Geometry, Measurement, and Data

Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry

Landscape architects can help design and plan outdoor spaces such as botanical gardens.

Project

Landscape Architects

When people who live and work in big cities take breaks, they leave their tall buildings to relax in patches of green. A city garden may be small, but it gives people a chance to enjoy the beauty of nature.

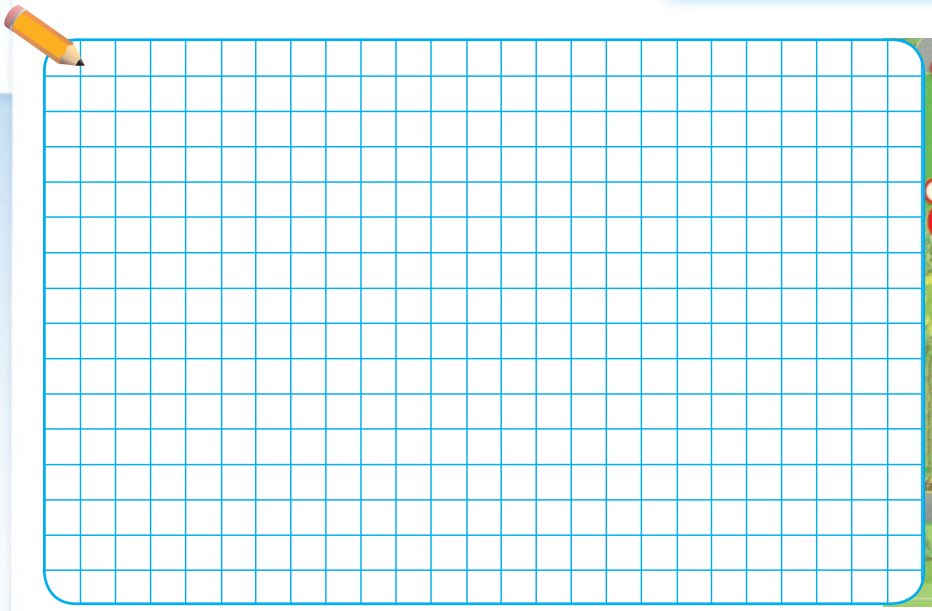
Get Started

Design a garden that covers a whole city block. Decide on features to have in your garden and where they will be located. Mark off parts of your garden for each feature. Then find the number of square units the feature covers and record it on the design. Use the Important Facts to help you.

Important Facts

Features of a City Garden

- Benches
- Flower garden
- Paths
- Shrub garden
- Snack bar
- Spring bulb garden
- Tree garden
- Waterfall and fountain



▲ This map is an example of how a city garden could be laid out.

Completed by _____

Chapter 10

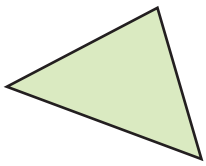
Two-Dimensional Figures

Show What You Know

Check your understanding of important skills.

Name _____

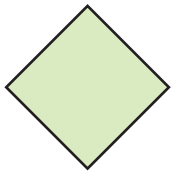
▶ Sides and Vertices Write the number of vertices.

1. 

_____ vertices

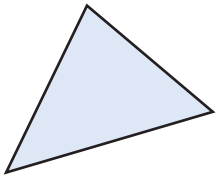
2. 

_____ vertices

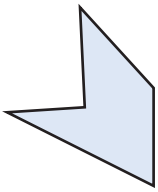
3. 

_____ vertices

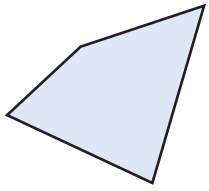
▶ Number of Sides Write the number of sides.

4. 

_____ sides

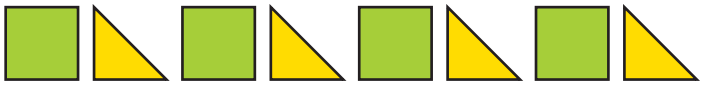
5. 

_____ sides

6. 

_____ sides

▶ Geometric Patterns Draw the next two shapes in the pattern.

7. 

The Isle of Wight Natural History Centre, off the coast of England, has shells of every size, shape, and color. Many shells have symmetry. Be a Math Detective. Investigate this shell. Describe its shape in geometric terms. Then determine whether this shell has line symmetry.

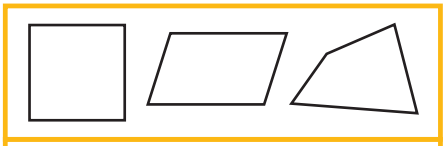
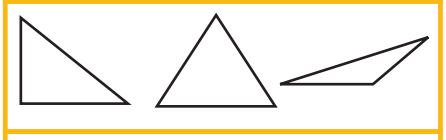
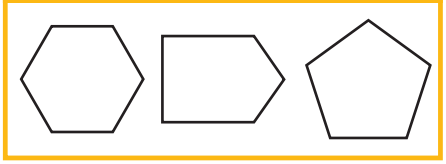
GO Online Assessment Options: **Soar to Success Math**

Vocabulary Builder

Visualize It

Complete the flow map by using the words with a ✓.

Geometry

What is it?	What are some examples?
_____ →	
_____ →	
_____ →	

Review Words

- ✓ polygon
- ✓ triangle
- ✓ quadrilateral

Preview Words

- acute angle
- acute triangle
- line
- line segment
- line symmetry
- obtuse angle
- obtuse triangle
- parallel lines
- parallelogram
- perpendicular lines
- ray
- right angle
- right triangle
- straight angle

Understand Vocabulary

Complete the sentences by using preview words.

1. A shape has _____ if it can be folded about a line so that its two parts match exactly.
2. A figure that has no endpoints is called a _____.
3. A figure that has two endpoints is called a _____.
4. _____ are lines that never cross.
5. When two lines cross to form a square corner, the lines are _____.

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Name _____

Lines, Rays, and Angles

Essential Question How can you identify and draw points, lines, line segments, rays, and angles?

UNLOCK the Problem REAL WORLD

Everyday things can model geometric figures. For example, the period at the end of this sentence models a point. A solid painted stripe in the middle of a straight road models a line.

Term and Definition	Draw It	Read It	Write It	Example
A **point** is an exact location in space.	A •	point A	point A	
A **line** is a straight path of points that continues without end in both directions.		line BC line CB	$\overleftrightarrow{BC}$ $\overleftrightarrow{CB}$	
A **line segment** is part of a line between two endpoints.		line segment DE line segment ED	$\overline{DE}$ $\overline{ED}$	
A **ray** is a part of a line that has one endpoint and continues without end in one direction.		ray FG	$\overrightarrow{FG}$	

Activity 1 Draw and label $\overline{JK}$.

_____

MATHEMATICAL PRACTICES

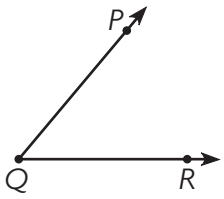
Math Talk **Explain** how lines, line segments, and rays are related.

- Is there another way to name $\overline{JK}$? **Explain**.

_____

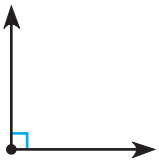
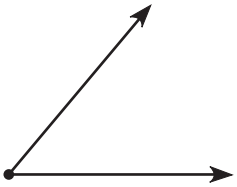
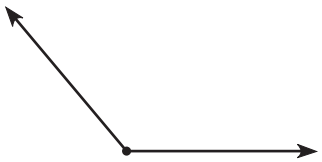
_____

Angles

Term and Definition	Draw It	Read It	Write It	Example
An **angle** is formed by two rays or line segments that have the same endpoint. The shared endpoint is called the vertex.		angle *PQR* angle *RQP* angle *Q*	$\angle PQR$ $\angle RQP$ $\angle Q$	

You can name an angle by the vertex. When you name an angle using 3 points, the vertex is always the point in the middle.

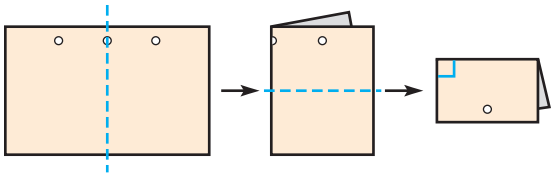
Angles are classified by the size of the opening between the rays.

A **right angle** forms a square corner.	A **straight angle** forms a line.	An **acute angle** is less than a right angle.	An **obtuse angle** is greater than a right angle and less than a straight angle.
			

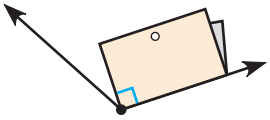
Activity 2 Classify an angle.

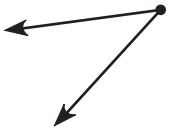
Materials ■ paper

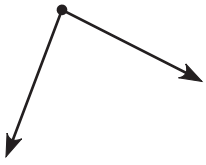
To classify an angle, you can compare it to a right angle.

