

Geometry and Volume

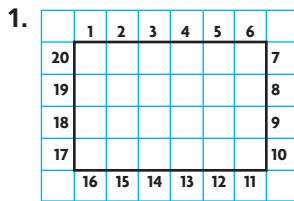
Show What You Know



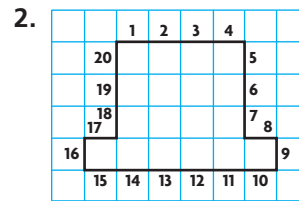
Check your understanding of important skills.

Name _____

► **Perimeter** Count the units to find the perimeter.

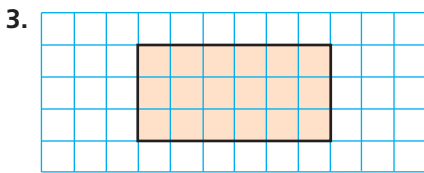


Perimeter = _____ units

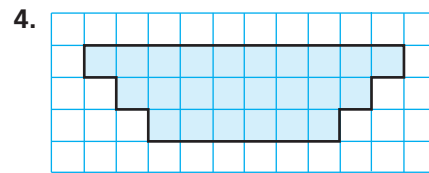


Perimeter = _____ units

► **Area** Write the area of each shape.



_____ square units



_____ square units

► **Multiply Three Factors** Write the product.

5. $3 \times 5 \times 4 =$ _____

6. $5 \times 5 \times 10 =$ _____

7. $7 \times 3 \times 20 =$ _____



Helen must find a certain polyhedron for a treasure hunt. Be a Math Detective by using the clues to help Helen identify the polyhedron.

Clues

- The polyhedron has 1 base.
- It has 4 lateral faces that meet at a common vertex.
- The edges of the base are all the same length.



rectangular prism



triangular prism



hexagonal prism



square pyramid



triangular pyramid

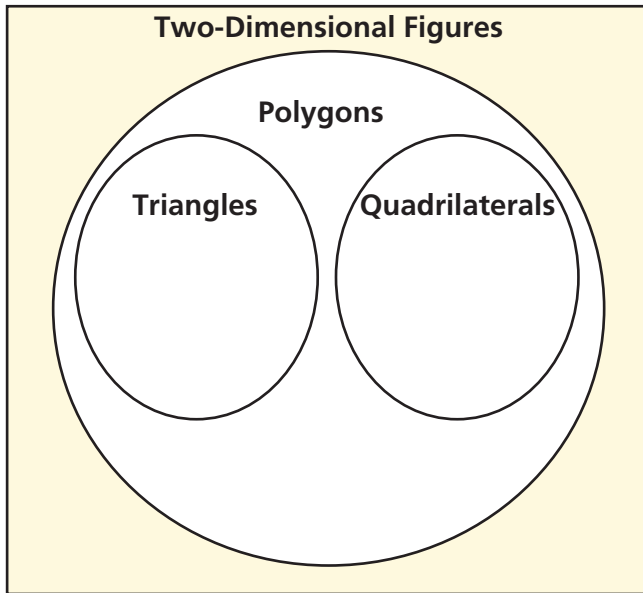


cube

Vocabulary Builder

► Visualize It

Sort the checked words into the circle map.



Review Words

- ✓ acute triangle
- ✓ decagon
- equilateral triangle
- ✓ hexagon
- isosceles triangle
- ✓ obtuse triangle
- ✓ octagon
- ✓ parallelogram
- quadrilateral
- ✓ rectangle
- ✓ rhombus
- ✓ right triangle
- scalene triangle
- ✓ trapezoid

► Understand Vocabulary

Write the preview word that answers the riddle.

1. I am a solid figure with two congruent polygons that are bases, connected with lateral faces that are rectangles. _____
2. I am a polygon in which all sides are congruent and all angles are congruent. _____
3. I am a cube that has a length, width, and height of 1 unit. _____
4. I am a solid figure with faces that are polygons. _____
5. I am the measure of the amount of space a solid figure occupies. _____
6. I am a polygon that connects with the bases of a polyhedron. _____

Preview Words

- base
- congruent
- heptagon
- lateral face
- nonagon
- polyhedron
- prism
- pyramid
- regular polygon
- unit cube
- volume

Name _____

Polygons

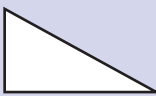

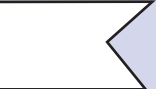

Essential Question How can you identify and classify polygons?

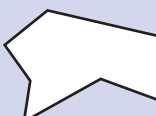
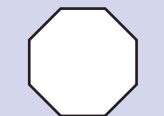
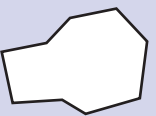
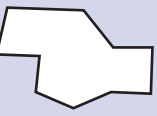
UNLOCK the Problem REAL WORLD

The Castel del Monte in Apulia, Italy, was built more than 750 years ago. The fortress has one central building with eight surrounding towers. Which polygon do you see repeated in the structure? How many sides, angles, and vertices does this polygon have?




A **polygon** is a closed plane figure formed by three or more line segments that meet at points called vertices. It is named by the number of sides and angles it has. To identify the repeated polygon in the fortress, complete the tables below.

Polygon				
Sides	3	4	5	
Angles				
Vertices				

Polygon				
Sides	7	8		
Angles				
Vertices				

Math Idea
Sometimes the angles inside a polygon are greater than 180° .



So, the _____ is the repeated polygon in the Castel del Monte because it has _____ sides, _____ angles, and _____ vertices.

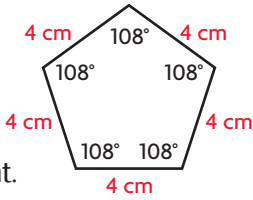
Math Talk MATHEMATICAL PRACTICES
What pattern do you see among the number of sides, angles, and vertices a polygon has?

Regular Polygons When line segments have the same length or when angles have the same measure, they are **congruent**. In a **regular polygon**, all sides are congruent and all angles are congruent.

regular polygon

All sides are congruent.

All angles are congruent.

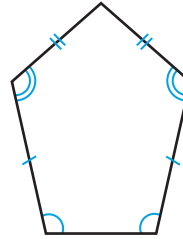


You can write measurements to show congruent sides and angles.

not a regular polygon

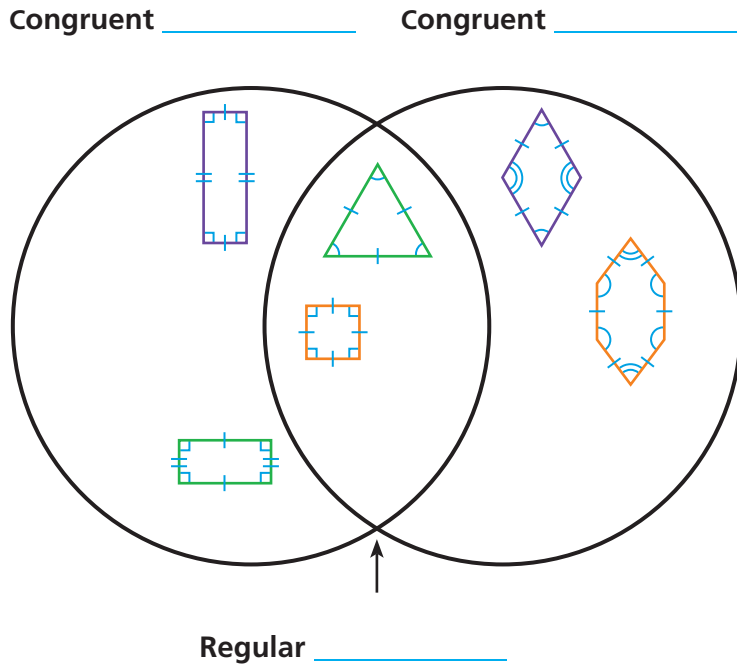
Not all sides are congruent.

Not all angles are congruent.



You can use the same markings to show the congruent sides and angles.

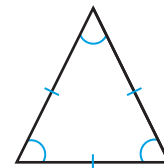
Try This! Label the Venn diagram to classify the polygons in each group. Then draw a polygon that belongs only to each group.



Share and Show

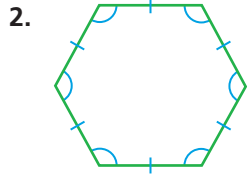
1. Name the polygon. Then use the markings on the figure to tell whether it is a *regular polygon* or *not a regular polygon*.

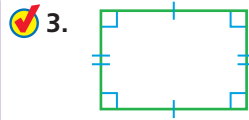
- a. Name the polygon. _____
- b. Are all the sides and all the angles congruent? _____
- c. Is the polygon a regular polygon? _____

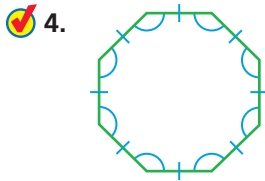


Name _____

Name each polygon. Then tell whether it is a *regular polygon* or *not a regular polygon*.



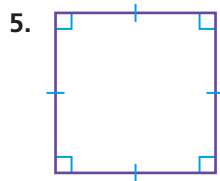


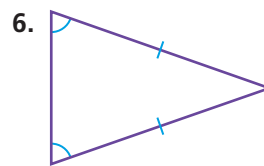


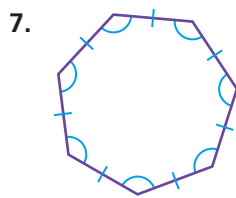
Math Talk **MATHEMATICAL PRACTICES** Explain why all regular pentagons have the same shape.

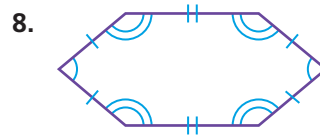
On Your Own

Name each polygon. Then tell whether it is a *regular polygon* or *not a regular polygon*.

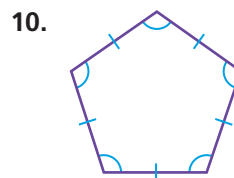






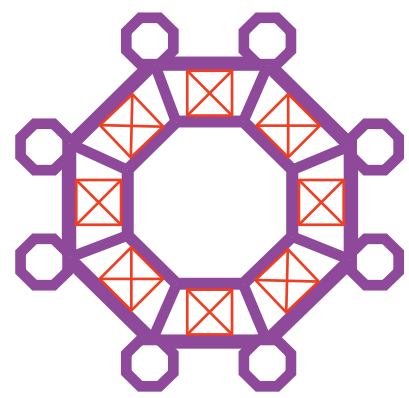






Problem Solving REAL WORLD

For 11–12, use the Castel del Monte floor plan at the right.



- 11. Which polygons in the floor plan have four equal sides and four congruent angles? How many of these polygons are there?

- 12. Is there a quadrilateral in the floor plan that is not a regular polygon? Name the quadrilateral and tell how many of the quadrilaterals are in the floor plan.

- 13. Sketch eight points. Then connect the points to draw a closed plane figure.

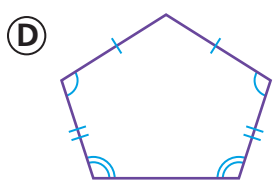
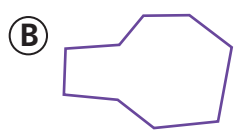
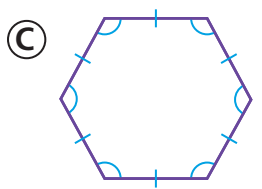
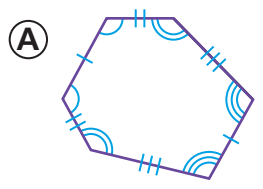


A large rounded rectangular box for drawing a closed plane figure.

What kind of polygon did you draw? _____

- 14. **H.O.T.** Look at the angles for all regular polygons. As the number of sides increases, do the measures of the angles increase or decrease? What pattern do you see?

- 15. **Test Prep** Which of the following is a regular hexagon?



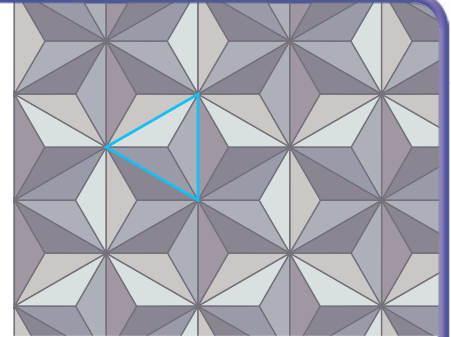
Name _____

Triangles

Essential Question How can you classify triangles?

UNLOCK the Problem REAL WORLD

If you look closely at Epcot Center’s Spaceship Earth building in Orlando, Florida, you may see a pattern of triangles. The triangle outlined in the pattern at the right has 3 congruent sides and 3 acute angles. What type of triangle is outlined?



Key Complete the sentence that describes each type of triangle.

