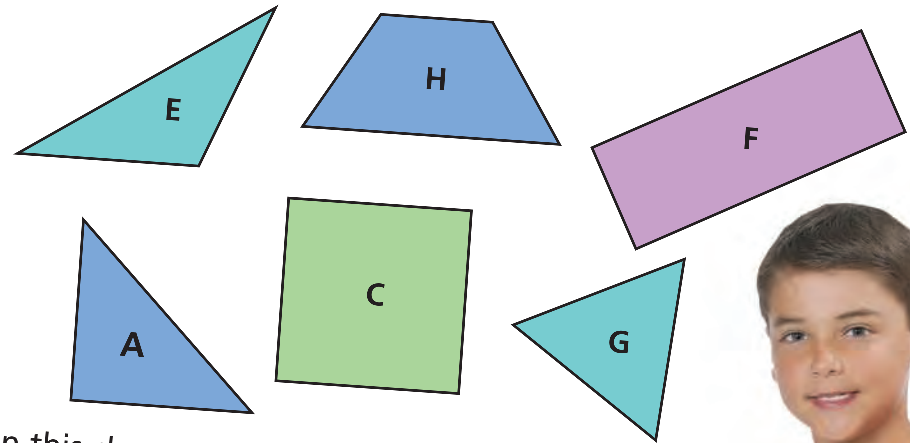
Chapter

4 Classifying Angles and Figures

Dear Student,

In this chapter, you will be learning new names for some figures that may already be familiar to you and names for some figures that may not be.

See how many of these you can name. Can you think of 2 different names for figure C? Can you think of a way to tell figures A, E, and G apart? Can you find something similar among figures C, F, and H?



In this chapter, you'll begin by looking at angles, but don't worry if you don't know what they are yet. You will be introduced to them when you play a game with a spinner! Enjoy!

Mathematically yours,
The authors of ***Think Math!***

THE WORLD ALMANAC FOR KIDS

Bridge Geometry

FACT·ACTIVITY 1

Triangular shapes are very important in construction because they can support a lot of weight. That's why you might see a lot of triangles when you look at a bridge. What other shapes and angles do you see in bridges?

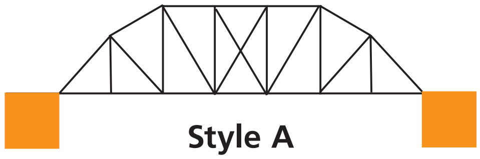
1. Use the bridge photos above. Write the number that identifies the geometric term.
   - parallel lines
   - perpendicular lines
   - acute triangle
   - right triangle
   - obtuse triangle
2. Describe and draw three more geometric figures you see in the bridge photos.

FACT·ACTIVITY 2

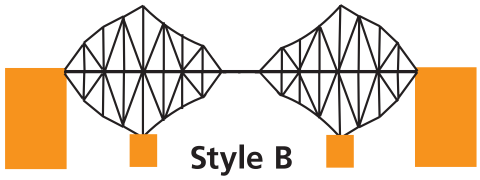
The Golden Gate Bridge, like many bridges, is symmetric. The Golden Gate Bridge is a suspension bridge, the roadway hangs from a series of interconnected cables.

The suspension bridge is just one of many different styles of bridges. Two others are shown below. Although they look different, they each contain similar geometric shapes and properties.

1. Copy or trace bridge Style A. Outline and name two types of triangles and two types of quadrilaterals in the bridge.
2. Which style, A or B, has only one line of symmetry? Which has two lines of symmetry? Explain.
3. The top half of Style B looks like it may be resting on a mirror. What term can be used to describe the two parts of the bridge?
4. Make a drawing of a bridge that includes the following features:
   - parallel lines
   - perpendicular lines
   - congruent triangles
   - symmetry



Style A



Style B

CHAPTER PROJECT

Materials: straws or craft sticks (no more than 30), tape, glue, scissors

Work in groups of four. Your group must:

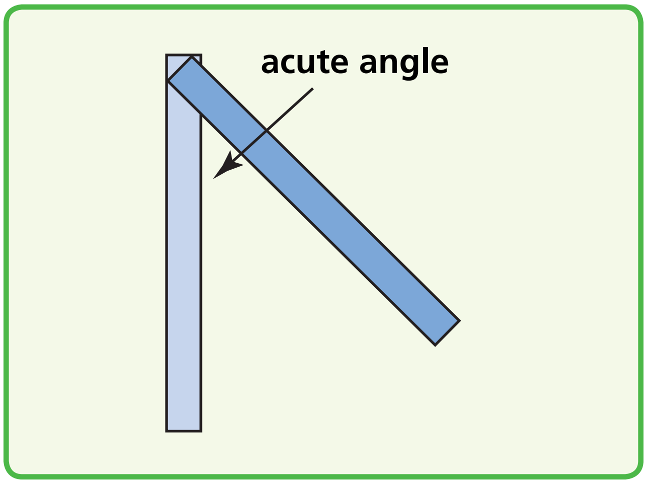
- Agree on a design of a bridge. Use the drawings from Fact Activity 2 to help. Design the bridge to demonstrate symmetry, parallel and perpendicular lines, and other geometry concepts taught in this chapter.
- Next, build the bridge to match your design.
- Write a description of your bridge explaining its geometric features.

ALMANAC Fact

As of June 2005, almost 2 billion vehicles had crossed the Golden Gate Bridge. There are more than 600,000 rivets in each bridge tower.

Chapter 4
Lesson 3

EXPLORE
Angles in Triangles



Sketch the triangles you make on a piece of scratch paper.

1. Use 3 strips of paper to try to make a triangle with **3 acute angles.**

   Is this possible?

2. Now use the strips of paper to try to make a triangle with exactly **2 acute angles.**

   Is this possible?

3. Now try to make a triangle with only **1 acute angle.**

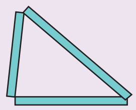
   Is this possible?

Chapter 4

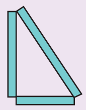
Lesson 4

REVIEW MODEL
Using Equal Sides to Make Triangles

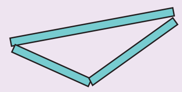
You can make a triangle with 0 equal sides. The triangle can be an acute triangle, a right triangle, and an obtuse triangle.



Acute and Scalene
3 sides are not same length; 3 acute angles

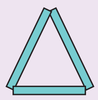


Right and Scalene
3 sides are not same length; 1 right and 2 acute angles

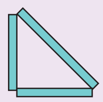


Obtuse and Scalene
3 sides are not same length; 1 obtuse and 2 acute angles

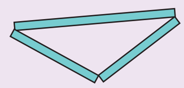
You can make a triangle with exactly 2 equal sides. The triangle can be an acute triangle, a right triangle, and an obtuse triangle.



Acute and Isosceles
2 sides are equal
3 acute angles

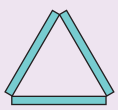


Right and Isosceles
2 sides are equal
1 right and 2 acute angles

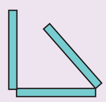


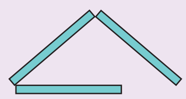
Obtuse and Isosceles
2 sides are equal
1 obtuse and 2 acute angles

You can make a triangle with exactly 3 equal sides. The triangle can be an acute triangle. You cannot make a triangle with exactly 3 equal sides and form a right triangle or an obtuse triangle.