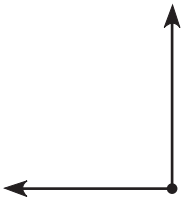


Make a right angle by using a sheet of paper. Fold the paper twice evenly to model a right angle. Use the right angle to classify the angles below. Write *acute*, *obtuse*, *right*, or *straight*.

a. 

b. 

c. 

d. 

Name _____

Share and Show

1. Draw and label $\overline{AB}$ in the space at the right.

$\overline{AB}$ is a _____.

Draw and label an example of the figure.

2. $\overleftrightarrow{XY}$

3. obtuse $\angle K$

4. right $\angle CDE$

Use Figure *M* for 5 and 6.

5. Name a line segment.

6. Name a right angle.

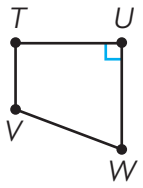


Figure *M*

On Your Own

Draw and label an example of the figure.

7. $\overrightarrow{PQ}$

8. acute $\angle RST$

9. straight $\angle WXZ$

Use Figure *F* for 10–15.

10. Name a ray.

11. Name an obtuse angle.

12. Name a line.

13. Name a line segment.

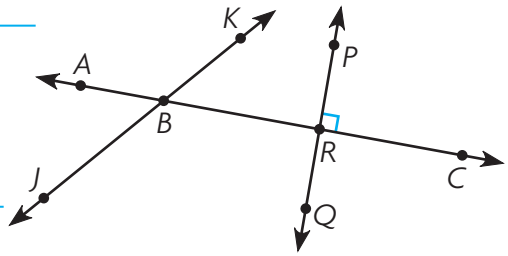


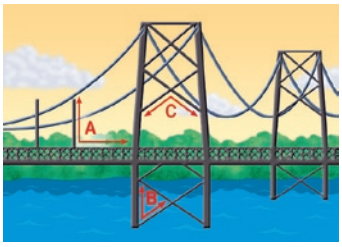
Figure *F*

14. Name a right angle.

15. Name an acute angle.

Problem Solving REAL WORLD

Use the picture of the bridge for 16 and 17.



16. Classify $\angle A$.

17. Which angle appears to be obtuse?

18. H.O.T. How many different angles are in Figure *X*? List them.

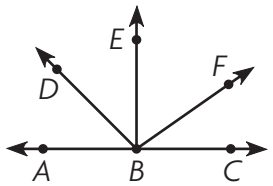
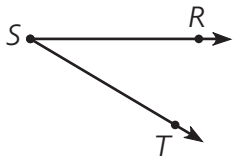


Figure *X*

19. What's the Error? Vanessa drew the angle at the right and named it $\angle TRS$. Explain why Vanessa's name for the angle is incorrect. Write a correct name for the angle.



20. Test Prep Which of the following terms best describes the figure at the right?

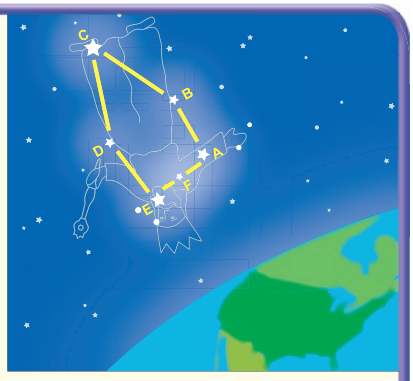
Ⓐ ray Ⓒ line

Ⓑ line segment Ⓓ angle

Connect to Science

Constellations

Astronomers study the stars and other objects in space. Cepheus is a constellation of stars named after an ancient mythological Greek king. Cepheus is visible in the northern sky all year long.



Trace the constellation. Then answer the questions.

21. How many line segments are shown in this drawing of Cepheus?

22. How many points are shown in this drawing of Cepheus?

23. Which angles appear to be right angles?

24. Which angle is an acute angle?

FOR MORE PRACTICE:
Standards Practice Book, pp. P189–190

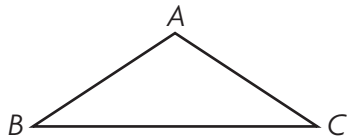
Name _____

Classify Triangles

Essential Question How can you classify triangles by the size of their angles?

UNLOCK the Problem

A triangle is a polygon with three sides and three angles. You can name a triangle by the vertices of its angles.

Triangle	Possible Names	
	△*ABC*	△*ACB*
	△*BCA*	△*BAC*
	△*CAB*	△*CBA*

Read Math

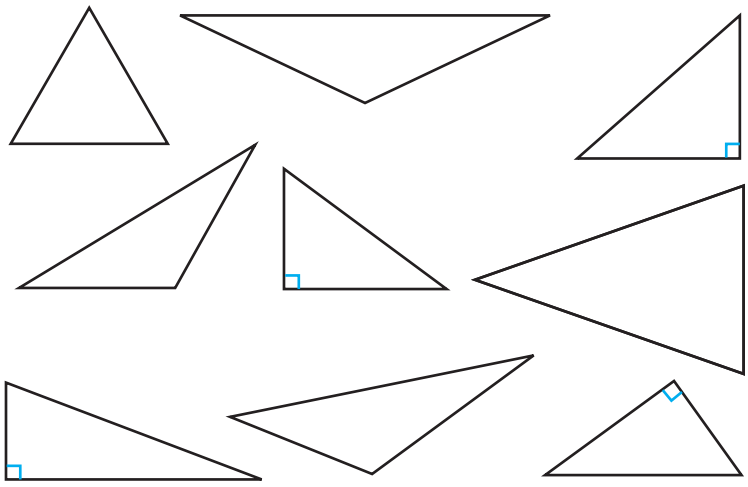
When you see "△*ABC*," say "triangle *ABC*."

An angle of a triangle can be right, acute, or obtuse.

Activity 1 Identify right, acute, and obtuse angles in triangles.

Materials ■ color pencils

Use the Triangle Color Guide to color the triangles below.



Triangle Color Guide	
RED	one right angle
BLUE	one obtuse angle
ORANGE	three acute angles

MATHEMATICAL PRACTICES

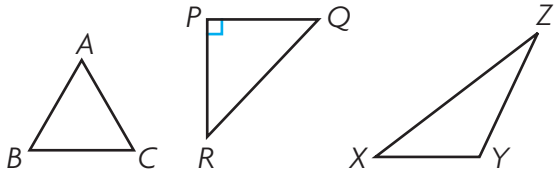
Math Talk Can a triangle have more than one obtuse angle? **Explain.**

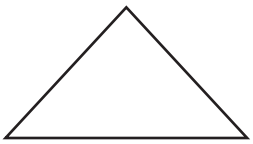
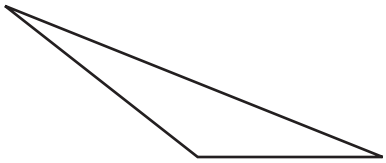
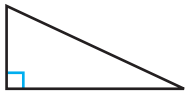
Try This!

a. Name the triangle with one right angle. _____

b. Name the triangle with one obtuse angle. _____

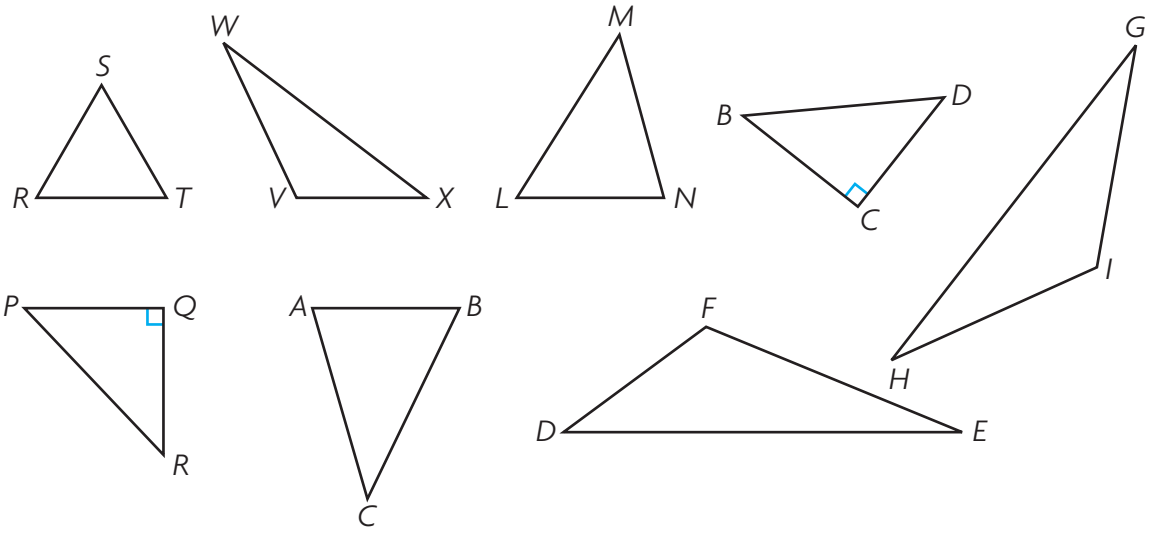
c. Name the triangle with three acute angles. _____