Classify triangles by the lengths of their sides.

An **equilateral triangle** has _____ congruent sides.

Classify triangles by the measures of their angles.

A **right triangle** has one 90° , or _____ angle.

An **isosceles triangle** has _____ congruent sides.

An **acute triangle** has 3 _____ angles.

A **scalene triangle** has _____ congruent sides.

An **obtuse triangle** has 1 _____ angle.

The type of triangle outlined in the pattern can be classified by the length of its sides as an _____ triangle.

The triangle can also be classified by the measures of its angles as an _____ triangle.

Math Talk

MATHEMATICAL PRACTICES

Is an equilateral triangle also a regular polygon? **Explain.**

Activity

Classify triangle ABC by the lengths of its sides and by the measures of its angles.

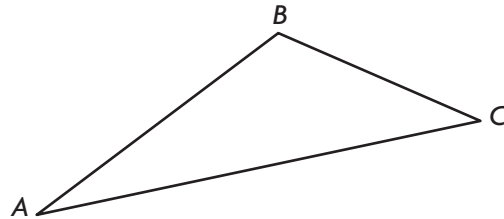
Materials ■ centimeter ruler ■ protractor

STEP 1 Measure the sides of the triangle using a centimeter ruler. Label each side with its length. Classify the triangle by the lengths of its sides.

STEP 2 Measure the angles of the triangle using a protractor. Label each angle with its measure. Classify the triangle by the measures of its angles.

- What type of triangle has 3 sides of different lengths?

- What is an angle called that is greater than 90° and less than 180° ?



Triangle ABC is a _____ triangle.

Try This! Draw the type of triangle described by the lengths of its sides and by the measures of its angles.

Triangle by Length of Sides		
	Scalene	Isosceles
Triangle by Angle Measure	Acute Think: I need to draw a triangle that is acute and scalene.	
Obtuse		

Math Talk

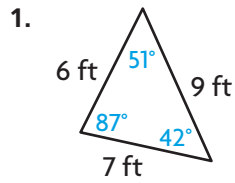
MATHEMATICAL PRACTICES

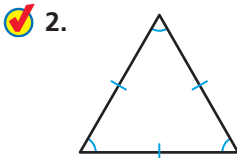
Can you draw a triangle that is right equilateral? **Explain.**

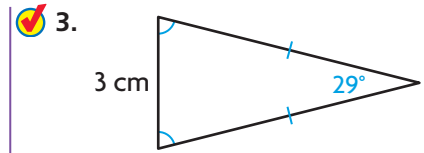
Name _____

Share and Show

Classify each triangle. Write *isosceles*, *scalene*, or *equilateral*.
Then write *acute*, *obtuse*, or *right*.

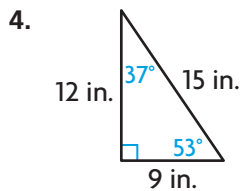


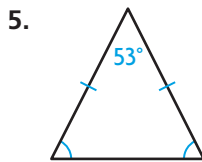


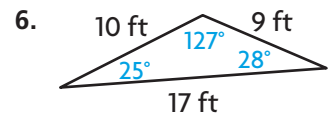


On Your Own.....

Classify each triangle. Write *isosceles*, *scalene*, or *equilateral*.
Then write *acute*, *obtuse*, or *right*.







Math Talk

MATHEMATICAL PRACTICES

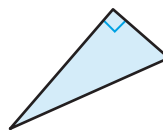
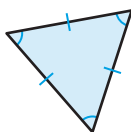
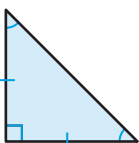
Can you tell that a triangle is obtuse, right, or acute without measuring the angles? **Explain.**

A triangle has sides with the lengths and angle measures given.
Classify each triangle. Write *isosceles*, *scalene*, or *equilateral*.
Then write *acute*, *obtuse*, or *right*.

7. sides: 3.5 cm, 6.2 cm, 3.5 cm
angles: 27°, 126°, 27°

8. sides: 2 in., 5 in., 3.8 in.
angles: 43°, 116°, 21°

9. Circle the figure that does not belong. **Explain.**



Problem Solving **REAL WORLD**

10. Draw 2 equilateral triangles that are congruent and share a side. What polygon is formed? Is it a regular polygon?

11. **H.O.T.** **What's the Error?** Shannon said that a triangle with exactly 2 congruent sides and an obtuse angle is an equilateral obtuse triangle. Describe her error.

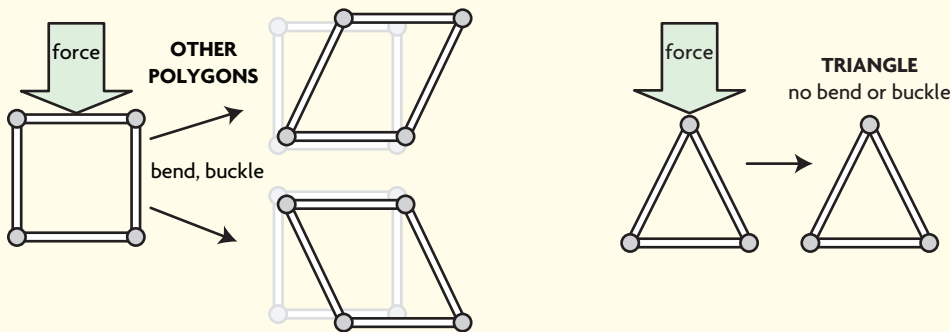
12. **Test Prep** Which kind of triangle has exactly 2 congruent sides?

- (A) isosceles (B) equilateral (C) scalene (D) right

Connect to Science

Forces and Balance

What makes triangles good for the construction of buildings or bridges? The 3 fixed lengths of the sides of a triangle, when joined, can form no other shape. So, when pushed, triangles don't bend or buckle.



Classify the triangles in the structures below. Write *isosceles*, *scalene*, or *equilateral*. Then write *acute*, *obtuse*, or *right*.



Name _____

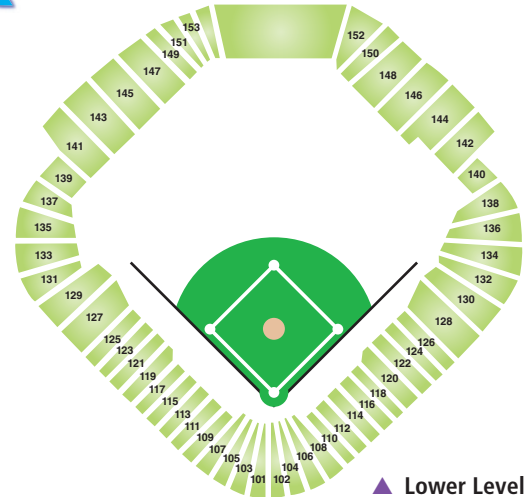
Quadrilaterals

Essential Question How can you classify and compare quadrilaterals?

UNLOCK the Problem REAL WORLD

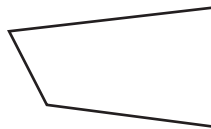
A seating chart for a baseball field has many four-sided figures, or **quadrilaterals**. What types of quadrilaterals can you find in the seating chart?

There are five special types of quadrilaterals. You can classify quadrilaterals by their properties, such as parallel sides and perpendicular sides. Parallel lines are lines that are always the same distance apart. Perpendicular lines are lines that intersect to form four right angles.



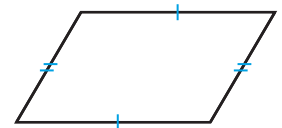
Key Complete the sentence that describes each type of quadrilateral.

A general quadrilateral has 4 sides and 4 angles.



A **parallelogram** has

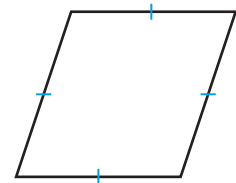
opposite _____
that are _____
and parallel.



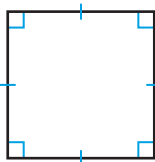
A **rectangle** is a special parallelogram with _____ right angles and 4 pairs of _____ sides.



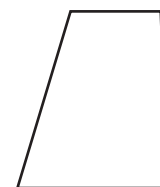
A **rhombus** is a special parallelogram with _____ congruent sides.



A **square** is a special parallelogram with _____ congruent sides and _____ right angles.



A **trapezoid** is a quadrilateral with exactly 1 pair of _____ sides.



So, the types of quadrilaterals you can find in the seating chart of the field are _____.

Math Talk

MATHEMATICAL PRACTICES

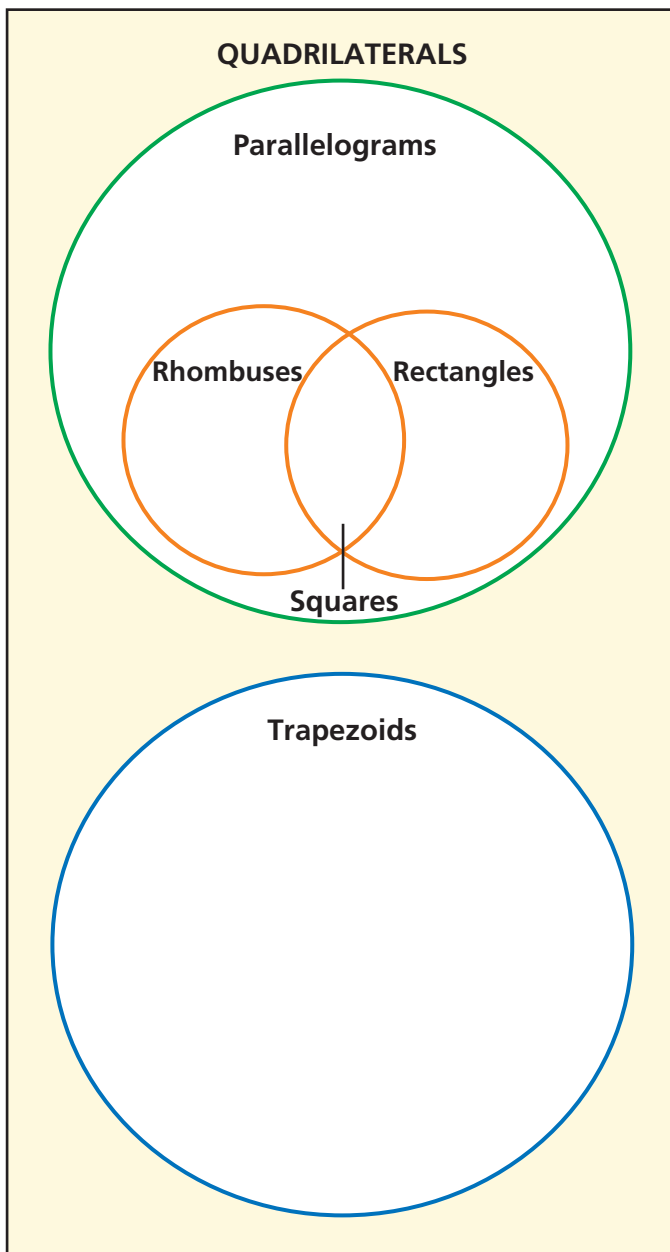
Explain how trapezoids and parallelograms are different.

Activity

Materials ■ quadrilaterals ■ scissors

You can use a Venn diagram to sort quadrilaterals and find out how they are related.

- Draw the diagram below on your MathBoard.
- Cut out the quadrilaterals and sort them into the Venn diagram.
- Record your work by drawing each figure you have placed in the Venn diagram below.



Complete the sentences by writing *always*, *sometimes*, or *never*.

A rhombus is _____ a square.

A parallelogram is _____ a rectangle.

A rhombus is _____ a parallelogram.

A trapezoid is _____ a parallelogram.

A square is _____ a rhombus.

1. **Explain** why the circle for parallelograms does not intersect the circle for trapezoids.

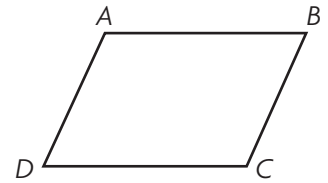
2. Draw a quadrilateral with four pairs of perpendicular sides and four congruent sides.



Name _____

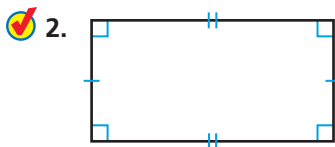
Share and Show

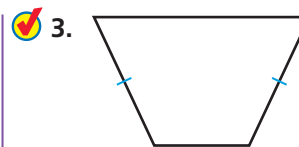
1. Use quadrilateral $ABCD$ to answer each question. Complete the sentence.



- Measure the sides. Are any of the sides congruent? _____
Mark any congruent sides.
 - How many right angles, if any, does the quadrilateral have? _____
 - How many pairs of parallel sides, if any, does the quadrilateral have? _____
- So, quadrilateral $ABCD$ is a _____.