Acute and Equilateral
3 sides are equal
3 acute angles





Check for Understanding

1. What are the different classes for triangles using angles and side lengths?

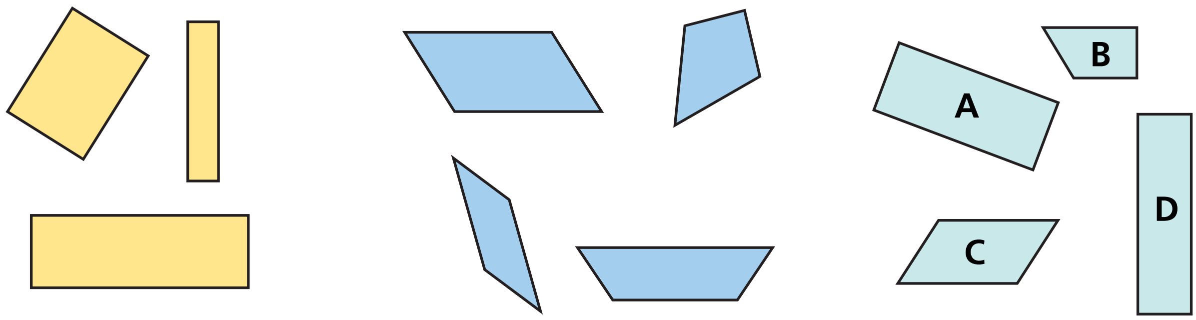
2. Can you make an obtuse equilateral triangle? What kinds of triangles are impossible?

Chapter 4
Lesson 7

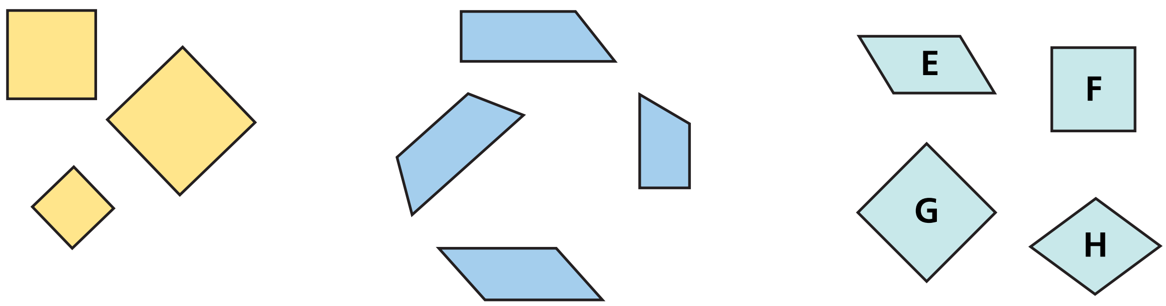
EXPLORE
Sorting Parallelograms

Write the letter(s) of the figures that belong in the third group on a separate piece of paper.

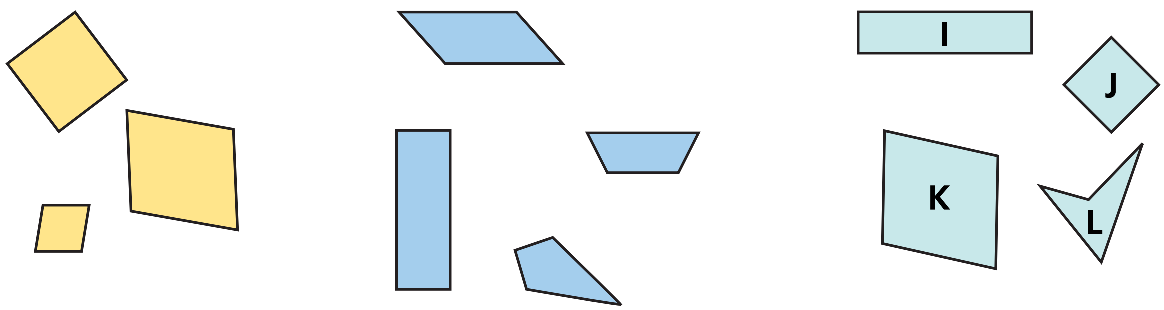
1 All of these belong. None of these belong. Which of these belong?



2 All of these belong. None of these belong. Which of these belong?



3 All of these belong. None of these belong. Which of these belong?



4 Draw a figure that belongs to all 3 groups on a separate sheet of paper.

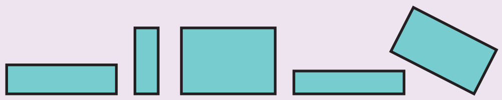
Chapter 4

Lesson 7

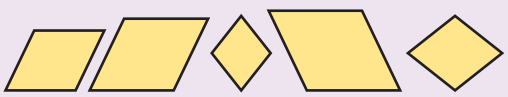
REVIEW MODEL
Classifying Parallelograms

Parallelograms are quadrilaterals with 2 pairs of parallel sides. Some parallelograms are rectangles and some are rhombuses.