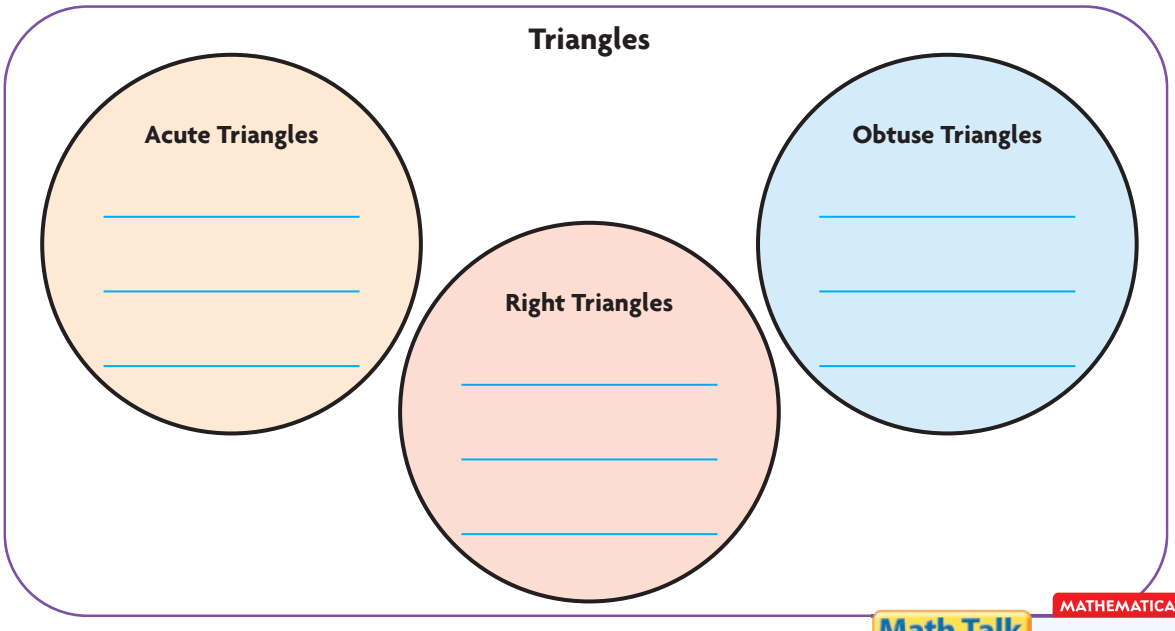


An **acute triangle** is a triangle with three acute angles.	An **obtuse triangle** is a triangle with one obtuse angle.	A **right triangle** is a triangle with one right angle.
		
Acute Triangle	**Obtuse Triangle**	**Right Triangle**

Activity 2 Use a Venn diagram to classify triangles.

Write the names of the triangles in the Venn diagram.





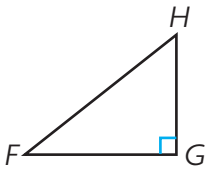
MATHEMATICAL PRACTICES

Math Talk **Explain** why the three circles in this Venn diagram do not overlap.

Name _____

Share and Show MATH BOARD

1. Name the triangle. Tell whether each angle is *acute*, *right*, or *obtuse*.



A name for the triangle is _____.

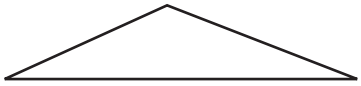
$\angle F$ is _____.

$\angle G$ is _____.

$\angle H$ is _____.

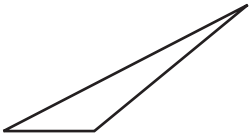
Classify each triangle. Write *acute, right,* or *obtuse*.

2.



_____

3.



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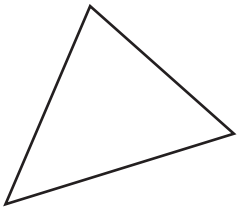
4.



_____

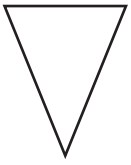
On Your Own

Classify each triangle. Write *acute, right,* or *obtuse*.

5.

_____

6.



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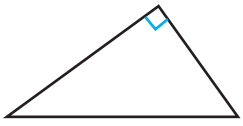
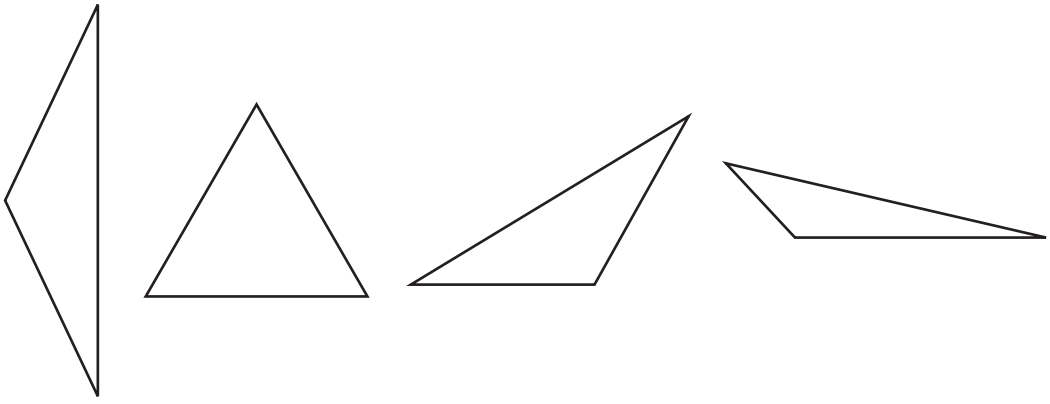
7.



_____

8. H.O.T. Cross out the figure that does not belong. **Explain.**



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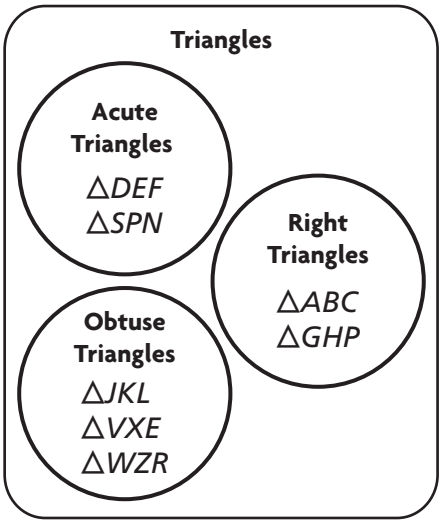
Problem Solving REAL WORLD

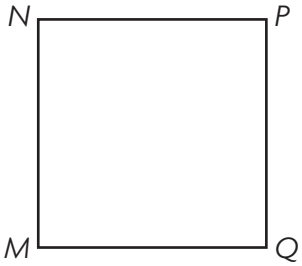
Use the Venn diagram for 9–10.



9. Which triangles do NOT have an obtuse angle? **Explain.**

10. H.O.T. How many triangles have *at least* two acute angles? **Explain.**

11. Use square *MNPQ* shown at the right. Draw a line segment from point *M* to point *P*. Name and classify the triangles formed by the line segment.



12. Write Math **Describe** how Figures A and B, shown at the right, are alike and how they are different. Identify the figures in as many ways as possible.

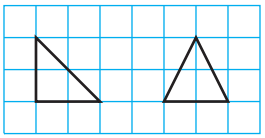


Figure A Figure B

13. Test Prep How many acute angles are in an obtuse triangle?

Ⓐ 0 Ⓑ 1 Ⓒ 2 Ⓓ 3

FOR MORE PRACTICE:
Standards Practice Book, pp. 191–192

Name _____

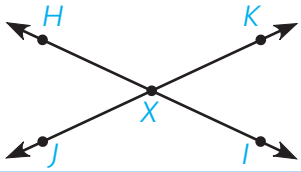
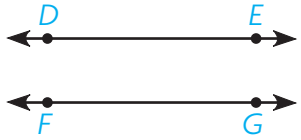
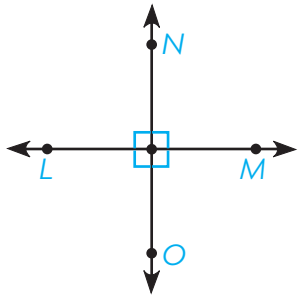
Parallel Lines and Perpendicular Lines

Essential Question How can you identify and draw parallel lines and perpendicular lines?