Classify the quadrilateral in as many ways as possible. Write *quadrilateral, parallelogram, rectangle, rhombus, square, or trapezoid*.





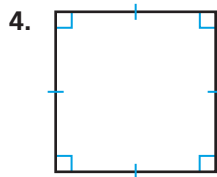
Math Talk

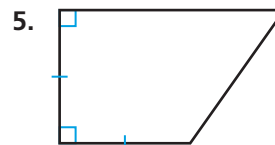
MATHEMATICAL PRACTICES

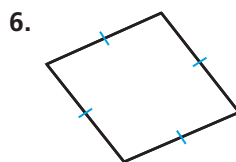
Can the parallel sides of a trapezoid be the same length?
Explain your answer.

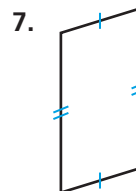
On Your Own

Classify the quadrilateral in as many ways as possible. Write *quadrilateral, parallelogram, rectangle, rhombus, square, or trapezoid*.











Problem Solving

Solve the problems.

8. A quadrilateral has exactly 2 congruent sides. Which quadrilateral types could it be? Which quadrilaterals could it not be?

9.  **What's the Error?** A quadrilateral has exactly 3 congruent sides. Davis claims that the figure must be a rectangle. Why is his claim incorrect? Use a diagram to **explain** your answer.

10. The opposite corners of a quadrilateral are right angles. The quadrilateral is not a rhombus. What kind of quadrilateral is this figure? **Explain** how you know.

11.  I am a figure with four sides. I can be placed in the following categories: quadrilateral, parallelogram, rectangle, rhombus, and square. Draw me. **Explain** why I fit into each category.

12. **Test Prep** A quadrilateral has exactly 1 pair of parallel sides and no congruent sides. What type of quadrilateral is it?

- | | |
|-------------------------------------|---|
| <input type="radio"/> (A) rectangle | <input type="radio"/> (C) parallelogram |
| <input type="radio"/> (B) rhombus | <input type="radio"/> (D) trapezoid |

Name _____

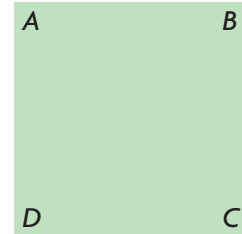
Problem Solving

Properties of Two-Dimensional Figures

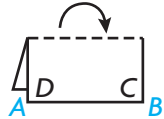
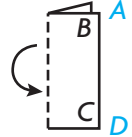
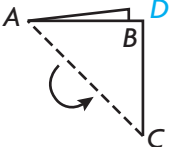
Essential Question How can you use the strategy *act it out* to approximate whether the sides of a figure are congruent?



Lori has a quadrilateral with vertices A , B , C , and D . The quadrilateral has four right angles. She wants to show that quadrilateral $ABCD$ is a square, but she does not have a ruler to measure the lengths of the sides. How can she show that the quadrilateral has four congruent sides and is a square?



Use the graphic organizer below to help you solve the problem.

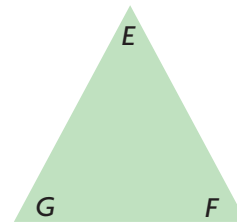
Read the Problem	Solve the Problem
<p>What do I need to find?</p> <p>I need to determine whether the quadrilateral has 4 _____ sides and is a _____.</p>	<p>I traced the quadrilateral and cut it out. I used <i>act it out</i> by folding to match each pair of sides.</p> <ul style="list-style-type: none"> I folded the quadrilateral to match side AB to side CD.  <ul style="list-style-type: none"> I folded the quadrilateral to match side AD to side BC.  <ul style="list-style-type: none"> I folded the quadrilateral diagonally to match side AD to side AB and side CD to side BC. 
<p>What information do I need to use?</p> <p>The quadrilateral has _____ angles. To be a square, it must also have _____ sides.</p>	
<p>How will I use the information?</p> <p>I can trace the figure, cut it out, and then fold it to match each pair of sides to show that sides _____ are _____.</p>	

1. What else do you need to do to solve the problem?

So, quadrilateral $ABCD$ _____ a square.

Try Another Problem

Terrence has drawn a triangle with vertices E , F , and G . The triangle has three congruent angles. He wants to show that triangle EFG has three congruent sides, but he does not have a ruler to measure the lengths of the sides. How can he show that the triangle has three congruent sides?



Read the Problem

Solve the Problem

What do I need to find?

Record your work by drawing your model after each fold. Label each drawing with the sides that you find are congruent.

What information do I need to use?

How will I use the information?

2. How can you use reasoning to show that all three sides of the triangle are congruent using just two folds? **Explain.**

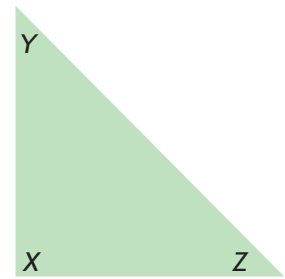
Name _____

Share and Show

1. Erica thinks that triangle XYZ , at the right, has two congruent sides, but she does not have a ruler to measure the sides. Are two sides congruent?


First, trace the triangle and cut out the tracing.


Then, fold the triangle to match each pair of sides to determine if at least two of the sides are congruent. As you test the sides, record or draw the results for each pair to make sure that you have checked all pairs of sides. Possible drawings are shown.



Finally, answer the question.

2. **What if** Erica also wants to show, without using a protractor, that the triangle has one right angle and two acute angles? Explain how she can show this.

-  3. December, January, and February were the coldest months in Kristen's town last year. February was the warmest of these months. December was not the coldest. What is the order of these months from coldest to warmest?

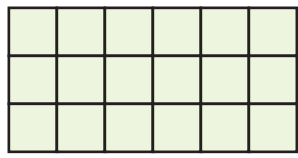
-  4. Jan enters a 20-foot by 30-foot rectangular room. The long sides face north and south. Jan enters the exact center of the south side and walks 10 feet north. Then she walks 8 feet east. How far is she from the east side of the room?

On Your Own

Choose a STRATEGY

- Act It Out
- Draw a Diagram
- Make a Table
- Solve a Simpler Problem
- Work Backward
- Guess, Check, and Revise

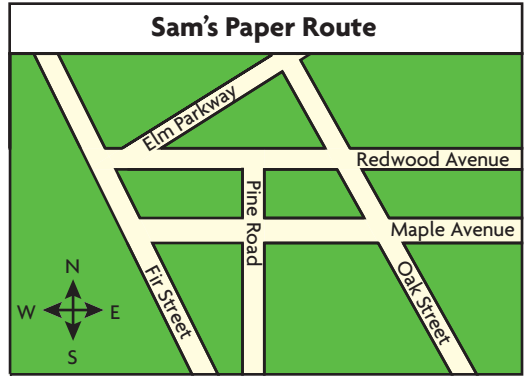
5. **H.O.T.** Max drew a grid to divide a piece of paper into 18 congruent squares, as shown. What is the least number of lines Max can draw to divide the grid into 6 congruent rectangles?



6. Of the 95 fifth and sixth graders going on a field trip, there are 27 more fifth graders than sixth graders. How many fifth graders are going on the field trip?

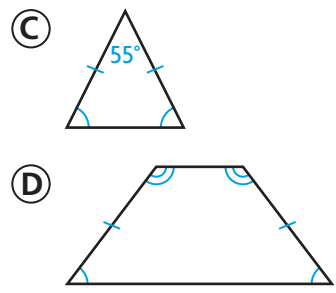
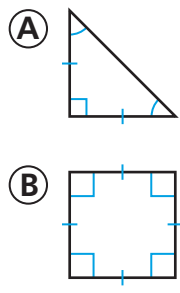
Use the map to solve 7–8.

7. Sam's paper route begins and ends at the corner of Redwood Avenue and Oak Street. His route is made up of 4 streets, and he makes no 90° turns. What kind of polygon do the streets of Sam's paper route form? Name the streets in Sam's route.



8. Sam's paper route includes all 32 houses on two pairs of parallel streets. If each street has the same number of houses, how many houses are on each street? Name the parallel streets.

9. **Test Prep** Which figure below is a quadrilateral that has opposite sides that are congruent and parallel?



Name _____

Three-Dimensional Figures

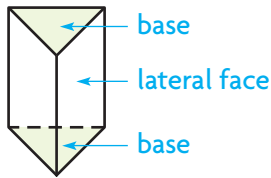
Essential Question How can you identify, describe, and classify three-dimensional figures?

UNLOCK the Problem

A solid figure has three dimensions: length, width, and height. **Polyhedrons**, such as prisms and pyramids, are three-dimensional figures with faces that are polygons.

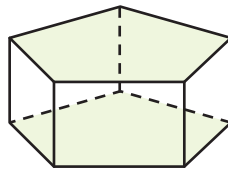
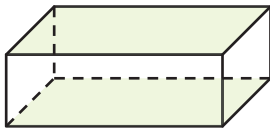
A **prism** is a polyhedron that has two congruent polygons as **bases**.

A polyhedron's **lateral faces** are polygons that connect with the bases. The lateral faces of a prism are rectangles.



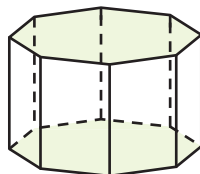
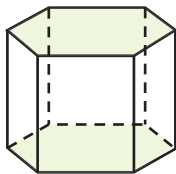
A prism's base shape is used to name the solid figure. The base shape of this prism is a triangle. The prism is a **triangular prism**.

Identify the base shape of the prism. Use the terms in the box to correctly name the prism by its base shape.



Base shape: _____
Name the solid figure.

Base shape: _____
Name the solid figure.



Base shape: _____
Name the solid figure.

Base shape: _____
Name the solid figure.

- Types of Prisms**
- decagonal prism
 - octagonal prism
 - hexagonal prism
 - pentagonal prism
 - rectangular prism
 - triangular prism

Math Talk **MATHEMATICAL PRACTICES**
What shapes make up a decagonal prism, and how many are there? **Explain.**


- What special prism has congruent squares for bases and lateral faces? _____

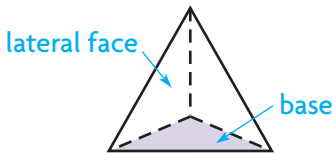
Pyramid A **pyramid** is a polyhedron with only one base. The lateral faces of a pyramid are triangles that meet at a common vertex.

Like a prism, a pyramid is named for the shape of its base.

Types of Pyramids

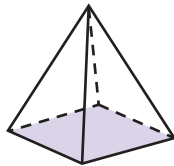
- pentagonal pyramid
- rectangular pyramid
- square pyramid
- triangular pyramid

 Identify the base shape of the pyramid. Use the terms in the box to correctly name the pyramid by its base shape.



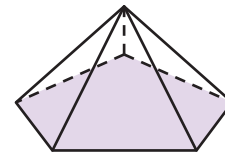
Base shape: _____

Name the solid figure.



Base shape: _____

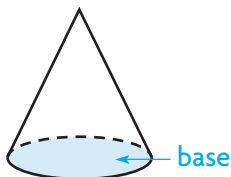
Name the solid figure.



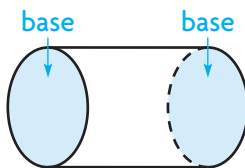
Base shape: _____

Name the solid figure.

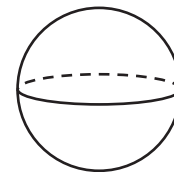
Non-polyhedrons Some three-dimensional figures have curved surfaces. These solid figures are *not* polyhedrons.



A **cone** has 1 circular base and 1 curved surface.



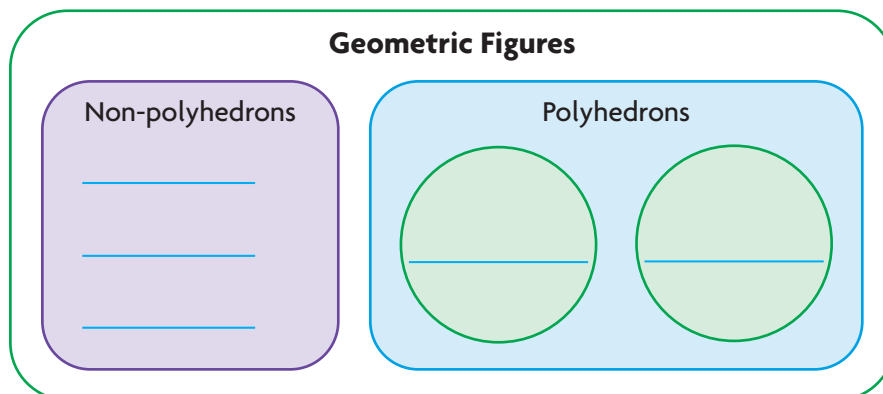
A **cylinder** has 2 congruent circular bases and 1 curved surface.