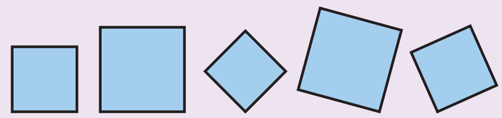
A rectangle is a parallelogram with 4 right angles. These are rectangles:



A rhombus is a parallelogram with 4 sides of equal length. These are rhombuses:



A square can also be called a rectangle because it has 4 right angles. It is a special rectangle because it also has 4 sides of equal length. All squares are rectangles, but not all rectangles are squares.



A square is also a rhombus because it has 4 sides of equal length. It is a special rhombus because it also has 4 right angles.

All squares are rhombuses, but not all rhombuses are squares.

Check for Understanding

On a separate sheet of paper write T if the statement is TRUE. Write F if the statement is FALSE.

1. All squares are parallelograms.

2. All parallelograms are squares.

3. Some parallelograms are either rectangles or rhombuses.

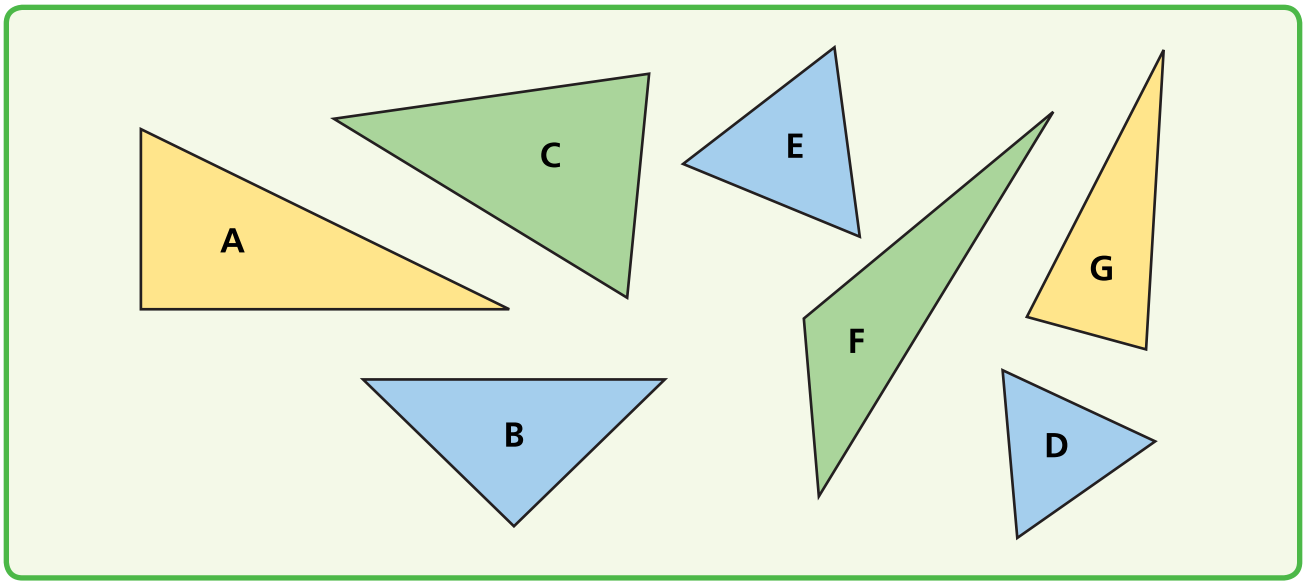
4. Some rhombuses are squares.

5. All squares are rhombuses.

Chapter 4

Lesson 8

EXPLORE
Symmetry in Classes of Triangles



1 Which **have no lines of symmetry?**

What kind of triangles are these?