UNLOCK the Problem REAL WORLD

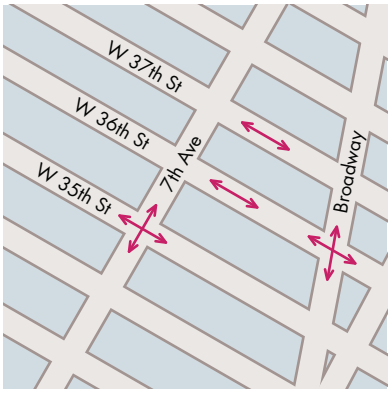
You can find models of lines in the world around you. For example, two streets that cross each other model intersecting lines. Metal rails on a train track that never cross model parallel lines.

▲ Maglev trains use magnets to lift them above the tracks while moving.

Term and Definition	Draw It	Read It	Write It
Intersecting lines are lines in a plane that cross at exactly one point. Intersecting lines form four angles.		Line *HI* intersects line *JK* at point *X*.	$\overleftrightarrow{HI}$ and $\overleftrightarrow{JK}$ intersect at point *X*
Parallel lines are lines in a plane that are always the same distance apart. Parallel lines never intersect.		Line *DE* is parallel to line *FG*.	$\overleftrightarrow{DE} \parallel \overleftrightarrow{FG}$ The symbol $\parallel$ means "is parallel to."
Perpendicular lines are lines in a plane that intersect to form four right angles.		Line *LM* is perpendicular to line *NO*.	$\overleftrightarrow{LM} \perp \overleftrightarrow{NO}$ The symbol $\perp$ means "is perpendicular to."

Try This! **Tell how the streets appear to be related. Write *perpendicular*, *parallel*, or *intersecting*.**

- W 36th St and Broadway _____
- W 35th St and 7th Ave _____
- W 37th St and W 36th St _____



MATHEMATICAL PRACTICES

Math Talk Can two rays be parallel? **Explain**.

Activity Draw and label $\overrightarrow{YX} \perp \overrightarrow{YZ}$ intersecting at point Y.

Materials ■ straightedge

STEP 1: Draw and label $\overrightarrow{YX}$.

STEP 2: Then draw and label $\overrightarrow{YZ}$.

STEP 3: Make sure $\overrightarrow{YX}$ and $\overrightarrow{YZ}$ intersect at point Y.

STEP 4: Make sure the rays are perpendicular.

- How can you check if two rays are perpendicular?

1. Name the figure you drew.

2. Can you classify the figure? **Explain.**

Share and Show MATH BOARD

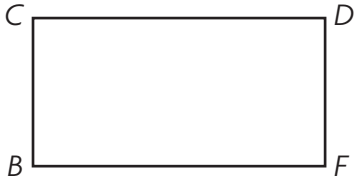
1. Draw and label $\overline{QR} \parallel \overline{ST}$.

Think: Parallel lines never intersect. Parallel line segments are parts of parallel lines.

Use the figure for 2 and 3.

2. Name two sides that appear to be parallel.

3. Name two sides that appear to be perpendicular.



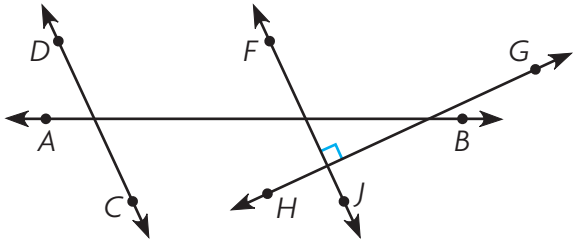
MATHEMATICAL PRACTICES

Math Talk **Explain** how the symbols $\perp$ and $\parallel$ help you remember which relationships they describe.

Name _____

On Your Own

Use the figure for 4–5.



4. Name a pair of lines that appear to be perpendicular. _____

5. Name a pair of lines that appear to be parallel.

_____

Draw and label the figure described.

6. $\overline{RS} \parallel \overline{TU}$

7. $\overleftrightarrow{KL}$ and $\overleftrightarrow{KM}$

8. $\overline{CD} \perp \overline{DE}$

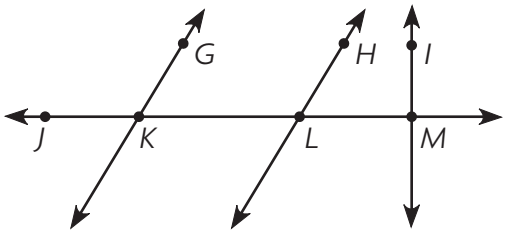
9. $\overrightarrow{JK} \perp \overleftrightarrow{LM}$

10. $\overrightarrow{ST}$ intersecting $\overleftrightarrow{UV}$ at point X

11. $\overleftrightarrow{AB} \parallel \overleftrightarrow{FG}$

Use the figure for 12–13.

12. H.O.T. **What's the Error?** Dan says that $\overleftrightarrow{HL}$ is parallel to $\overleftrightarrow{IM}$. Is Dan correct? **Explain.**



_____

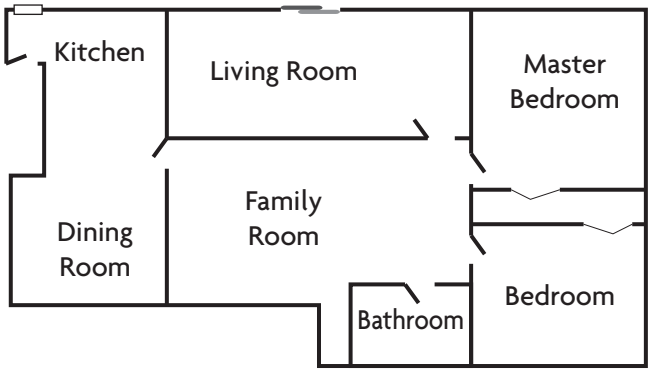
_____

13. Name two intersecting line segments that are not perpendicular.

_____

Problem Solving REAL WORLD

Use the house plan at the right for 14–16.



14. What geometric term describes a corner of the living room?

_____

_____

15. Name three parts of the plan that show line segments.

_____

_____

16. Name a pair of line segments that appear to be parallel.

_____

_____

Use the map at the right for 17–19.

17. Name a street that appears to be parallel to S 17th Street.

_____

_____

18. Name a street that appears to be parallel to Vernon Street.

_____

19. Name a street that appears to be perpendicular to S 19th Street.

_____

20. **Test Prep** Which best describes perpendicular lines?

Ⓐ They never meet.

Ⓑ They form four right angles.

Ⓒ They form one acute angle.

Ⓓ They form one obtuse angle.

FOR MORE PRACTICE:
Standards Practice Book, pp. 193–194

Name _____

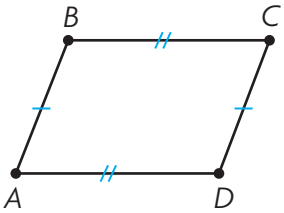
Classify Quadrilaterals

Essential Question How can you sort and classify quadrilaterals?

UNLOCK the Problem REAL WORLD

A quadrilateral is a polygon with four sides and four angles. You can name a quadrilateral by the vertices of its angles.

Quadrilateral *ABCD* is a possible name for the figure shown at the right. Quadrilateral *ACBD* is not a possible name, since points *A* and *C* are not endpoints of the same side.

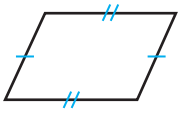


The tick marks on the line segments show that they have the same length. Sides *AD* and *BC* have the same length. Sides *AB* and *CD* have the same length.

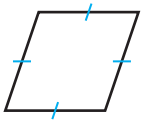
Assume that line segments that appear to be parallel are parallel.

Common Quadrilaterals

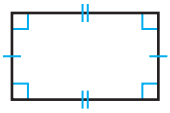
Trapezoid
- 1 pair of parallel sides



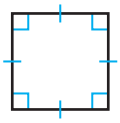
Parallelogram
- 2 pairs of parallel sides
- 2 pairs of sides of equal length



Rhombus
- 2 pairs of parallel sides
- 4 sides of equal length



Rectangle
- 2 pairs of parallel sides
- 2 pairs of sides of equal length
- 4 right angles

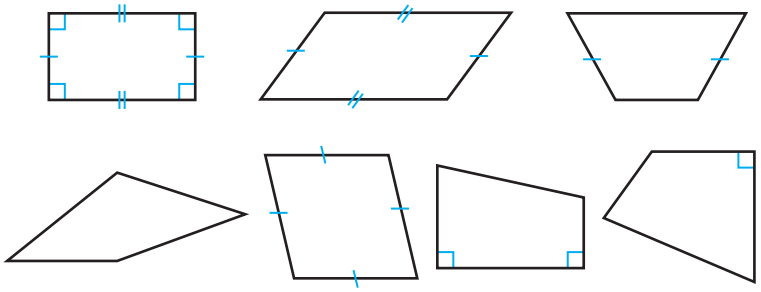


Square
- 2 pairs of parallel sides
- 4 sides of equal length
- 4 right angles

Activity 1 Identify right angles in quadrilaterals.