A **sphere** has no bases and 1 curved surface.

 Use the Venn diagram to sort the three-dimensional figures listed at the left.

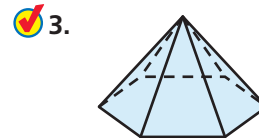
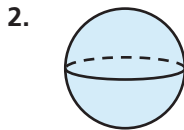
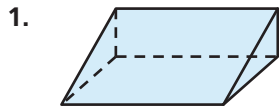
- Cones
- Cylinders
- Prisms
- Pyramids
- Spheres



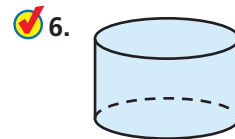
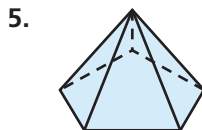
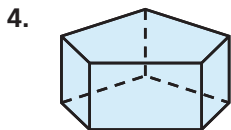
Name _____

Share and Show

Classify the solid figure. Write *prism*, *pyramid*, *cone*, *cylinder*, or *sphere*.



Name the solid figure.



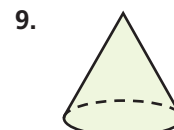
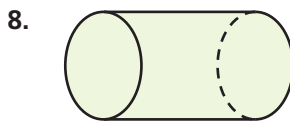
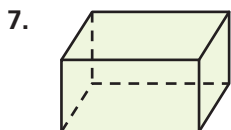
Math Talk

MATHEMATICAL PRACTICES

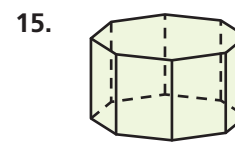
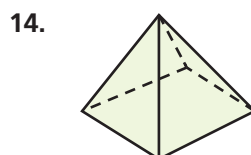
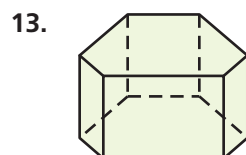
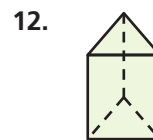
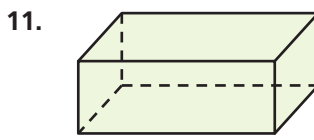
Compare a prism and a pyramid. Tell how they are similar and how they are different.

On Your Own

Classify the solid figure. Write *prism*, *pyramid*, *cone*, *cylinder*, or *sphere*.



Name the solid figure.



Problem Solving REAL WORLD

16. Mario is making a sculpture out of stone. He starts by carving a base with five sides. He then carves five triangular lateral faces that all meet at a point at the top. What three-dimensional figure does Mario make?

17. **H.O.T.** What is another name for a cube? **Explain** your reasoning.

Connect to Reading

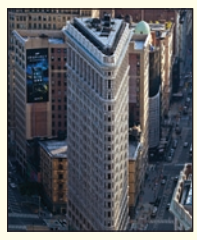
Identify the Details

If you were given a description of a building and asked to identify which one of these three buildings is described, which details would you use to determine the building?

Word problems contain details that help you solve the problem. Some details are meaningful and are important to finding the solution and some details may not be. *Identify the details* you need to solve the problem.

Example Read the description. Underline the details you need to identify the solid figure that will name the correct building.

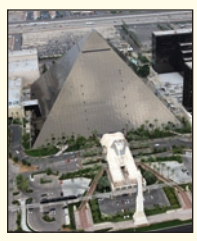
This building is one of the most identifiable structures in its city's skyline. It has a square foundation and 28 floors. The building has four triangular exterior faces that meet at a point at the top of the structure.



◀ Flatiron Building, New York City, New York



◀ Nehru Science Center, Mumbai, India



◀ Luxor Hotel, Las Vegas, Nevada

Identify the solid figure and name the correct building.

18. Solve the problem in the Example.

Solid figure: _____

Building: _____

19. This building was completed in 1902. It has a triangular foundation and a triangular roof that are the same size and shape. The three sides of the building are rectangles.

Solid figure: _____

Building: _____



Mid-Chapter Checkpoint

► Vocabulary

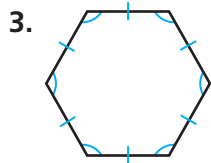
Choose the best term from the box.

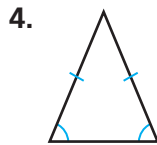
1. A closed plane figure with all sides congruent and all angles congruent is called a _____. (p. 442)
2. Line segments that have the same length or angles that have the same measure are _____. (p. 442)

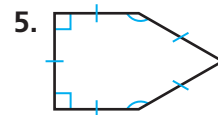
Vocabulary
congruent
polyhedron
regular polygon

► Concepts and Skills

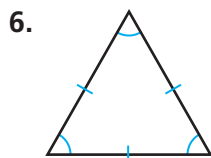
Name each polygon. Then tell whether it is a *regular polygon* or *not a regular polygon*.

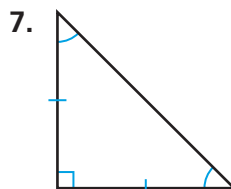


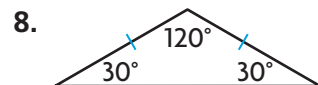




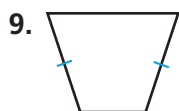
Classify each triangle. Write *isosceles*, *scalene*, or *equilateral*. Then write *acute*, *obtuse*, or *right*.

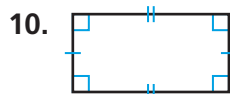


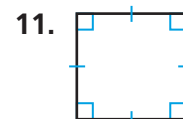




Classify the quadrilateral in as many ways as possible. Write *quadrilateral*, *parallelogram*, *rectangle*, *rhombus*, *square*, or *trapezoid*.

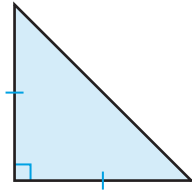






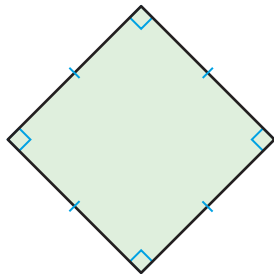
Fill in the bubble completely to show your answer.

12. What type of triangle is shown below?



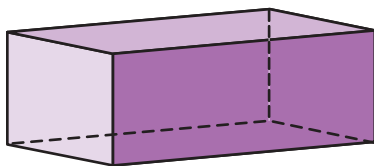
- (A) right isosceles
- (B) right scalene
- (C) equilateral
- (D) obtuse scalene

13. Classify the quadrilateral in as many ways as possible.



- (A) quadrilateral, parallelogram, rhombus
- (B) quadrilateral, parallelogram, rhombus, trapezoid
- (C) quadrilateral, parallelogram, rhombus, rectangle, trapezoid, square
- (D) quadrilateral, parallelogram, rhombus, rectangle, square

14. Classify the following figure.



- (A) cone
- (B) cube
- (C) rectangular prism
- (D) rectangular pyramid

Name _____

Unit Cubes and Solid Figures

Essential Question What is a unit cube and how can you use it to build a solid figure?

Investigate

You can build rectangular prisms using unit cubes. How many different rectangular prisms can you build with a given number of unit cubes?

Materials ■ centimeter cubes

A **unit cube** is a cube that has a length, width, and height of 1 unit. A cube has _____ square faces. All of its faces are congruent. It has _____ edges. The lengths of all its edges are equal.

A. Build a rectangular prism with 2 unit cubes.

Think: When the 2 cubes are pushed together, the faces and edges that are pushed together make 1 face and 1 edge.

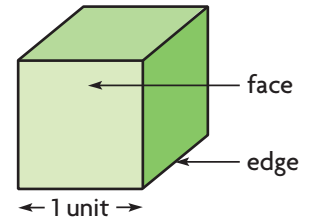
- How many faces does the rectangular prism have? _____
- How many edges does the rectangular prism have? _____

B. Build as many different rectangular prisms as you can with 8 unit cubes.

C. Record in units the dimensions of each rectangular prism you built with 8 cubes.

Dimensions		

So, with 8 unit cubes, I can build _____ different rectangular prisms.



Math Talk

MATHEMATICAL PRACTICES

Describe the different rectangular prisms that you can make with 4 unit cubes.

Draw Conclusions

1. **Explain** why a rectangular prism composed of 2 unit cubes has 6 faces. How do its dimensions compare to a unit cube?

2. **Explain** how the number of edges for the rectangular prism compares to the number of edges for the unit cube.

3. **Describe** what all of the rectangular prisms you made in Step B have in common.

Make Connections

You can build other solid figures and compare the solid figures by counting the number of unit cubes.

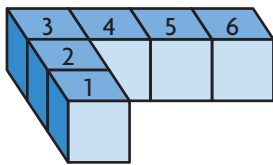


Figure 1

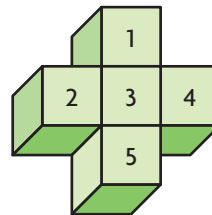


Figure 2

Figure 1 is made up of _____ unit cubes.

Figure 2 is made up of _____ unit cubes.

So, Figure _____ has more unit cubes than Figure _____.

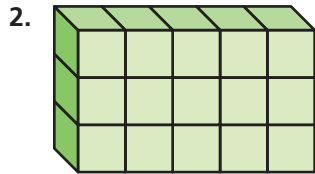
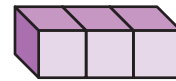
- Use 12 unit cubes to build a solid figure that is not a rectangular prism. Share your model with a partner. Describe how your model is the same and how it is different from your partner's model.

Name _____

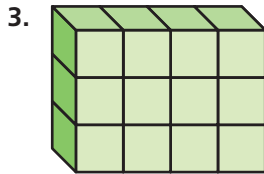
Share and Show

Count the number of cubes used to build each solid figure.

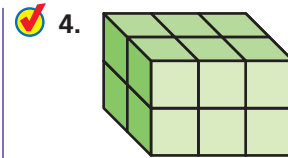
1. The rectangular prism is made up of _____ unit cubes.



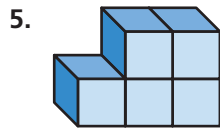
_____ unit cubes



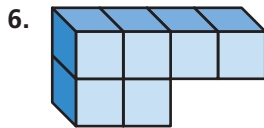
_____ unit cubes



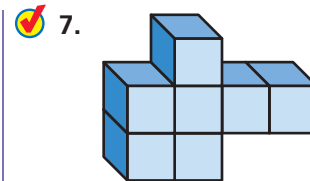
_____ unit cubes




_____ unit cubes



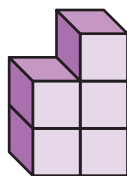
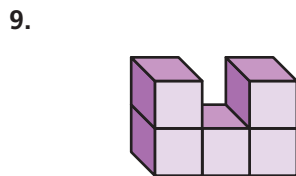
_____ unit cubes



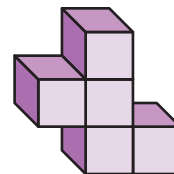
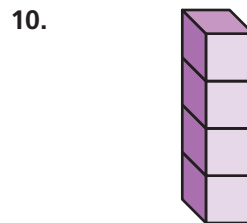
_____ unit cubes

8.  How are the rectangular prisms in Exercises 3–4 related? Can you show a different rectangular prism with the same relationship? **Explain.**

Compare the number of unit cubes in each solid figure. Use $<$, $>$ or $=$.



_____ unit cubes ○ _____ unit cubes



_____ unit cubes ○ _____ unit cubes

Architecture is the art and science of designing buildings and structures. An architect is a person who plans and designs the buildings.

Good architects are both artists and engineers. They must have a good knowledge of building construction, and they should know how to design buildings that meet the needs of the people who use them.

The Cube Houses of Rotterdam in the Netherlands, shown at the top right, were built in the 1970s. Each cube is a house, tilted and resting on a hexagon-shaped pylon, and is meant to represent an abstract tree. The village of Cube Houses creates a “forest”.



The Nakagin Capsule Tower, shown at the right, is an office and apartment building in Tokyo, Japan, made up of modules attached to two central cores. Each module is a rectangular prism connected to a concrete core by four huge bolts. The modules are office and living spaces that can be removed or replaced.



Use the information to answer the questions.

11. There are 38 Cube Houses. Each house could hold 1,000 unit cubes that are 1 meter by 1 meter by 1 meter. Describe the dimensions of a cube house using unit cubes. Remember that the edges of a cube are all the same length.

12. **H.O.T.** The Nakagin Capsule Tower has 140 modules, and is 14 stories high. If all of the modules were divided evenly among the number of stories, how many modules would be on each floor? How many different rectangular prisms could be made from that number?

