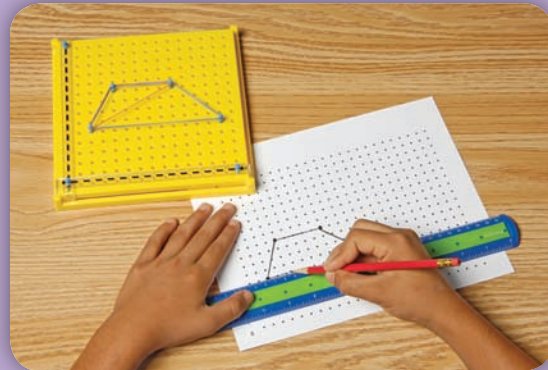
Distribute the materials. Have students slide the x-axis of the XY Coordinate Pegboard to the bottom of the board and the y-axis to the left edge and secure the axes with pegs. Write the following coordinates on the board: (2, 5), (4, 9), (9, 9), (13, 5). Have students place pegs at the coordinates and stretch a rubber band around the pegs to create a trapezoid.

Materials

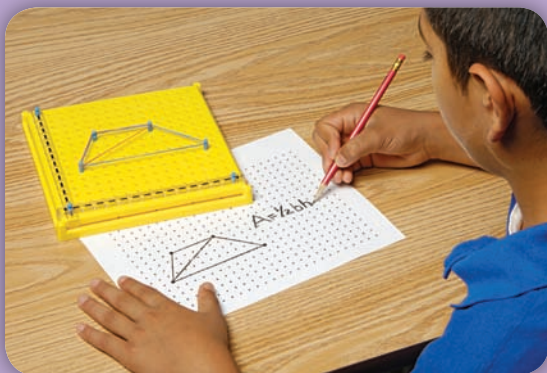
- XY Coordinate Pegboard
- Centimeter Dot Paper (BLM 11; 1 per pair)
- ruler or straightedge



1. Have students divide the trapezoid into two triangles by stretching a rubber band of a different color from (2, 5) to (4, 9) to (9, 9).



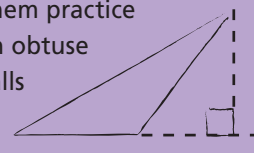
2. Have students draw the trapezoid on centimeter dot paper. Then have them draw a line that divides the trapezoid into two triangles.



3. Students should determine the length of the top base of the trapezoid, the bottom base, and the altitude by counting the units. Students should then find the area (in square units) of each of its internal triangles ($A = \frac{1}{2}bh$). Note that the bases of the triangles are also the bases of the trapezoid. Students can add the areas of the triangles together to determine the area of the trapezoid.

! Look Out!

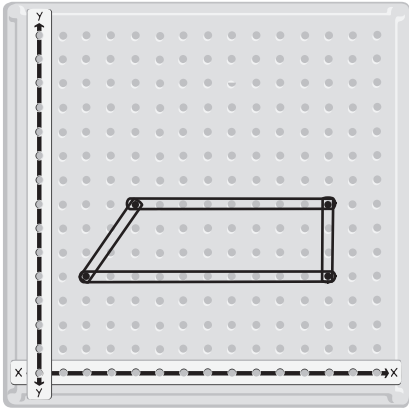
Students may have difficulty recognizing that the height of each of the trapezoid's two internal triangles is the same as the height of the trapezoid itself. Have them practice identifying the height of an obtuse triangle when the height falls outside the figure.



Use an XY Coordinate Pegboard to model the trapezoids. Divide each trapezoid into two triangles. Find the area of each trapezoid.

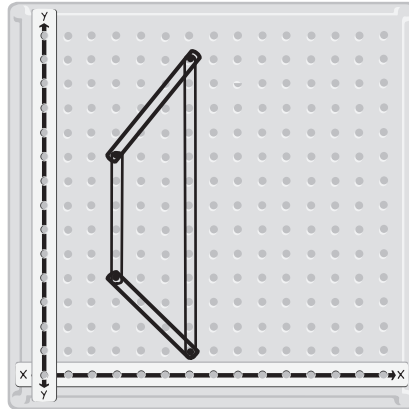
(Check students' work.)

1.