Materials ■ color pencils

Use the Quadrilateral Color Guide to color the quadrilaterals.



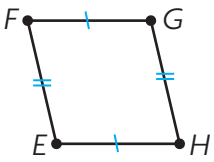
Quadrilateral Color Guide	
RED:	exactly 4 right angles
BLUE:	exactly 2 right angles
ORANGE:	exactly 1 right angle

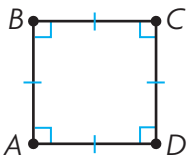
MATHEMATICAL PRACTICES

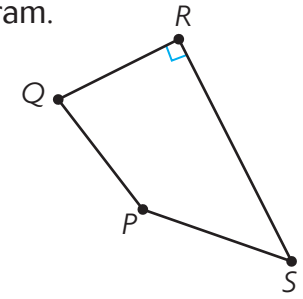
Math Talk Can a quadrilateral have exactly 3 right angles? **Explain.**

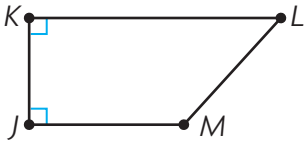
Activity 2 Use a Venn diagram to sort quadrilaterals.

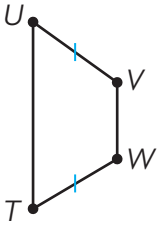
Write the names of the quadrilaterals in the Venn diagram.

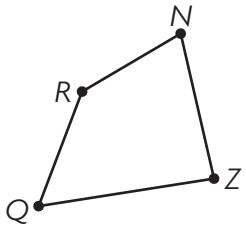


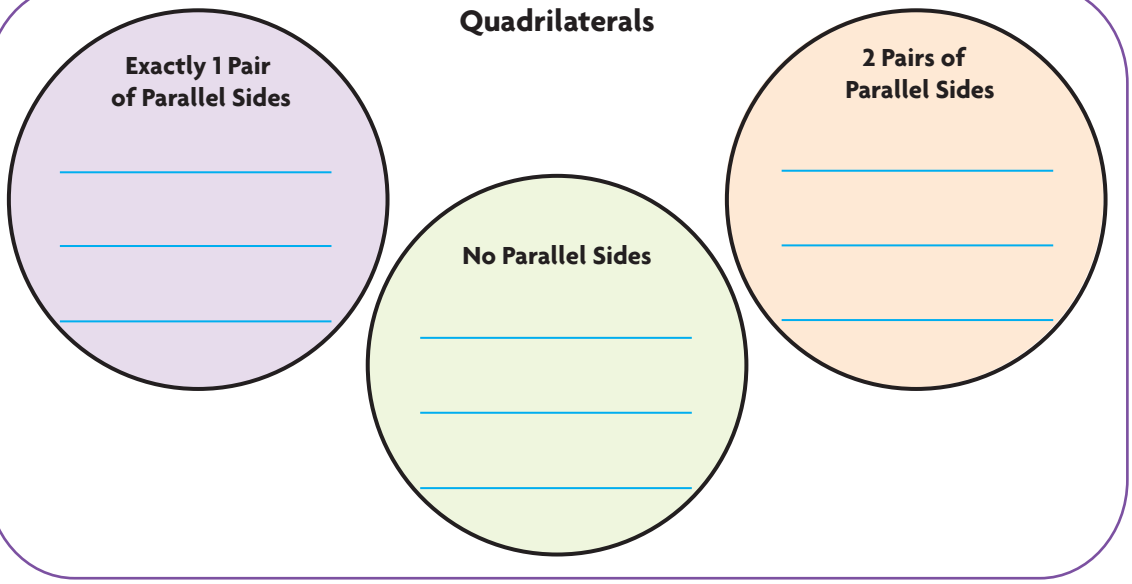






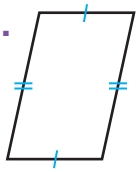




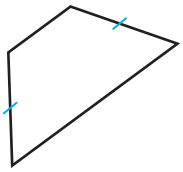


Try This! Classify each figure as many ways as possible. Write *quadrilateral, trapezoid, parallelogram, rhombus, rectangle,* or *square*.

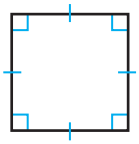
a.



b.



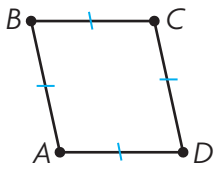
c.



Name _____

Share and Show MATH BOARD

1. Tell whether the quadrilateral is also a trapezoid, parallelogram, rhombus, rectangle, or square.



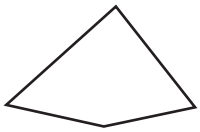
Think: _____ pairs of parallel sides

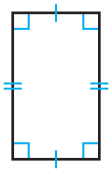
_____ sides of equal length

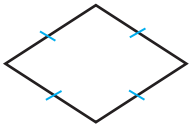
_____ right angles

Quadrilateral *ABCD* is also a _____.

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

2. 

3. 

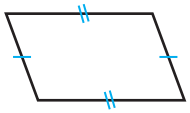
4. 

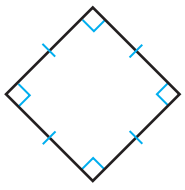
MATHEMATICAL PRACTICES

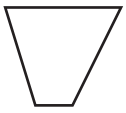
Math Talk How would you classify a figure with 4 sides, none of which are parallel? **Explain.**

On Your Own

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

5. 

6. 

7. 

Problem Solving REAL WORLD

8. Write Math **Explain** how a rhombus and square are alike, and how they are different.

9. **Test Prep** Which figure can never have 2 pairs of parallel sides?

Ⓐ trapezoid

Ⓑ rhombus

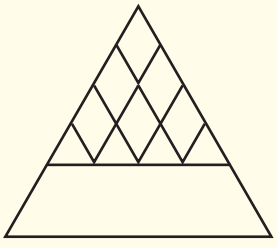
Ⓒ rectangle

Ⓓ quadrilateral

Connect to Art

The Louvre Museum is located in Paris, France. Architect I.M. Pei designed the glass and metal structure at the main entrance of the museum. This structure is called the Louvre Pyramid.

Below is a diagram of part of the entrance to the Louvre Pyramid.



10. **Describe** the quadrilaterals you see in the diagram.

11. H.O.T. How many triangles do you see in the diagram? **Explain.**

Name _____

Mid-Chapter Checkpoint

Vocabulary

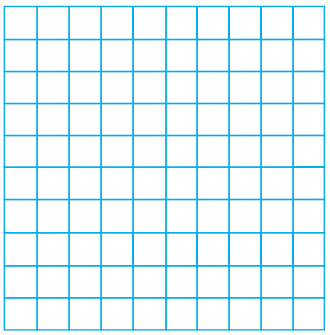
Choose the best term from the box to complete the sentence.

Vocabulary
acute angle
line segment
obtuse angle
ray
right angle
straight angle

1. A _____ is part of a line between two endpoints. (p. 381)
2. A _____ forms a square corner. (p. 382)
3. An _____ is greater than a right angle and less than a straight angle. (p. 382)
4. The two-dimensional figure that has one endpoint is a _____. (p. 381)
5. An angle that forms a line is called a _____. (p. 382)

Concepts and Skills

6. On the grid to the right, draw a polygon that has 2 pairs of parallel sides, 2 pairs of sides equal in length, and 2 acute and 2 obtuse angles. Tell all the possible names for the figure.



_____

Draw the figure.

7. parallel lines
8. obtuse $\angle ABC$
9. intersecting lines that are not perpendicular
10. acute $\angle RST$

Fill in the bubble completely to show your answer.

11. Which statement is true?

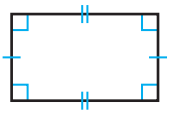
Ⓐ A right triangle always has two acute angles.

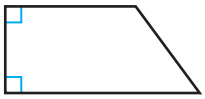
Ⓑ An obtuse triangle always has two obtuse angles.

Ⓒ An acute triangle always has a right angle.

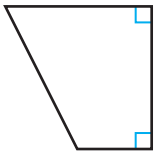
Ⓓ A triangle always has an obtuse angle.