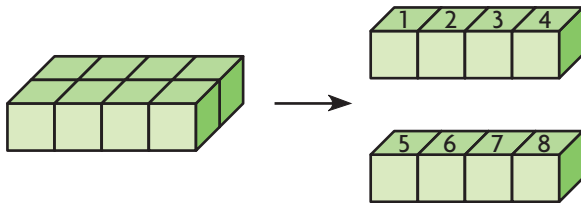
Name _____

Understand Volume

Essential Question How can you use unit cubes to find the volume of a rectangular prism?

Investigate

CONNECT You can find the volume of a rectangular prism by counting unit cubes. **Volume** is the measure of the amount of space a solid figure occupies and is measured in **cubic units**. Each unit cube has a volume of 1 cubic unit.



The rectangular prism above is made up of _____ unit cubes and has a volume of _____ cubic units.

Materials ■ rectangular prism net A ■ centimeter cubes

A. Cut out, fold, and tape the net to form a rectangular prism.

B. Use centimeter cubes to fill the base of the rectangular prism without gaps or overlaps. Each centimeter cube has a length, width, and height of 1 centimeter and a volume of 1 cubic centimeter.

- How many centimeter cubes make up the length of the first layer? the width? the height?

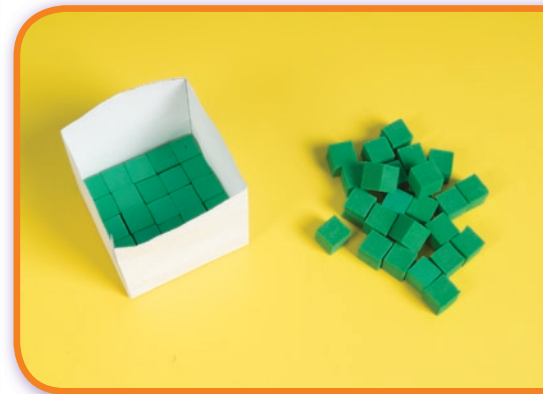
length: _____ width: _____ height: _____

- How many centimeter cubes are used to fill the base? _____

C. Continue filling the rectangular prism, layer by layer. Count the number of centimeter cubes used for each layer.

- How many centimeter cubes are in each layer? _____
- How many layers of cubes fill the rectangular prism? _____
- How many centimeter cubes fill the prism? _____

So, the volume of the rectangular prism is _____ cubic centimeters.



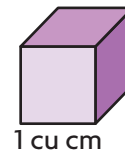
Draw Conclusions

1. **Describe** the relationship among the number of centimeter cubes you used to fill each layer, the number of layers, and the volume of the prism.

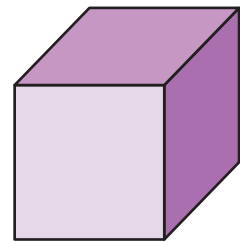
2. **Apply** If you had a rectangular prism that had a length of 3 units, a width of 4 units, and a height of 2 units, how many unit cubes would you need for each layer? How many unit cubes would you need to fill the rectangular prism?

Make Connections

To find the volume of three-dimensional figures, you measure in three directions. For a rectangular prism, you measure its length, width, and height. Volume is measured using cubic units, such as cu cm, cu in., or cu ft.



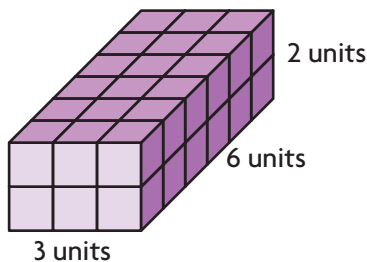
1 cu cm



1 cu in.

- Which has a greater volume, 1 cu cm or 1 cu in.? **Explain.**

Find the volume of the prism if each cube represents 1 cu cm, 1 cu in., and 1 cu ft.



_____ cu cm

_____ cu in.

_____ cu ft

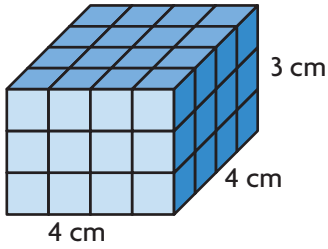
- Would the prism above be the same size if it were built with centimeter cubes, inch cubes, or foot cubes? **Explain.**

Name _____

Share and Show

Use the unit given. Find the volume.

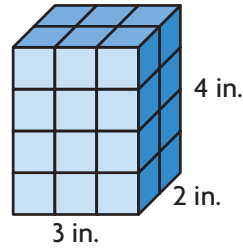
1.



Each cube = 1 cu cm

Volume = _____ cu _____

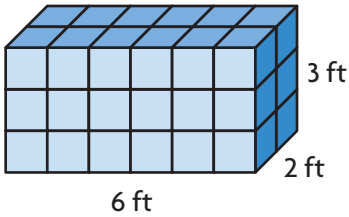
2.



Each cube = 1 cu in.

Volume = _____ cu _____

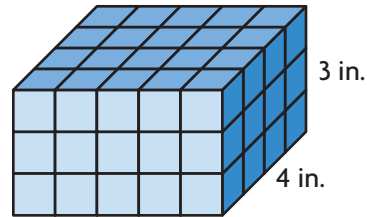
3.



Each cube = 1 cu ft

Volume = _____ cu _____

4.

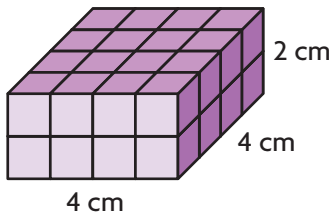


Each cube = 1 cu in.

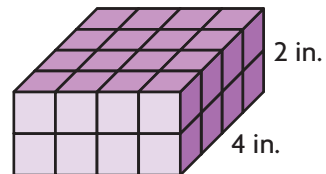
Volume = _____ cu _____

Compare the volumes. Write $<$, $>$, or $=$.

5.



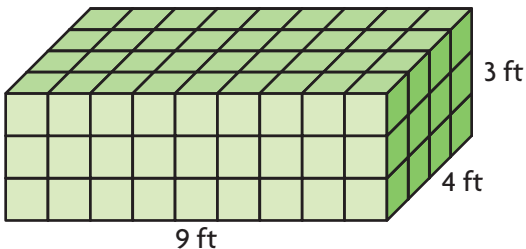
Each cube = 1 cu cm



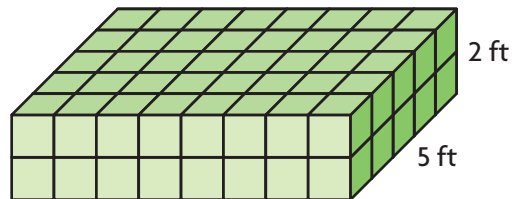
Each cube = 1 cu in.

_____ cu cm _____ cu in.

6.



Each cube = 1 cu ft



Each cube = 1 cu ft

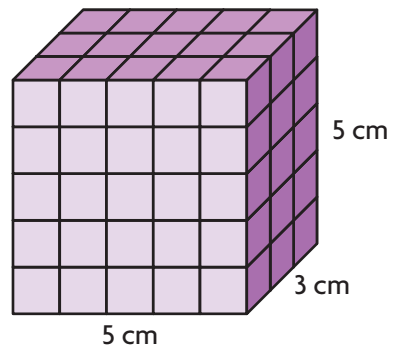
_____ cu ft _____ cu ft

Problem Solving **REAL WORLD**

7. **What's the Error?** Jerry says that a cube with edges that measure 10 centimeters has a volume that is twice as much as a cube with sides that measure 5 centimeters. **Explain** and correct Jerry's error.

8. **H.O.T.** Pattie built a rectangular prism with cubes. The base of her prism has 12 centimeter cubes. If the prism was built with 108 centimeter cubes, how many layers does her prism have? What is the height of her prism?

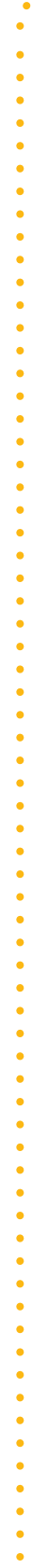
10. **Test Prep** Find the volume of the rectangular prism.



Each cube = 1 cu cm

- (A) 25 cubic feet
- (B) 25 cubic meters
- (C) 75 cubic meters
- (D) 75 cubic centimeters

SHOW YOUR WORK



Name _____

Estimate Volume**Essential Question** How can you use an everyday object to estimate the volume of a rectangular prism?**Investigate**

Izzy is mailing 20 boxes of crayons to a children's-education organization overseas. She can pack them in one of two different-sized shipping boxes. Using crayon boxes as a cubic unit, about what volume is each shipping box, in crayon boxes? Which shipping box should Izzy use to mail the crayons?

Materials ■ rectangular prism net B ■ 2 boxes, different sizes

- A.** Cut out, fold, and tape the net to form a rectangular prism. Label the prism "Crayons." You can use this prism to estimate and compare the volume of the two boxes.
- B.** Using the crayon box that you made, count to find the number of boxes that make up the base of the shipping box. Estimate the length to the nearest whole unit.

Number of crayon boxes that fill the base:

Box 1: _____ Box 2: _____

- C.** Starting with the crayon box in the same position, count to find the number of crayon boxes that make up the height of the shipping box. Estimate the height to the nearest whole unit.

Number of layers:

Box 1: _____ Box 2: _____

Box 1 has a volume of _____ crayon boxes

and Box 2 has a volume of _____ crayon boxes.

So, Izzy should use Box _____ to ship the crayons.



Draw Conclusions

1. **Explain** how you estimated the volume of the shipping boxes.

2. **Analyze** If you had to estimate to the nearest whole unit to find the volume of a shipping box, how might you be able to ship a greater number of crayon boxes in the shipping box than you actually estimated? **Explain**.

Make Connections

The crayon box has a length of 3 inches, a width of 4 inches, and a height of 1 inch. The volume of the

crayon box is _____ cubic inches.



Using the crayon box, estimate the volume of the box at the right in cubic inches.

- The box to the right holds _____ crayon boxes in each of _____ layers, or _____ crayon boxes.
- Multiply the volume of 1 crayon box by the estimated number of crayon boxes that fit in the box at the right.

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{4cm}}$$

So, the volume of the shipping box at the right

is about _____ cubic inches.



Name _____

Share and Show

Estimate the volume.

1. Each tissue box has a volume of 125 cubic inches.

There are _____ tissue boxes in the larger box.

The estimated volume of the box holding the tissue


boxes is _____ \times 125 = _____ cu in.



-  2. Volume of chalk box: 16 cu in.



Volume of large box: _____

-  3. Volume of small jewelry box: 30 cu cm

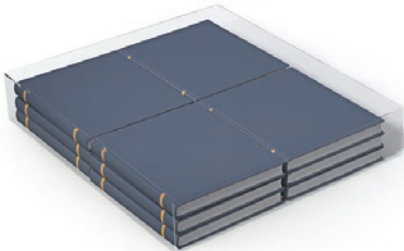


Volume of large box: _____

On Your Own

Estimate the volume.

4. Volume of book: 80 cu in.



Volume of large box: _____

5. Volume of spaghetti box: 750 cu cm



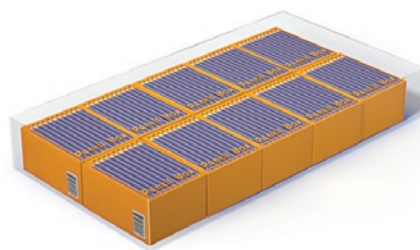
Volume of large box: _____

6. Volume of cereal box: 324 cu in.



Volume of large box: _____

7. Volume of pencil box: 4,500 cu cm



Volume of large box: _____

Problem Solving

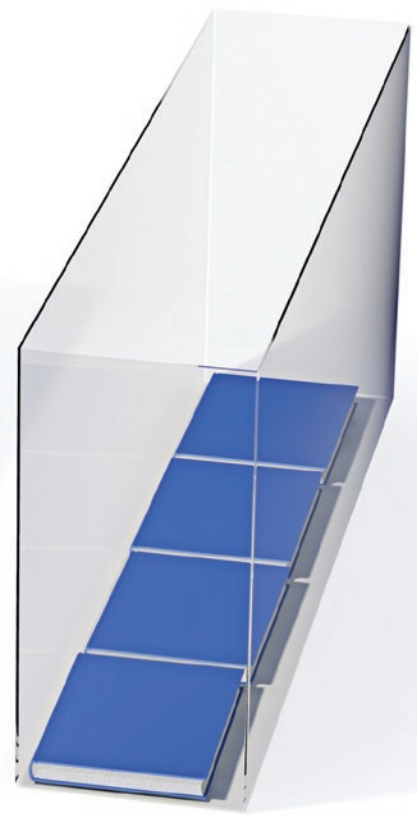


Sense or Nonsense?

- 8. Marcelle estimated the volume of the two boxes below, using one of his books. His book has a volume of 48 cubic inches. Box 1 holds about 7 layers of books, and Box 2 holds about 14 layers of books. Marcelle says that the volume of either box is about the same.