Area of triangle 12 sq. units
 Area of triangle 15 sq. units
 Area of trapezoid 27 sq. units

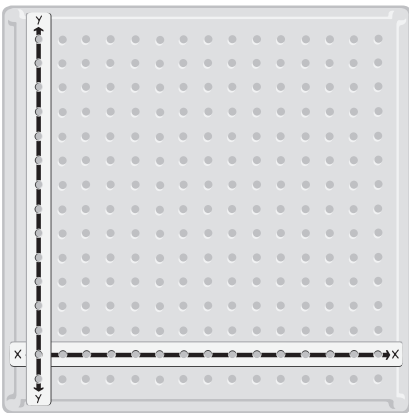
2.



Area of triangle 7.5 sq. units
 Area of triangle 18 sq. units
 Area of trapezoid 25.5 sq. units

Using an XY Coordinate Pegboard, model a trapezoid with the given area. Sketch the model. Answer the questions.

3. 64 square units

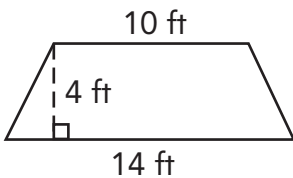


What is the length of the short base? _____
 What is the length of the long base? _____
 What is the height? _____

Check students' models;
 answers will vary
 depending on models.

Find the area of each trapezoid.

4.



48 ft²

5. bases, 4 in. and 6 in.
 height, 5 in.

25 in.²

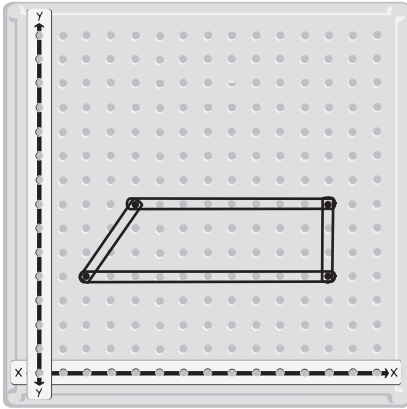
6. bases, 9 cm and 10 cm
 height, 6 cm

57 cm²



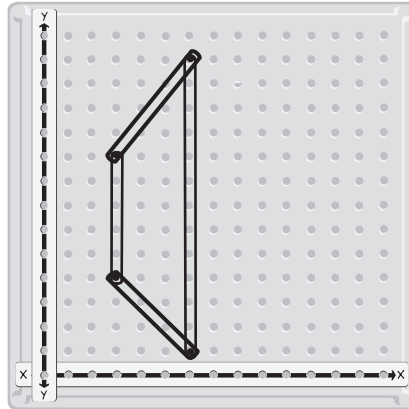
Use an XY Coordinate Pegboard to model the trapezoids. Divide each trapezoid into two triangles. Find the area of each trapezoid.

1.



Area of triangle _____ sq. units
 Area of triangle _____ sq. units
 Area of trapezoid _____ sq. units

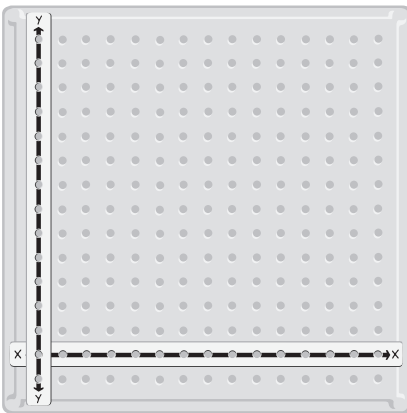
2.



Area of triangle _____ sq. units
 Area of triangle _____ sq. units
 Area of trapezoid _____ sq. units

Using an XY Coordinate Pegboard, model a trapezoid with the given area. Sketch the model. Answer the questions.

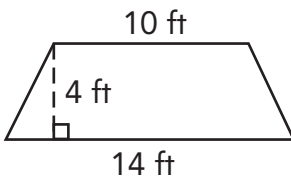
3. 64 square units



What is the length of the short base? _____
 What is the length of the long base? _____
 What is the height? _____

Find the area of each trapezoid.

4.



5. bases, 4 in. and 6 in.
 height, 5 in.

6. bases, 9 cm and 10 cm
 height, 6 cm

Name _____