12. Which figure has 2 pairs of sides that appear to be parallel?

Ⓐ 

Ⓒ 

Ⓑ 

Ⓓ 

13. Which quadrilateral can have 2 pairs of parallel sides, all sides with equal length, and no right angles?

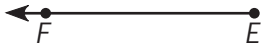
Ⓐ square

Ⓑ rhombus

Ⓒ rectangle

Ⓓ trapezoid

14. Which names the figure correctly?



Ⓐ line *EF*

Ⓑ ray *FE*

Ⓒ angle *FE*

Ⓓ ray *EF*

Name _____

Line Symmetry

Essential Question How can you check if a shape has line symmetry?

UNLOCK the Problem REAL WORLD

One type of symmetry found in geometric shapes is line symmetry. This sign is in the hills above Hollywood, California. Do the letters in the Hollywood sign show line symmetry?

A shape has **line symmetry** if it can be folded about a line so that its two parts match exactly. A fold line, or a **line of symmetry**, divides a shape into two parts that are the same size and shape.

Activity Explore line symmetry.

Materials ■ pattern blocks ■ scissors ■ tracing paper

A Does the letter W have line symmetry?

STEP 1 Use pattern blocks to make the letter W.

STEP 2 Trace the letter.

STEP 3 Cut out the tracing.

STEP 4 Fold the tracing over a vertical line.

Think: The two parts of the folded W match exactly. The fold line is a line of symmetry.

So, the letter W _____ line symmetry.

Math Idea

A vertical line goes up and down. ↕

A horizontal line goes left and right. ↔

A diagonal line goes through vertices of a polygon that are not next to each other. It can go up and down and left and right. ⤢ ⤡

MATHEMATICAL PRACTICES

Math Talk Why is it important to use a fold line to check if a shape has line symmetry?

B Does the letter L have line symmetry?

STEP 1

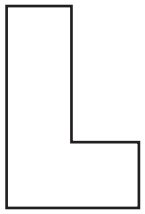
Use pattern blocks or grid paper to make the letter L.

STEP 2

Trace the letter.

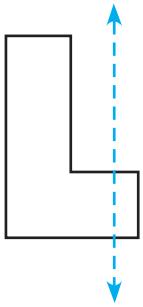
STEP 3

Cut out the tracing.



STEP 4

Fold the tracing over a vertical line.

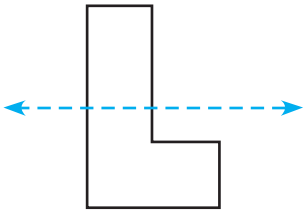


Do the two parts match exactly?

_____

STEP 5

Then open it and fold it horizontally.

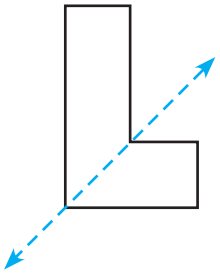


Do the two parts match exactly?

_____

STEP 6

Then open it and fold it diagonally.



Do the two parts match exactly?

_____

So, the letter L _____ line symmetry.

1. Repeat Steps 1–6 for the remaining letters in HOLLYWOOD. Which letters have line symmetry?

_____

2. Do any of the letters have more than one line of symmetry? **Explain.**

_____

_____

Remember

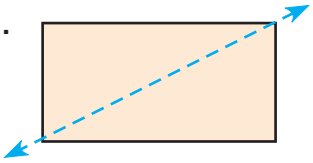
You can fold horizontally, vertically, or diagonally to determine if the parts match exactly.

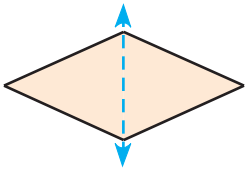
Name _____

Share and Show

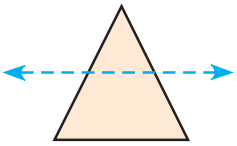
MATH BOARD

Tell whether the parts on each side of the line match.
Is the line a line of symmetry? Write *yes* or *no*.

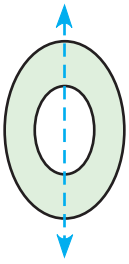
1. 

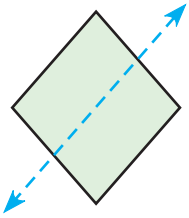
2. 

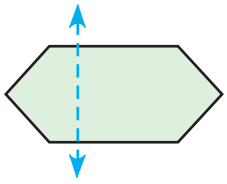
3. 

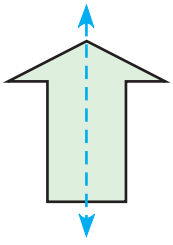
4. 

Tell if the blue line appears to be a line of symmetry.
Write *yes* or *no*.

5. 

6. 

7. 

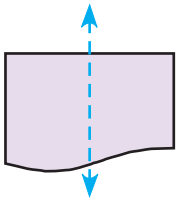
8. 

MATHEMATICAL PRACTICES

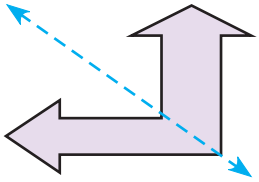
Math Talk **Explain** how you can use paper folding to check if a shape has line symmetry.

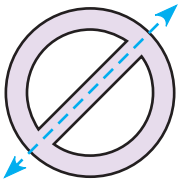
On Your Own

Tell if the blue line appears to be a line of symmetry.
Write *yes* or *no*.

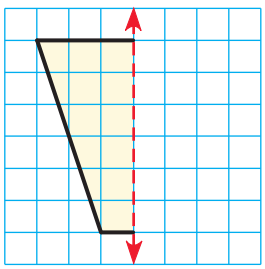
9. 

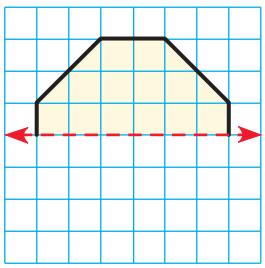
10. 

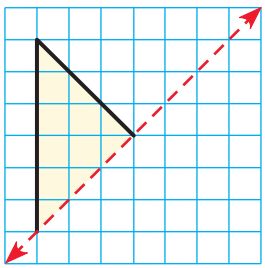
11. 

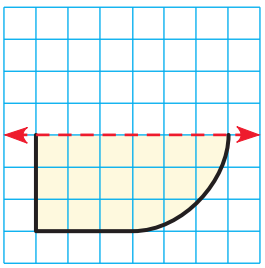
12. 

H.O.T. Complete the design by reflecting over the line of symmetry.

13. 

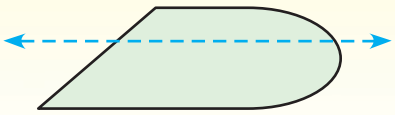
14. 

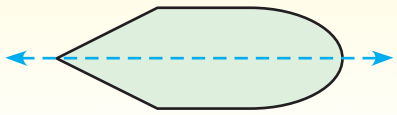
15. 

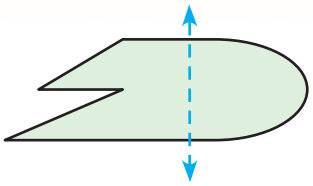
16. 

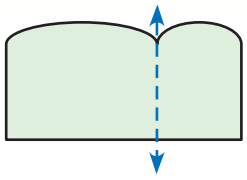
UNLOCK the Problem

17. Which shape has a correctly drawn line of symmetry?

Ⓐ 

Ⓒ 

Ⓑ 

Ⓓ 

a. What do you need to find? _____

_____

b. How can you tell if the line of symmetry is correct?

_____

_____

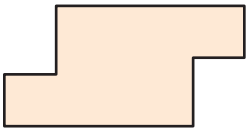
c. Tell how you solved the problem.

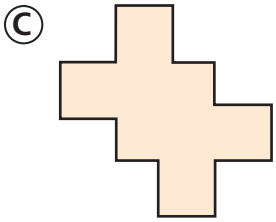
_____

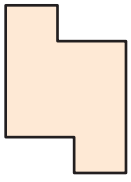
_____

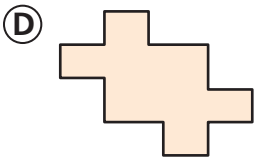
d. Fill in the bubble for the correct answer choice above.

18. Which shape appears to have line symmetry?

Ⓐ 

Ⓒ 

Ⓑ 

Ⓓ 

19. Which best describes the line of symmetry in the letter M?

M

Ⓐ horizontal

Ⓑ vertical

Ⓒ diagonal

Ⓓ rotational

FOR MORE PRACTICE:
Standards Practice Book, pp. P197–P198

Name _____

Find and Draw Lines of Symmetry

Essential Question How do you find lines of symmetry?

UNLOCK the Problem

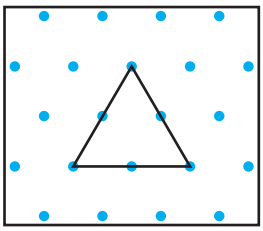
How many lines of symmetry does each polygon have?

Activity 1 Find lines of symmetry.