Box 1



Box 2

- Does Marcelle's statement make sense or is it nonsense?
Explain your answer.

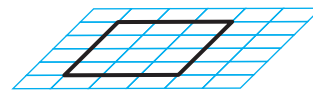
Name _____

Volume of Rectangular Prisms

Essential Question How can you find the volume of a rectangular prism?

CONNECT The base of a rectangular prism is a rectangle. You know that area is measured in square units, or units², and that the area of a rectangle can be found by multiplying the length and the width.

Volume is measured in cubic units, or units³. When you build a prism and add each layer of cubes, you are adding a third dimension, height.



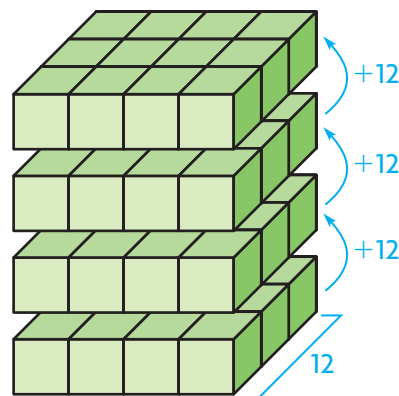
The area of the base is _____ sq units.

UNLOCK the Problem REAL WORLD

Sid built the rectangular prism shown at the right, using 1-inch cubes. The prism has a base that is a rectangle and has a height of 4 cubes. What is the volume of the rectangular prism that Sid built?

You can find the volume of a prism in cubic units by multiplying the number of square units in the base shape by the number of layers, or its height.

Each layer of Sid's rectangular prism is composed of _____ inch cubes.



Height (in layers)	1	2	3	4
Volume (in cubic inches)	12	24		

Multiply the height by _____.

1. How does the volume change as each layer is added?

2. What does the number you multiply the height by represent?

So, the volume of Sid's rectangular prism is _____ in.³

Relate Height to Volume

Toni stacks cube-shaped beads that measure 1 centimeter on each edge in a storage box. The box can hold 6 layers of 24 cubes with no gaps or overlaps. What is the volume of Toni's storage box?

- What are the dimensions of the base of the box?

- What operation can you use to find the area of the base shape?

One Way Use base and height.

The volume of each bead is _____ cm^3 .

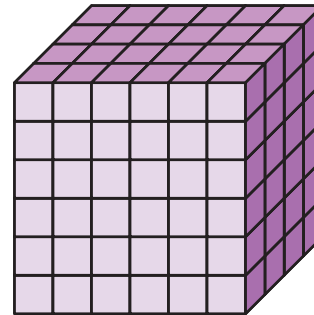
The storage box has a base with an area of _____ cm^2 .

The height of the storage box is _____ centimeters.

The volume of the storage box is

(_____ \times _____), or _____ cm^3 .

Base
area



Another Way Use length, width, and height.

You know that the area of the base of the storage box is 24 cm^2 .

The base has a length of _____ centimeters


and a width of _____ centimeters. The height

is _____ centimeters. The volume of the storage box is

(_____ \times _____) \times _____ , or _____ \times _____ , or _____ cm^3 .

Base area

So, the volume of the storage box is _____ cm^3 .

3.  **What if** each cube-shaped bead measured 2 centimeters on each edge? How would the dimensions of the storage box change? How would the volume change?

Name _____

Share and Show

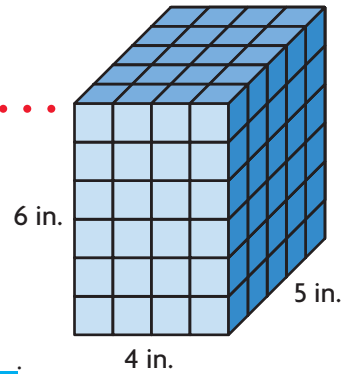


Find the volume.

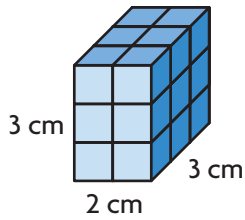
1. The length of the rectangular prism is _____.

The width is _____. So, the area of the base is _____.

The height is _____. So, the volume of the prism is _____.

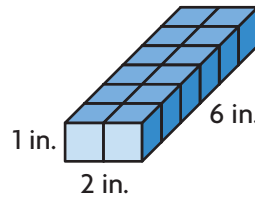


2.



Volume: _____

3.



Volume: _____

MATHEMATICAL PRACTICES

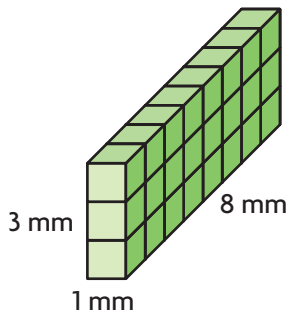
Math Talk

Explain why the exponent 2 is used to express the measure of area and the exponent 3 is used to express the measure of volume.

On Your Own

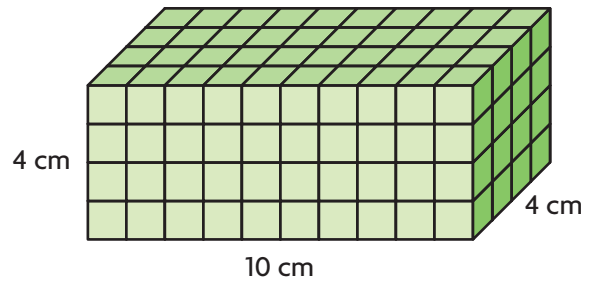
Find the volume.

4.



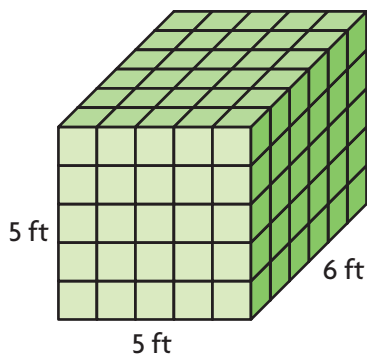
Volume: _____

5.



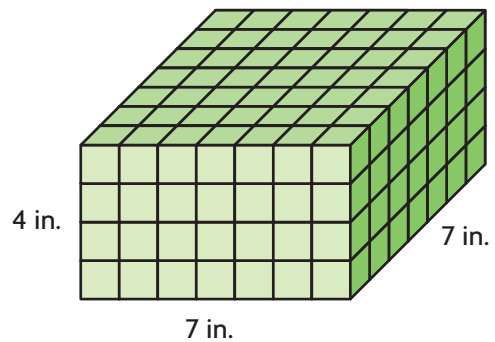
Volume: _____

6.



Volume: _____

7.



Volume: _____

UNLOCK the Problem REAL WORLD

8. Rich is building a travel crate for his dog, Thomas, a beagle-mix who is about 30 inches long, 12 inches wide, and 24 inches tall. For Thomas to travel safely, his crate needs to be a rectangular prism that is about 12 inches greater than his length and width, and 6 inches greater than his height. What is the volume of the travel crate that Rich should build?



a. What do you need to find to solve the problem?

b. How can you use Thomas's size to help you solve the problem?

c. What steps can you use to find the size of Thomas's crate?

d. Fill in the blanks for the dimensions of the dog crate.

length: _____

width: _____

height: _____

area of base: _____

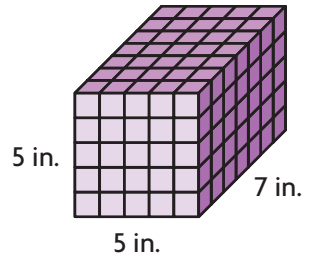
e. Find the volume of the crate by multiplying the base area and the height.

_____ × _____ = _____

So, Rich should build a travel crate for Thomas that has a volume of _____.

9. What is the volume of the rectangular prism at the right?

- (A) 35 in.³
- (B) 125 in.³
- (C) 155 in.³
- (D) 175 in.³

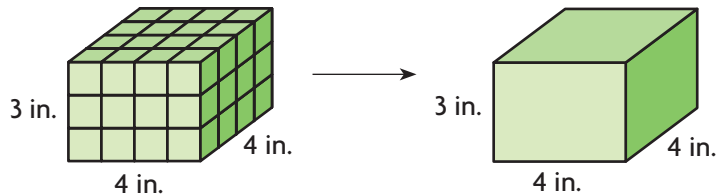


Name _____

Apply Volume Formulas

Essential Question How can you use a formula to find the volume of a rectangular prism?

CONNECT Both prisms show the same dimensions and have the same volume.



UNLOCK the Problem REAL WORLD

Mike is making a box to hold his favorite DVDs. The length of the box is 7 inches, the width is 5 inches and the height is 3 inches. What is the volume of the box Mike is making?

- Underline what you are asked to find.
- Circle the numbers you need to use to solve the problem.

One Way Use length, width, and height.

You can use a formula to find the volume of a rectangular prism.

$$\text{Volume} = \text{length} \times \text{width} \times \text{height}$$

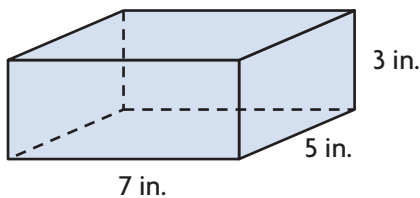
$$V = l \times w \times h$$

STEP 1 Identify the length, width, and height of the rectangular prism.

length = _____ in.

width = _____ in.

height = _____ in.



STEP 2 Multiply the length by the width.

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

STEP 3 Multiply the product of the length and width by the height.

$$35 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

So, the volume of Mike's DVD box is _____ cubic inches.

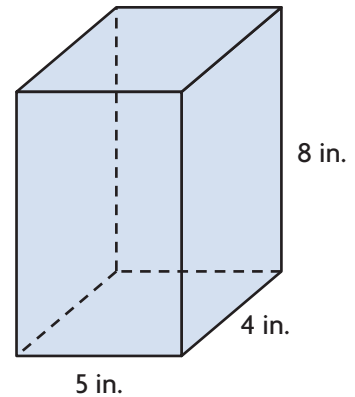
Math Talk **MATHEMATICAL PRACTICES**
Explain how you can use the Associative Property to group the part of the formula that represents area.

You have learned one formula for finding the volume of a rectangular prism. You can also use another formula.

Volume = Base area \times height
 $V = B \times h$
B = area of the base shape,
h = height of the solid figure.

🔑 Another Way Use the area of the base shape and height.

Emilio's family has a sand castle kit. The kit includes molds for several solid figures that can be used to make sand castles. One of the molds is a rectangular prism like the one shown at the right. How much sand will it take to fill the mold?



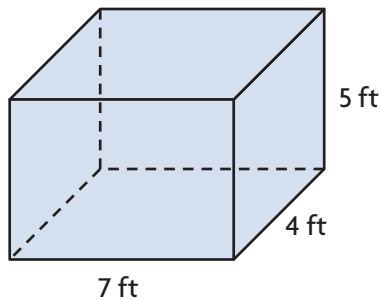
$V = \quad B \quad \times \quad h$
 $V = (\underline{\quad} \times \underline{\quad}) \times \underline{\quad}$
 $V = \underline{\quad} \times \underline{\quad}$
 $V = \underline{\quad} \text{ cu in.}$

Replace *B* with an expression for the area of the base shape. Replace *h* with the height of the solid figure.
 Multiply.

So, it will take cubic inches of sand to fill the rectangular prism mold.

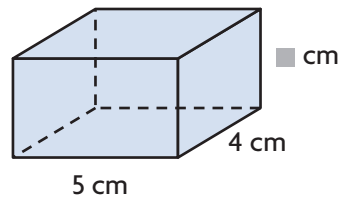
Try This!

A Find the volume.



$V = l \times w \times h$
 $V = \underline{\quad} \times \underline{\quad} \times \underline{\quad}$
 $V = \underline{\quad} \times \underline{\quad}$
 $V = \underline{\quad} \text{ cu ft}$

B Find the unknown measurement.



$V = l \times w \times h$
 $60 = \underline{\quad} \times \underline{\quad} \times \blacksquare$
 $60 = \underline{\quad} \times \blacksquare$

Think: If I filled this prism with centimeter cubes, each layer would have 20 cubes. How many layers of 20 cubes are equal to 60?

So, the unknown measurement is cm.

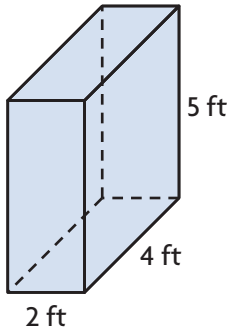
Name _____

Share and Show



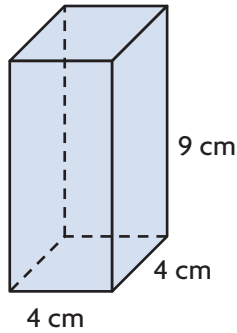
Find the volume.