2 Which triangles have exactly **1 line of symmetry?**

What kind of triangles are these?

3 Which triangles have **3 lines of symmetry?**

What kind of triangles are these?

4 Can you find any triangles with **exactly 2 lines of symmetry?**

Chapter 4

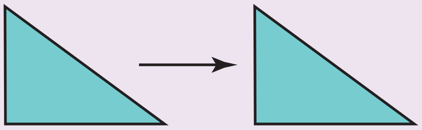
Lesson 9

REVIEW MODEL
Transformations of a Triangle

These three types of transformations do not change the size and shape of the original figure.

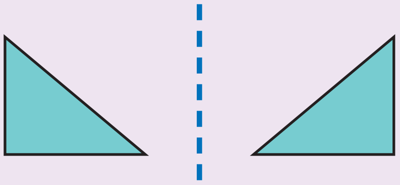
Translation

A translation, or slide, moves a figure without changing its orientation. The direction of movement is shown by an arrow.



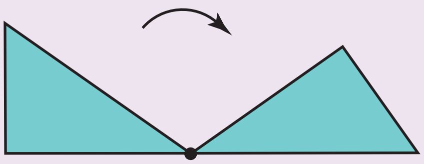
Reflection

A reflection, or flip, flips a figure over a line so that the new and the original figures are mirror images of each other over the line. The line is shown as dotted.



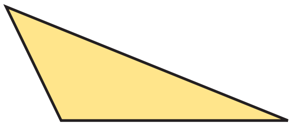
Rotation

A rotation, or turn, moves a figure around a fixed point that is chosen. It is shown by a point on the figure.



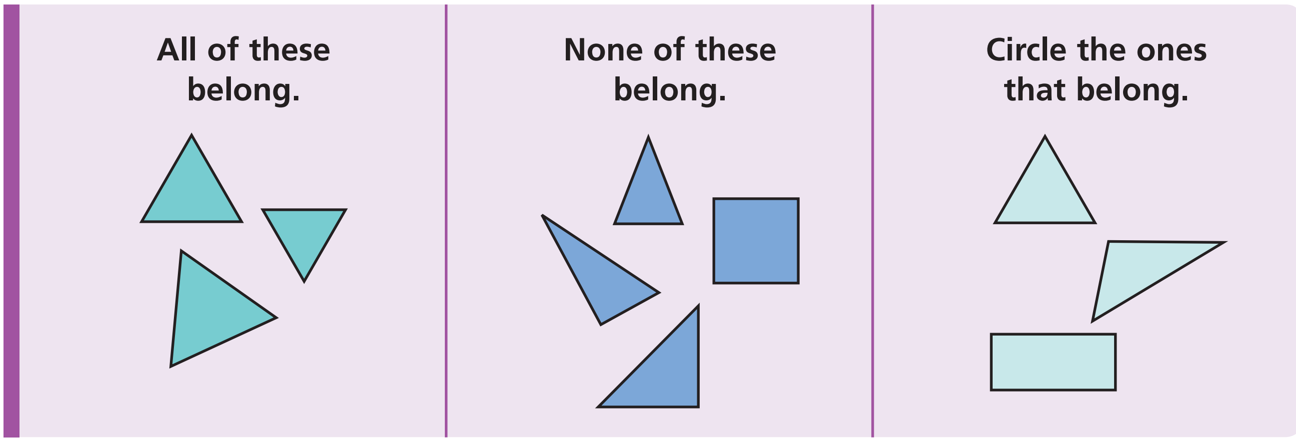
Check for Understanding

1. Translate, reflect, and rotate this triangle. Draw these transformations on a separate sheet of paper.



Chapter 4
Lesson 10

REVIEW MODEL
Problem Solving Strategy
Look for a Pattern



Strategy: Look for a Pattern

Read to Understand

What do you know from reading the problem?

The first group of figures share characteristics the second group doesn't have.

Plan

How can you solve this problem?

by figuring out which figure in the third group shares characteristics with those in the first group

Solve

How can you look for a pattern?