Materials ■ isometric and square dot paper ■ straightedge

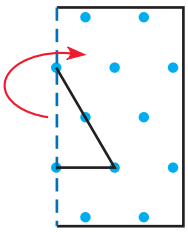
STEP 1

Draw a triangle like the one shown, so all sides have equal length.



STEP 2

Fold the triangle in different ways to test for line symmetry. Draw along the fold lines that are lines of symmetry.



- Is there a line of symmetry if you fold the paper horizontally?

_____

STEP 3

Repeat the steps for each polygon shown. Complete the table.

Polygon	 Triangle	 Square	 Parallelogram	 Rhombus	 Trapezoid	 Hexagon
Number of Sides	3					
Number of Lines of Symmetry	3					

- In a regular polygon, all sides are of equal length and all angles are equal. What do you notice about the number of lines of symmetry in regular polygons?

_____

_____

MATHEMATICAL PRACTICES

Math Talk How many lines of symmetry does a circle have? **Explain.**

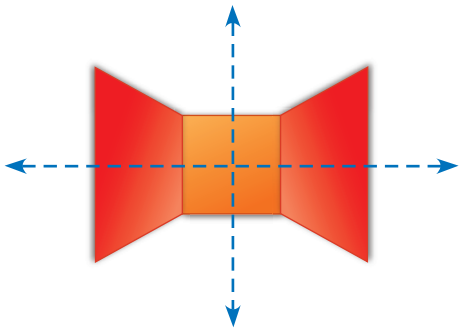
Activity 2 Make designs that have line symmetry.

Materials ■ pattern blocks

Make a design by using more than one pattern block. Record your design. Draw the line or lines of symmetry.

ERROR Alert
To avoid errors, you may use a mirror to check for line symmetry.

Make a design with 2 lines of symmetry.



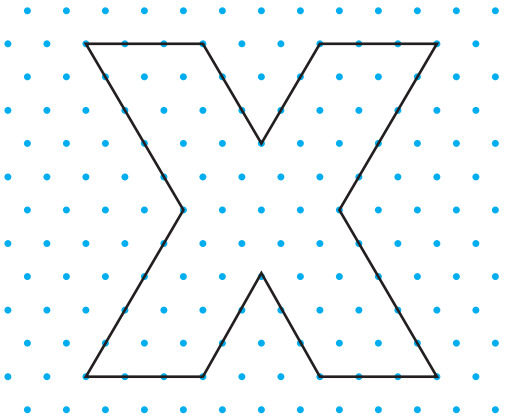
Make a design with 1 line of symmetry.

Make a design with more than 2 lines of symmetry.

Make a design with zero lines of symmetry.

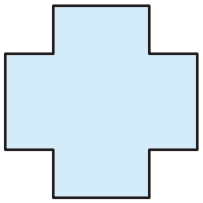
Share and Show MATH BOARD

1. The shape at the right has line symmetry. Draw the 2 lines of symmetry.



Name _____

Tell whether the shape appears to have zero lines, 1 line, or more than 1 line of symmetry. Write *zero, 1,* or *more than 1*.

2. 

3. 

4. 

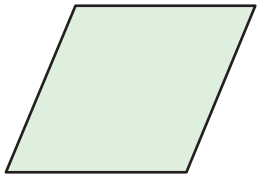
5. 

MATHEMATICAL PRACTICES

Math Talk **Explain** how you can find lines of symmetry for a shape.

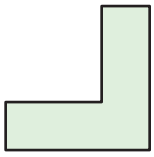
On Your Own

Tell whether the shape appears to have zero lines, 1 line, or more than 1 line of symmetry. Write *zero, 1,* or *more than 1*.

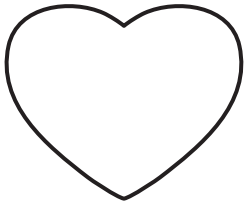
6. 

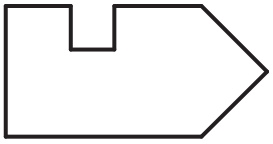
7. 

8. 

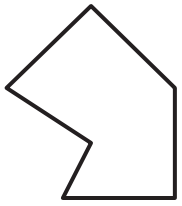
9. 

Practice: Copy and Solve Does the design have line symmetry? Write *yes* or *no*. If your answer is *yes*, draw all lines of symmetry.

10. 

11. 

12. 

13. 

Draw a shape for each statement. Draw the line or lines of symmetry.

14. zero lines of symmetry

15. 1 line of symmetry

16. 2 lines of symmetry

Problem Solving

Use the chart for 17–19.

A	H	S
B	I	T
C	J	U
D	K	V
E	L	W

17. Which letters appear to have only 1 line of symmetry?

_____

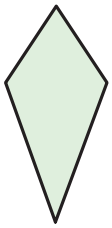
18. Which letters appear to have zero lines of symmetry?

_____

19. The letter C has horizontal symmetry. The letter A has vertical symmetry. Which letters appear to have both horizontal and vertical symmetry?

_____

20. H.O.T. **Sense or Nonsense?** Jeff says that the shape has only 2 lines of symmetry.



Does his statement make sense? **Explain**.

_____

_____

_____

_____

21. Write Math Draw a shape that has at least 2 lines of symmetry. Then write instructions that **explain** how to find the lines of symmetry.

_____

_____

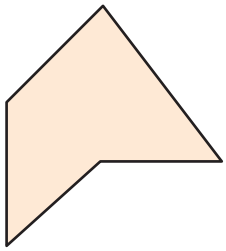
_____

_____

22. **Test Prep** How many lines of symmetry does the figure shown at the right have?

Ⓐ 0 Ⓒ 5

Ⓑ 1 Ⓓ 10



Name _____

Problem Solving • Shape Patterns

Essential Question How can you use the strategy *act it out* to solve pattern problems?

UNLOCK the Problem REAL WORLD

You can find patterns in fabric, pottery, rugs, and wall coverings. You can see patterns in shape, size, position, color, or number of figures.

Sofia will use the pattern below to make a wallpaper border. What might be the next three figures in the pattern?

Use the graphic organizer below to solve the problem.

Read the Problem

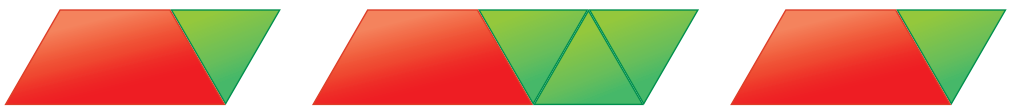
What do I need to find?	What information do I need to use?	How will I use the information?
I need to find the next three _____ in the pattern.	I need to use the _____ of each figure in Sofia's pattern.	I will use pattern blocks to model the _____ and act out the problem.

Solve the Problem

Describe how you acted out the problem to solve it.

I used a trapezoid and triangle to model the first figure in the pattern. I used a _____ and _____ to model the second figure in the pattern. I continued to model the pattern by repeating the models of the first two figures.

These are the next three figures in the pattern.



MATHEMATICAL PRACTICES

Math Talk **Explain** how you can describe the shape pattern using numbers.

Try Another Problem

Draw what might be the next figure in the pattern.

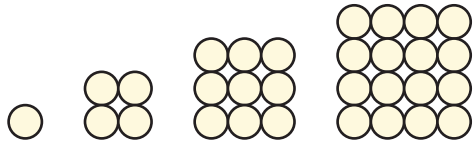


Figure: 1 2 3 4 _____ 5

How can you describe the pattern?

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

1. Use the figures to write a number pattern. Then describe the pattern in the numbers.

_____

_____

_____

Math Talk MATHEMATICAL PRACTICES

What other strategy could you use to solve the problem?

2. What might the tenth number in your pattern be? **Explain.**

_____

_____

Name _____

Share and Show

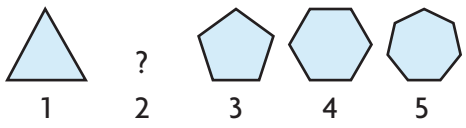
MATH BOARD

UNLOCK the Problem Tips

- Use the Problem Solving MathBoard.
- Underline the important facts.
- Choose a strategy you know.

1. Marisol is making a pattern with blocks. What might the missing shape be?

First, look at the blocks.

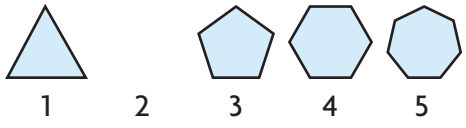


Next, describe the pattern.

_____

_____

Finally, draw the missing shape.



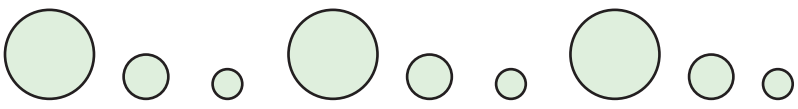
2. Use the shapes to write a number pattern. Then describe the pattern in the numbers.