1.



$V =$ _____

2.

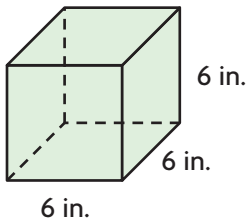


$V =$ _____

On Your Own

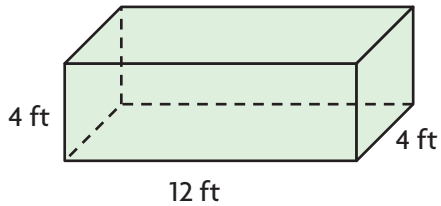
Find the volume.

3.



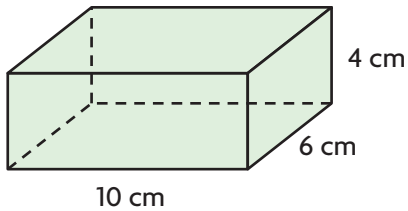
$V =$ _____

4.



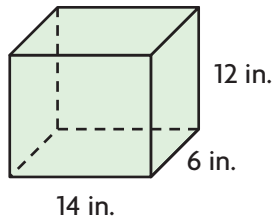
$V =$ _____

5.



$V =$ _____

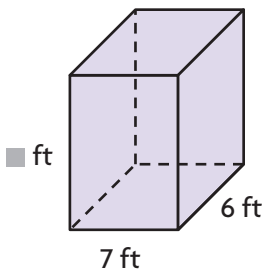
6.



$V =$ _____

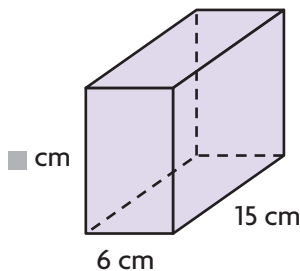
H.O.T. Algebra Find the unknown measurement.

7.



$V = 420 \text{ cu ft}$ $\blacksquare =$ _____ ft

8.



$V = 900 \text{ cu cm}$ $\blacksquare =$ _____ cm

Problem Solving **REAL WORLD**

9. The Jade Restaurant has a large aquarium on display in its lobby. The base of the aquarium is 5 feet by 2 feet. The height of the aquarium is 4 feet. How many cubic feet of water are needed to completely fill the aquarium?

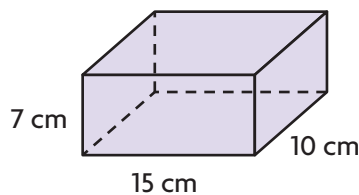
10. The Pearl Restaurant put a larger aquarium in its lobby. The base of their aquarium is 6 feet by 3 feet, and the height is 4 feet. How many more cubic feet of water does the Pearl Restaurant's aquarium hold than the Jade Restaurant's aquarium?

11. **H.O.T.** Eddie measured his aquarium using a small fish food box. The box has a base area of 6 inches and a height of 4 inches. Eddie found that the volume of his aquarium is 3,456 cubic inches. How many boxes of fish food could fit in the aquarium? **Explain** your answer.

12. **Write Math** Describe the difference between area and volume.

13. **Test Prep** Adam stores his favorite CDs in a box like the one at the right. What is the volume of the box?

- (A) 150 cubic centimeters
- (B) 750 cubic centimeters
- (C) 1,050 cubic centimeters
- (D) 1,150 cubic centimeters



SHOW YOUR WORK

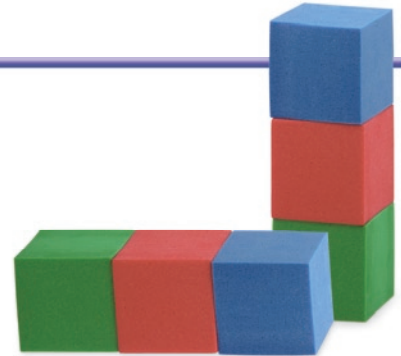
Name _____

Problem Solving • Compare Volumes

Essential Question: How can you use the strategy *make a table* to compare different rectangular prisms with the same volume?



Adam has 50 one-inch cubes. The cubes measure 1 inch on each edge. Adam wonders how many rectangular prisms, each with a different-size base, that he could make with all of the one-inch cubes.



Use the graphic organizer below to help you solve the problem.

Read the Problem	Solve the Problem																																	
<p>What do I need to find?</p> <p>I need to find the number of _____, each with a different-size _____, that have a volume of _____.</p>	<p>Complete the table.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Base (sq in.)</th> <th style="width: 25%;">Height (in.)</th> <th style="width: 50%;">Volume (cu in.)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">(1 × 1)</td> <td style="text-align: center;">50</td> <td style="text-align: center;">$(1 \times 1) \times 50 = 50$</td> </tr> <tr> <td style="text-align: center;">(1 × 2)</td> <td style="text-align: center;">25</td> <td style="text-align: center;">$(1 \times 2) \times 25 = 50$</td> </tr> <tr> <td style="text-align: center;">(1 × 5)</td> <td style="text-align: center;">10</td> <td style="text-align: center;">$(1 \times 5) \times 10 = 50$</td> </tr> <tr> <td style="text-align: center;">(1 × 10)</td> <td style="text-align: center;">5</td> <td style="text-align: center;">$(1 \times 10) \times 5 = 50$</td> </tr> <tr> <td style="text-align: center;">(1 × 25)</td> <td style="text-align: center;">2</td> <td style="text-align: center;">$(1 \times 25) \times 2 = 50$</td> </tr> <tr> <td style="text-align: center;">(1 × 50)</td> <td style="text-align: center;">1</td> <td style="text-align: center;">$(1 \times 50) \times 1 = 50$</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Base (sq in.)	Height (in.)	Volume (cu in.)	(1 × 1)	50	$(1 \times 1) \times 50 = 50$	(1 × 2)	25	$(1 \times 2) \times 25 = 50$	(1 × 5)	10	$(1 \times 5) \times 10 = 50$	(1 × 10)	5	$(1 \times 10) \times 5 = 50$	(1 × 25)	2	$(1 \times 25) \times 2 = 50$	(1 × 50)	1	$(1 \times 50) \times 1 = 50$												
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<p>What information do I need to use?</p> <p>I can use the formula _____ and the factors of _____.</p>																																		
<p>How will I use the information?</p> <p>I will use the formula and the factors of 50 in a _____ that shows all of the possible combinations of dimensions with a volume of _____ without repeating the dimensions of the bases.</p>																																		

1. What else do you need to do to solve the problem? _____

2. How many rectangular prisms with different bases can Adam make using fifty one-inch cubes? _____



Try Another Problem

Mrs. Wilton is planning a rectangular flower box for her front window. She wants the flower box to hold exactly 16 cubic feet of soil. How many different flower boxes, all with whole-number dimensions and a different-size base, will hold exactly 16 cubic feet of soil?

Use the graphic organizer below to help you solve the problem.



Read the Problem

What do I need to find?

What information do I need to use?

How will I use the information?

Solve the Problem

MATHEMATICAL PRACTICES

Math Talk

Explain how a flower box with dimensions of $(1 \times 2) \times 8$ is different from a flower box with dimensions of $(2 \times 8) \times 1$.

3. How many flower boxes with different-size bases will hold exactly 16 cubic feet of soil, using whole-number dimensions?

Name _____

Share and Show



UNLOCK the Problem

Tips

- ✓ Circle the question.
- ✓ Break the problem into easier steps.

1. Mr. Price makes cakes for special occasions. His most popular-sized cakes have a volume of 360 cubic inches. The cakes have a height, or thickness, of 3 inches, and have different whole number lengths and widths. No cakes have a length or width of 1 or 2 inches. How many different cakes, each with a different-size base, have a volume of 360 cubic inches?

First, think about what the problem is asking you to solve, and the information that you are given.

Next, make a table using the information from problem.

Finally, use the table to solve the problem.

2. **What if** the 360 cubic-inch cakes are 4 inches thick and any whole number length and width are possible? How many different cakes could be made? Suppose that the cost of a cake that size is \$25, plus \$1.99 for every 4 cubic inches of cake. How much would the cake cost?

3. One company makes inflatable swimming pools that come in four sizes of rectangular prisms. The length of each pool is twice the width and twice the depth. The depth of the pools are each a whole number from 2 to 5 feet. If the pools are filled all the way to the top, what is the volume of each pool?

SHOW YOUR WORK


On Your Own


Choose a STRATEGY

- Act It Out
- Draw a Diagram
- Make a Table
- Solve a Simpler Problem
- Work Backward
- Guess, Check, and Revise

4. Ray wants to buy the larger of two aquariums. One aquarium has a base that is 20 inches by 20 inches and a height that is 18 inches. The other aquarium has a base that is 40 inches by 12 inches and a height that is 12 inches. Which aquarium has a greater volume? By how much?

5. Ken owns 13 CDs. His brother Keith has 7 more CDs than he does. Their brother, George, has more CDs than either of the younger brothers. Together, the three brothers have 58 CDs. How many CDs does George have?

6.  Kathy has ribbons that have lengths of 7 inches, 10 inches, and 12 inches. **Explain** how she can use these ribbons to measure a length of 15 inches.

7.  A park has a rectangular playground area that has a length of 66 feet and a width of 42 feet. The park department has 75 yards of fencing material. Is there enough fencing material to enclose the playground area? **Explain**.

8. **Test Prep** John is making a chest that will have a volume of 1,200 cubic inches. The length is 20 inches and the width is 12 inches. How many inches tall will his chest be?

(A) 4 in. (C) 6 in.

(B) 5 in. (D) 7 in.

SHOW YOUR WORK 

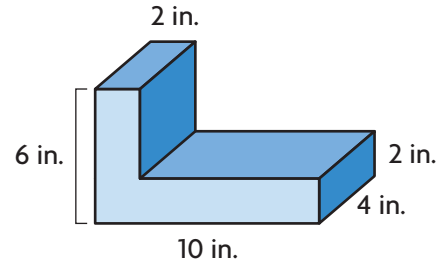
Name _____

Find Volume of Composed Figures

Essential Question How can you find the volume of rectangular prisms that are combined?

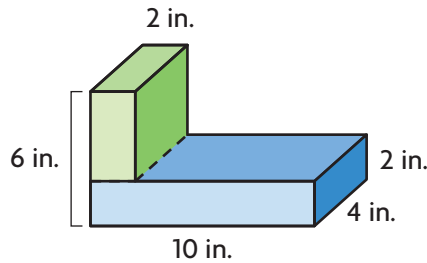
UNLOCK the Problem REAL WORLD

The shape at the right is a composite figure. It is made up of two rectangular prisms that are combined. How can you find the volume of the figure?

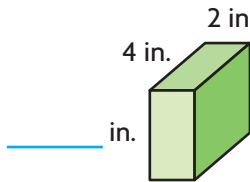


One Way Use addition.

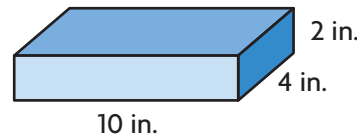
STEP 1 Break apart the solid figure into two rectangular prisms.



STEP 2 Find the length, width, and height of each prism.



Think: The total height of both prisms is 6 inches. Subtract the given heights to find the unknown height. $6 - 2 = 4$



STEP 3 Find the volume of each prism.

$$V = l \times w \times h$$

$$V = \underline{\quad} \times \underline{\quad} \times \underline{\quad}$$

$$V = \underline{\quad} \text{ in.}^3$$

$$V = l \times w \times h$$

$$V = \underline{\quad} \times \underline{\quad} \times \underline{\quad}$$

$$V = \underline{\quad} \text{ in.}^3$$

STEP 4 Add the volumes of the rectangular prisms.

$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

So, the volume of the composite figure is _____ cubic inches.

- What is another way you could divide the composite figure into

two rectangular prisms? _____

Another Way Use subtraction.

You can subtract the volumes of prisms formed in empty spaces from the greatest possible volume to find the volume of a composite figure.

STEP 1

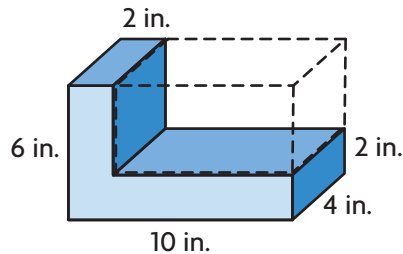
Find the greatest possible volume.

length = _____ in.

width = _____ in.

height = _____ in.