The figures that belong are all equilateral triangles. The figures that do not belong are isosceles triangles, scalene triangles and quadrilaterals. So, the equilateral triangles are the figures that belong.

Check

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?

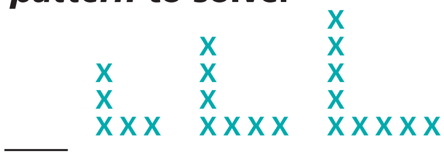
Problem Solving Strategies

- ✔ Act It Out
- ✔ Draw a Picture
- ✔ Guess and Check
- ✔ **Look for a Pattern**
- ✔ Make a Graph
- ✔ Make a Model
- ✔ Make an Organized List
- ✔ Make a Table
- ✔ Solve a Simpler Problem
- ✔ Use Logical Reasoning
- ✔ Work Backward
- ✔ Write an Equation

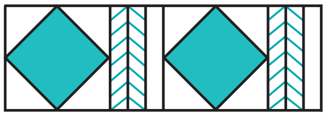
Problem Solving Practice

Use the strategy *look for a pattern* to solve.

1. What could be the missing figure in the pattern? Explain.



2. Tina made this design. What part of the pattern comes next? Explain.



Mixed Strategy Practice

Use any strategy to solve. Explain.

3. At a carnival, Alonso and his friends paid $1 for 3 pictures at a photo booth. They had a total of 18 pictures taken. How much money did they spend on pictures?

4. Eli buys 3 books that each cost $1.97. The clerk adds $0.35 in sales tax. Eli pays using bills and receives less than a dollar as change. How much did Eli pay the clerk?

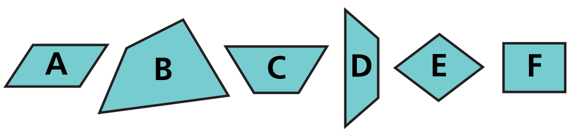
Use the table.

5. How many large yards does Rafael need to mow to earn the same amount of money he earns mowing 6 medium yards?

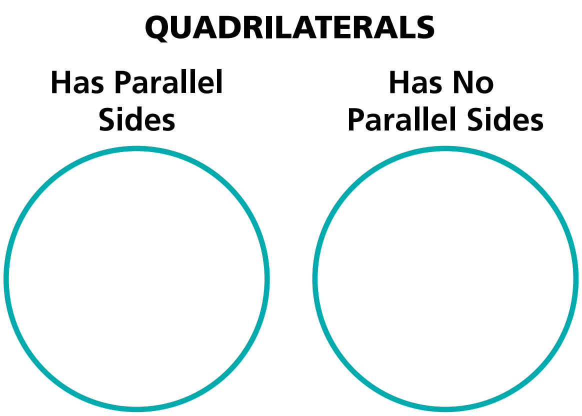
LAWN MOWING EARNINGS

Yard Size	Amount Earned
Small Yard	$23
Medium Yard	$35
Large Yard	$42

6. These figures are all quadrilaterals.



Sort the figures into a Venn diagram drawn on a separate sheet of paper.



Chapter 4 Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1. A triangle with no equal sides is called a(n) __?__.
2. Two intersecting lines that form right angles are __?__.
3. A figure that has exactly four sides is a(n) __?__.
4. Lines that do not cross and are the same distance apart from each other are called __?__.
5. An angle that is smaller than a right angle is a(n) __?__.
6. A __?__ has 4 sides that are the same length.
7. Any quadrilateral that has two pairs of parallel sides is called a(n) __?__.
8. A mathematical term for flipping a figure is __?__.
9. A triangle that has two or more equal sides is called a(n) __?__.
10. Turning a figure is the same as __?__ it.

Complete each analogy using the best term from Word List B.

11. Flipping is to reflecting as sliding is to __?__.
12. Equilateral triangle is to triangle as __?__ is to quadrilateral.