_____

3. H.O.T. **What if** the pattern continued? Write an expression to describe the number of sides the sixth shape has in Marisol's pattern.

_____

4. Sahil made a pattern using circles. The first nine circles are shown. Describe the pattern. If Sahil continues the pattern, what might the next three circles be?



_____

On Your Own

Use the toy quilt designs for 5–6.

5. Lu is making a quilt that is 20 squares wide and has 24 rows. The border of the quilt is made by using each toy design equally as often. Each square can hold one design. How many of each design does she use for the border?

6. Write Math Starting in the first square of her quilt, Lu lined up her toy designs in this order: plane, car, fire truck, helicopter, crane, and wagon. Using this pattern unit, which design will Lu place in the fifteenth square? Explain how you found your answer.

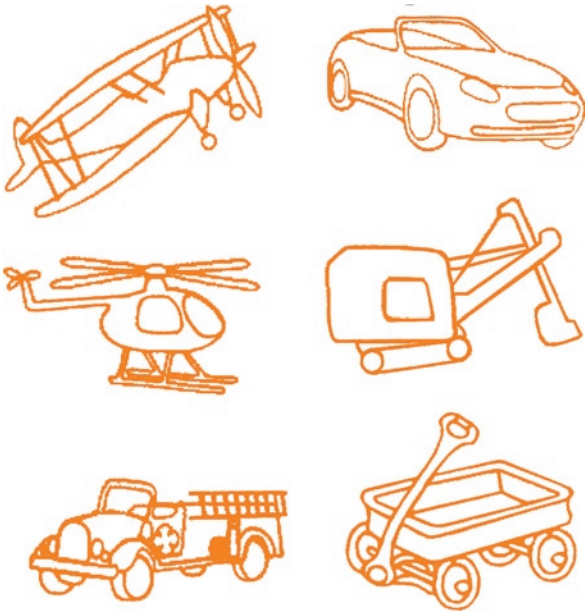
7. Missy uses 1 hexagonal, 2 rectangular, and 4 triangular pieces of fabric to make 1 bug design for a quilt. If she uses 70 pieces in all to make bug designs, how many of each shape does she use?

8. Test Prep Neal has 3 square pattern blocks. How many lines of symmetry do all 3 pattern blocks have?

Ⓐ 3 Ⓑ 5 Ⓒ 6 Ⓓ 12

Choose a STRATEGY

- Act It Out
- Draw a Diagram
- Find a Pattern
- Make a Table or List
- Solve a Simpler Problem



SHOW YOUR WORK

Name _____

Chapter Review/Test

Check Vocabulary

Choose the best term from the box to complete the sentence.

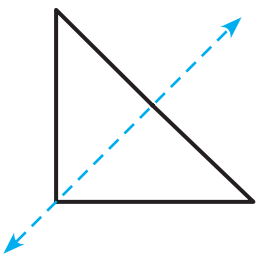
Vocabulary
line symmetry
parallelogram
ray
trapezoid

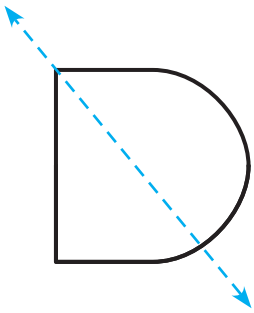
1. A _____ is a quadrilateral with exactly one pair of parallel sides. (p. 393)
2. A shape has _____ if it can be folded about a line so that its two parts match exactly. (p. 399)
3. A _____ has one endpoint and continues without end in one direction. (p. 381)

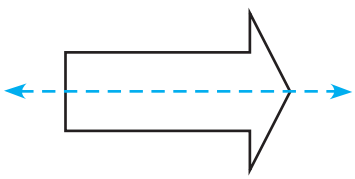
Check Concepts

Tell if the blue line appears to be a line of symmetry.

Write *yes* or *no*.

4. 

5. 

6. 

Use Figure *A* for 7–9.

7. Name a pair of perpendicular lines.

8. Name a pair of intersecting lines that are not perpendicular.

9. Classify $\angle AGD$. Write *acute, right,* or *obtuse*.

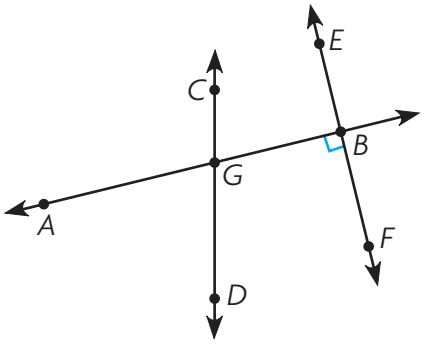
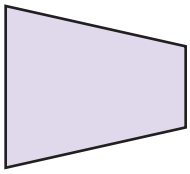


Figure *A*

GO Online Assessment Options Chapter Test

Fill in the bubble completely to show your answer.

10. Which describes the shape?



Ⓐ zero lines of symmetry

Ⓑ 1 line of symmetry

Ⓒ 2 lines of symmetry

Ⓓ more than 2 lines of symmetry

11. Which figure does **not** have two pairs of parallel sides?

Ⓐ parallelogram

Ⓑ trapezoid

Ⓒ rhombus

Ⓓ square

12. How many right angles can be in an obtuse triangle?

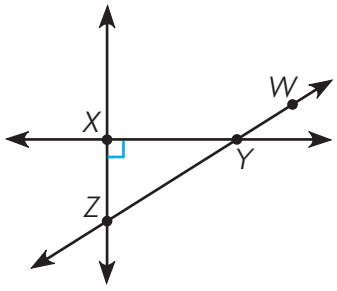
Ⓐ 0

Ⓑ 1

Ⓒ 2

Ⓓ 3

13. Which is the correct label for a right angle in the figure?



Ⓐ $\angle XYZ$

Ⓑ $\angle XYW$

Ⓒ $\angle ZXY$

Ⓓ $\angle ZYX$

14. Which of the following letters of the alphabet has line symmetry?

Ⓐ S

Ⓑ F

Ⓒ H

Ⓓ N

Name _____

Fill in the bubble completely to show your answer.

15. Which statement is true?

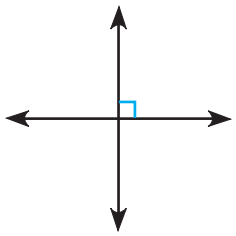
Ⓐ A trapezoid can never have a right angle.

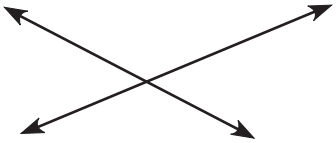
Ⓑ A parallelogram can never have a right angle.

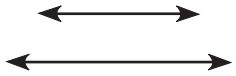
Ⓒ A rhombus is a type of trapezoid.

Ⓓ A square is a type of parallelogram.

16. Which lines appear parallel?

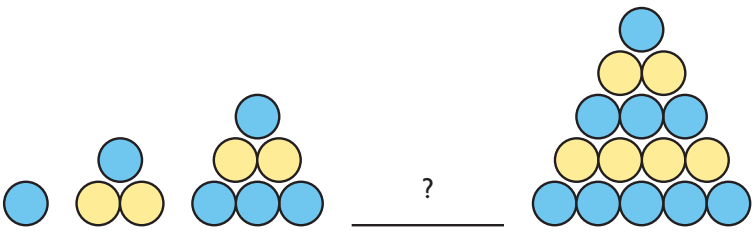
Ⓐ 

Ⓒ 

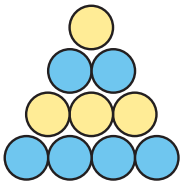
Ⓑ 

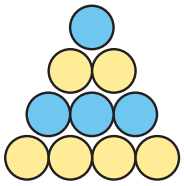
Ⓓ 

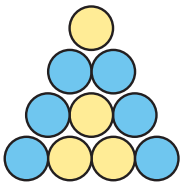
17. Norris drew the pattern below.

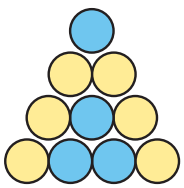


Which is the missing figure in the pattern?

Ⓐ 

Ⓒ 

Ⓑ 

Ⓓ 

Constructed Response

Describe a pattern. Write a rule using numbers to find the number of squares in any figure in the pattern.

18.

Figure: 1 2 3 4

Rule: _____

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

Performance Task

20. Evie's birthday is the 18th day of May. Since May is the 5th month, Evie wrote the date like this:

5/18

A Evie says all the numbers she wrote have line symmetry. Is she correct? Explain your thinking.

B Choose one of the numbers Evie wrote. Using a straightedge, draw a line of symmetry.

C Using the same format as Evie, write a date for which all the numbers have line symmetry.