$V =$ _____ cubic inches



STEP 2

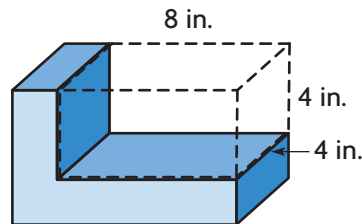
Find the volume of the prism in the empty space.

length = _____ in. **Think:** $10 - 2 = 8$

width = _____ in.

height = _____ in. **Think:** $6 - 2 = 4$

$V = 8 \times 4 \times 4 =$ _____ cubic inches



STEP 3

Subtract the volume of the empty space from the greatest possible volume.

_____ - _____ = _____ cubic inches

So, the volume of the composite figure is _____ cubic inches.

Try This!

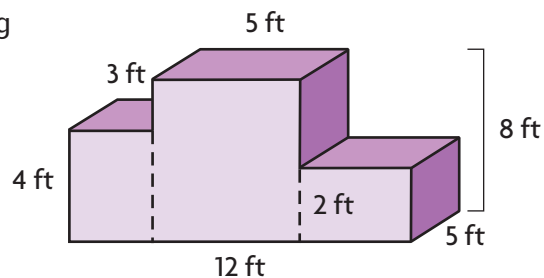
Find the volume of a composite figure made by putting together three rectangular prisms.

$V =$ _____ \times _____ \times _____ = _____ cu ft

$V =$ _____ \times _____ \times _____ = _____ cu ft

$V =$ _____ \times _____ \times _____ = _____ cu ft

Total volume = _____ + _____ + _____ = _____ cubic feet



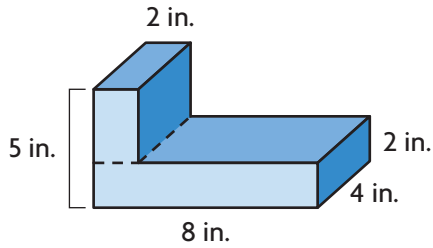
Name _____

Share and Show



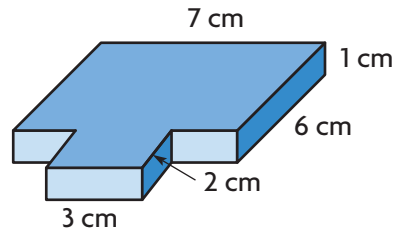
Find the volume of the composite figure.

1.



$V =$ _____

2.

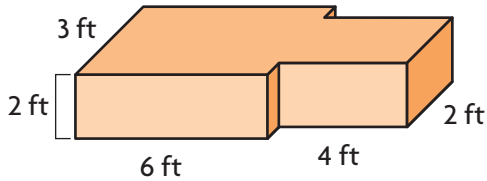


$V =$ _____

On Your Own

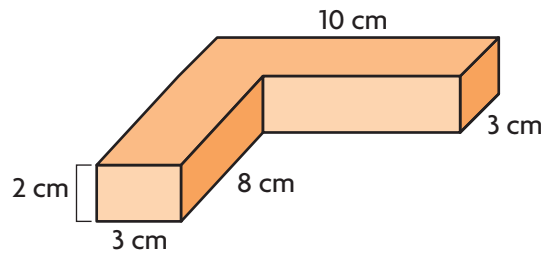
Find the volume of the composite figure.

3.



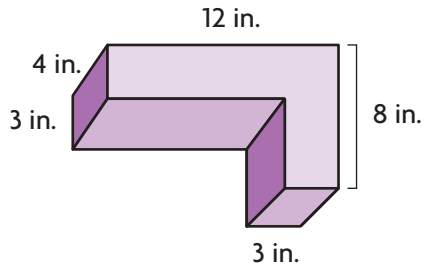
$V =$ _____

4.



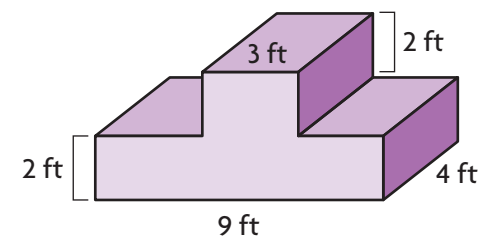
$V =$ _____

5.



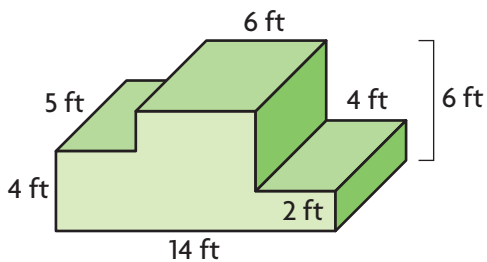
$V =$ _____

6.



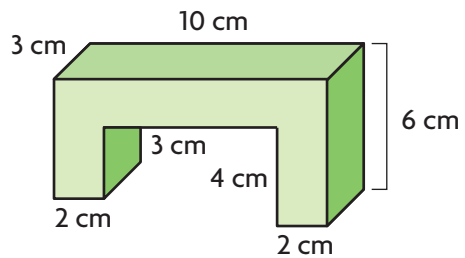
$V =$ _____

7.



$V =$ _____

8.

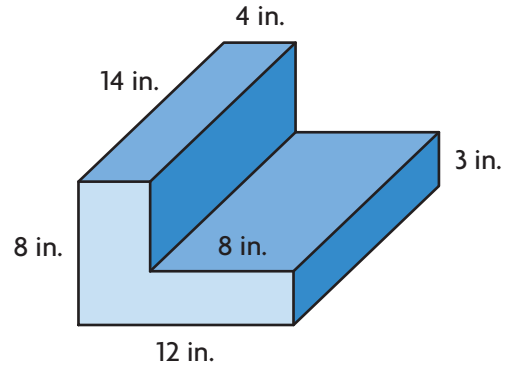


$V =$ _____

Problem Solving **REAL WORLD**

Use the composite figure at the right for 9–11.

9. As part of a wood-working project, Jordan made the figure at the right out of wooden building blocks. How much space does the figure he made take up?



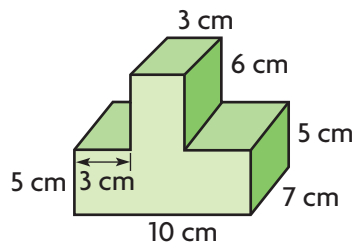
10. What are the dimensions of the two rectangular prisms you used to find the volume of the figure? What other rectangular prisms could you have used?

11. **H.O.T.** If the volume is found using subtraction, what is the volume of the empty space that is subtracted? **Explain.**

12. **Write Math** **Explain** how you can find the volume of composite figures that are made by combining rectangular prisms.

13. **Test Prep** What is the volume of the composite figure?

- (A) 126 cubic centimeters
- (B) 350 cubic centimeters
- (C) 450 cubic centimeters
- (D) 476 cubic centimeters



SHOW YOUR WORK



Chapter Review/Test

Vocabulary

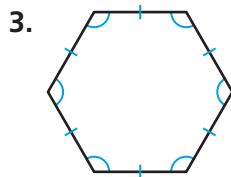
Choose the best term from the box.

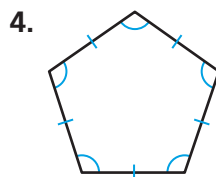
1. A _____ has two congruent polygons as bases and rectangular lateral faces. (p. 457)
2. A _____ has only one base and triangular lateral faces. (p. 458)

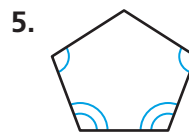
Vocabulary
polyhedron
prism
pyramid

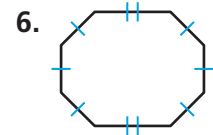
Concepts and Skills

Name each polygon. Then tell whether it is a *regular polygon* or *not a regular polygon*.

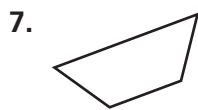


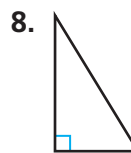




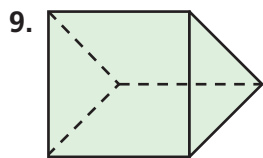


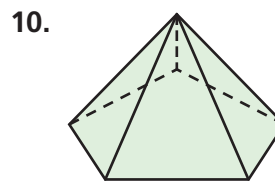
Classify each figure in as many ways as possible.



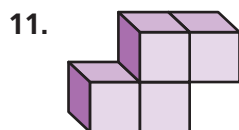


Classify the solid figure. Write *prism*, *pyramid*, *cone*, *cylinder*, or *sphere*.

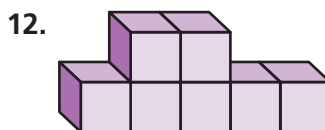




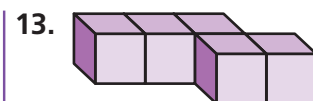
Count the number of cubes used to build each solid figure.



_____ unit cubes



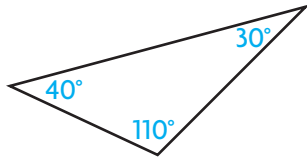
_____ unit cubes



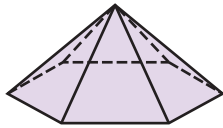
_____ unit cubes

Fill in the bubble completely to show your answer.

14. What type of triangle is shown below?



- (A) acute; isosceles
 - (B) acute; scalene
 - (C) obtuse; scalene
 - (D) obtuse; isosceles
15. Angela buys a paperweight at the local gift shop. The paperweight is in the shape of a hexagonal pyramid.



- Which of the following represents the correct number of faces, edges, and vertices in a hexagonal pyramid?
- (A) 6 faces, 12 edges, 18 vertices
 - (B) 7 faces, 7 edges, 12 vertices
 - (C) 7 faces, 12 edges, 7 vertices
 - (D) 8 faces, 18 edges, 12 vertices
16. A manufacturing company constructs a shipping box to hold its cereal boxes. Each cereal box has a volume of 40 cubic inches. If the shipping box holds 8 layers with 4 cereal boxes in each layer, what is the volume of the shipping box?
- (A) 160 cu in.
 - (B) 320 cu in.
 - (C) 480 cu in.
 - (D) 1,280 cu in.

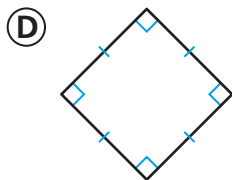
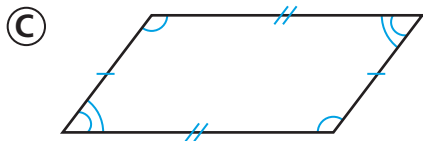
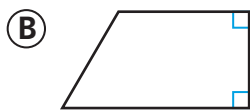
Name _____

Fill in the bubble completely to show your answer.

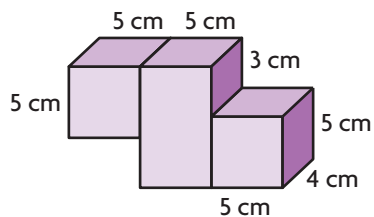
17. Sharri packed away her old summer clothes in a storage tote that had a length of 3 feet, a width of 4 feet, and a height of 3 feet. What was the volume of the tote that Sharri used?

- (A) 36 cu ft
- (B) 24 cu ft
- (C) 21 cu ft
- (D) 10 cu ft

18. Which quadrilateral is NOT classified as a parallelogram?



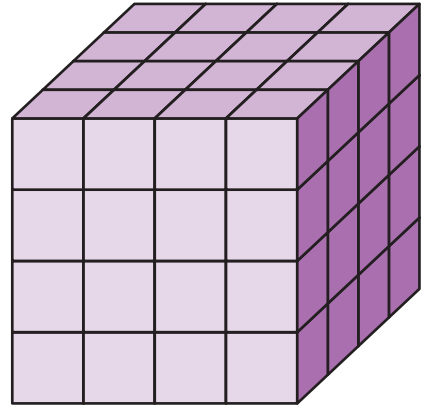
19. What is the volume of the composite figure below?



- (A) $1,875 \text{ cm}^3$
- (B) 480 cm^3
- (C) 360 cm^3
- (D) 150 cm^3

► Constructed Response

20. A video game store made a display of game console boxes shown at the right. The length, width, and height of each game console box is 2 feet.



What is the volume of the display of game console boxes?
Show your work and explain your answer.

On a busy Saturday, the video game store sold 22 game consoles.
What is the volume of the game console boxes that are left?

► Performance Task

21. Look for two pictures of three-dimensional buildings in newspapers and magazines. The buildings should be rectangular prisms.
- A** Paste the pictures on a large sheet of paper. Leave room to write information near the picture.
 - B** Label each building with their name and location.
 - C** Research the buildings, if the information is available. Find things that are interesting about the buildings or their location. Also find their length, width, and height to the nearest foot. If the information is not available, measure the buildings on the page in inches or centimeters, and make a good estimate of their width (such as $\frac{1}{2}$ the height, rounded to the nearest whole number). Find their volumes.
 - D** Make a class presentation, choosing one of the buildings you found.