Word List A

acute angle
acute triangle
equilateral triangle
interseacting lines
isosceles triangle
obtuse angle
parallel lines
parallelogram
perpendicular lines
quadrilateral
reflecting
rhombus
rotating
scalene triangle
sliding
trapezoid

Word List B

angle
square
translating
turning

Talk Math

Discuss with a partner what you have just learned about classifying figures. Use the vocabulary terms *line of symmetry, obtuse angle, right angle, acute angle,* and *parallel lines.*

13. How can you describe an equilateral triangle?
14. How can you describe a square?
15. How can you describe a trapezoid?

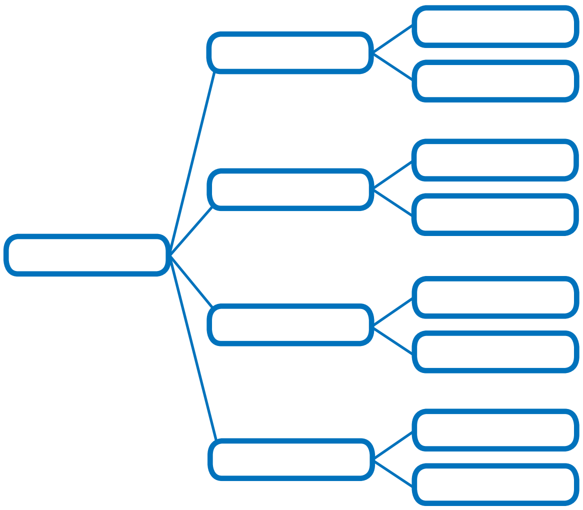
Degrees of Meaning Grid

16 **Create a degrees of meaning grid for the terms *quadrilateral* and *triangle.***

General	Less General	Specific

Tree Diagram

17 **Create a tree diagram using the word *transformation*. Use what you know and what you have learned about translating, rotating, and reflecting figures.**



What's in a Word?

SQUARE Words often have more than one meaning. Some words, such as *square,* even have more than one mathematical meaning. A *square* is a quadrilateral with four right angles and four equal sides. Area is measured in square units, such as "4 *square* inches." Here is another use of the word *square*. To *square* a number means to multiply the number by itself; for example, 4×4 is 4 squared (4^2) or 16.

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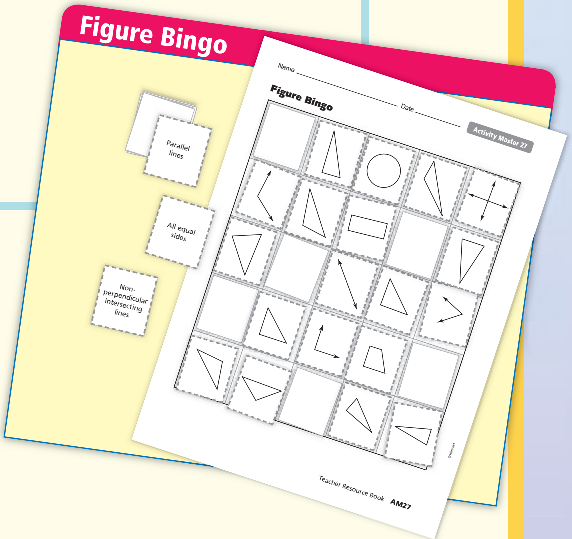
GAME

Figure Bingo

Game Purpose
To practice identifying attributes of figures and lines

Materials
- Activity Master 27 (*Figure Bingo*)
- Activity Master 28 (*Bingo Figures*)
- Activity Master 29 (*Bingo Cards*)



How To Play The Game

1. Play this game with a small group. Each group will need one set of *Bingo Cards.* Each player will need a *Figure Bingo* page and one set of *Bingo Figures.*
2. Pick one student to be the Caller. The Caller cuts out the *Bingo Cards* for the group.
3. Players cut out their *Bingo Figures* along the dotted lines. Place them face-up in any order on your *Figure Bingo* page.
4. The Caller picks a *Figure Card* from the pile and reads it aloud. Look at your *Figure Bingo* page. Find any figures that match the description and turn them face-down.
5. Continue playing. The first player to get 5 *Bingo Figures* face-down in a row, column, or diagonal, says "Bingo!"
   - If the figures match the descriptions that have been read, that player wins!
   - If the figures do not match the descriptions, keep playing until someone else says "Bingo!" and has the correct figures.
6. Choose a new Caller, and play another game.

GAME

Who Has . . . ?

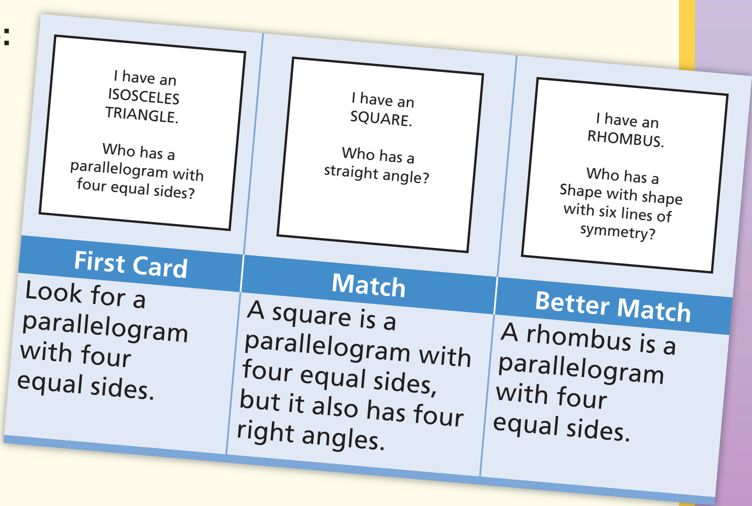
Game Purpose
To practice classifying figures and angles

Materials
- Activity Masters 34 and 35 (*Who Has . . . Game* cards)

How To Play The Game

1. Play this game with a small group. Cut out the cards from Activity Masters 34 and 35. Mix them up. Give an equal number of cards to each player.
   - If there is an extra card, the person who gets that card is Player 1.
   - If there is no extra card, the player who has the card that says "I have a PENTAGON" is Player 1.
2. Player 1 puts down the card face-up and reads the description at the bottom of the card.
3. The player who has the card that best matches the description puts it down, and reads the description at the bottom of that card.

Example:



4. Continue playing in this way. The player whose card best matches the definition puts down the card and reads the next definition aloud.
5. The winner is the first player to match all of his or her cards.

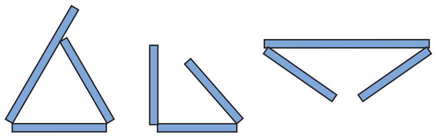
CHALLENGE

Is there a pattern in the lengths of triangle sides? To find out, you will need notebook paper or straws, a pair of scissors, and an inch ruler.

1. Cut 2 strips of paper, or straws, for each of these lengths: 2 inches, 3 inches, 4 inches, 5 inches, 6 inches, 8 inches, 9 inches.

2. Copy the table below. Then try to make each triangle with your paper strips or straws. Record your results in the table. Write *yes* or *no* to tell whether you could make a triangle. Only write *yes* if 3 paper strips or straws make a triangle without overlapping or leaving any gaps.

   These are NOT triangles:



	Lengths of Strips	Can I make a triangle?
A	2 inches, 2 inches, 3 inches	
B	2 inches, 3 inches, 5 inches	
C	4 inches, 5 inches, 8 inches	
D	5 inches, 6 inches, 9 inches	
E	3 inches, 4 inches, 8 inches	
F	2 inches, 4 inches, 6 inches	
G	6 inches, 8 inches, 9 inches	

3. Now use what you know to predict whether you will be able to make these triangles. Then test your predictions.

	Lengths of Strips	Can I make a triangle?
H	4 inches, 8 inches, 9 inches	
J	5 inches, 5 inches, 8 inches	
K	3 inches, 3 inches, 9 inches	

4. Use what you have learned to answer this question:

   - In order for three sides to form a triangle, what must be true about the sum of the lengths of any two sides?