LESSON 32

• Polygons

Texas Essential Knowledge and Skills

- **(5.7)** identify essential attributes including parallel, perpendicular, and congruent parts of two-dimensional geometric figures.
- **(5.14)(C)** select the problem-solving strategy systematic guessing and checking to solve a problem.
- **(5.15)(A)** explain and record observations using technology.
- **(5.16)(A)** make generalizations from sets of examples and nonexamples.

Power Up

facts

Power Up E

count aloud

Count by 12s from 12 to 84. Count by 5s from 4 to 54.

mental math

a. **Time:** How many hours are in 2 days?

b. **Number Sense:** There are 39 boys and 45 girls on the playground. Altogether, how many children are on the playground?

c. **Money:** Jean earned $680. She spent $400. How much money does Jean have left?

d. **Time:** 60 minutes is 1 hour. How many minutes is 10 hours?

e. **Percent:** 50% of 30

f. **Percent:** 10% of 30

g. **Number Sense:** 8×45

h. **Calculation:** $6 \times 7, -2, \div 5, \times 2, -1, \div 5$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. At the store a pencil costs 34¢, an eraser costs 52¢, and a notebook costs $1.05. Santo purchased a combination of five of these items for a total of $2.59. What did Santo purchase?

New Concept

A **plane** is a flat surface that extends without end. The classroom floor is part of a plane that extends beyond the walls. The wall surfaces in the room are parts of other planes. Planes can contain flat shapes such as triangles, squares, and circles. Some of these flat shapes are **polygons.**

Visit www.SaxonMath.com/Int5Activities for an online activity.

A polygon is a flat shape formed by line segments that close in an area. Each of these shapes is a polygon:

The line segments that form a polygon are called **sides.** Two sides meet at a **vertex** (plural: *vertices*) to form an angle. A polygon may have three or more straight sides, and it has as many vertices and angles as it has sides.

Polygons do not have any curved sides.

Conclude These figures are not polygons. Explain why.

Connect Name a real-world example of a polygon. Explain your reasoning.

Polygons are named by the number of sides they have. The table below names some common polygons.

Polygons

Polygon	Number of Sides	Example
Triangle	3	
Quadrilateral	4	
Pentagon	5	
Hexagon	6	
Heptagon	7	
Octagon	8	
Decagon	10	
Dodecagon	12	

Notice that a four-sided polygon is a **quadrilateral.** There are different kinds of quadrilaterals, such as squares, rectangles, parallelograms, and trapezoids. We will study these classifications in more detail later.

Example 1

This figure is an example of a quadrilateral:

Which of these shapes is *not* a quadrilateral?

A  **B**  **C**  **D** 

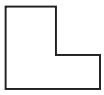
A quadrilateral is a polygon with four sides. The shape that does not have four sides is choice **C.**

Conclude Which of the shapes in choices **A–D** appear to have perpendicular sides?

Sometimes we enclose an area by using smooth curves. A circle is one example of an area that is enclosed by a smooth curve. Because a circle does not enclose an area with line segments, a circle is not a polygon.

Example 2

Which of these shapes is not a polygon?

A  **B**  **C**  **D** 

A polygon is formed by line segments. A circle is a smooth curve. The shape that is not a polygon is choice **C.**

Conclude Which of the shapes in choices **A–D** appear to have at least two parallel sides?

Example 3

Name each of these polygons:

a.  **b.**  **c.** 

a. The polygon has six sides. It is a **hexagon.**

b. This 12-sided polygon is a **dodecagon.**

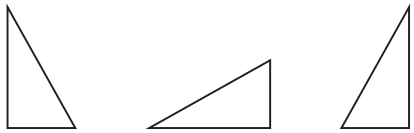
c. The block-letter T has 8 sides and is an **octagon.**

Thinking Skill

Connect

Name a shape that has all sides congruent.

Figures that have the same size and shape are **congruent.** The three triangles below are congruent even though they have been flipped and turned to different positions.



Example 4

Which two rectangles below are congruent?

A  **B**  **C**  **D** 

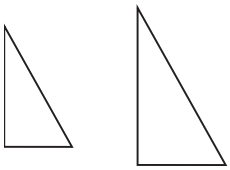
Rectangles **A** and **C** have the same size and shape, so they are congruent figures.

Thinking Skill

Connect

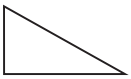
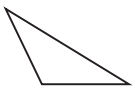
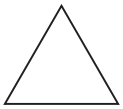
Suppose two figures are identical. Are the figures congruent, similar, or both?

Congruent figures are also **similar.** Similar figures have the same shape. They may or may not be the same size. When looking at two similar figures that are not the same size, the larger figure will look like a magnified version of the smaller figure. These two triangles are similar but not congruent.



Example 5

Which two triangles below are similar?

A  **B**  **C**  **D** 

Triangles **B** and **D** have the same shape, so they are similar figures.

Lesson Practice

a. Draw a triangle with two perpendicular sides.

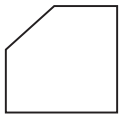
b. A quadrilateral is a polygon with how many sides?

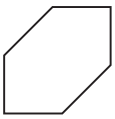
c. Draw a quadrilateral that has one pair of parallel sides.

d. Draw a quadrilateral with two pairs of parallel sides.

e. Draw a quadrilateral that has no parallel sides. (Begin by drawing two nonparallel segments. Then connect those with two other nonparallel segments.)

Name each shape:

f. 

g. 

h. 

i. **Represent** Draw a polygon shaped like the block letter F. What type of polygon did you draw?

j. **Represent** Draw two triangles that are congruent.

Written Practice

Distributed and Integrated

1. (Inv. 2) **Analyze** Suki took $20 to the carnival. She spent $\frac{1}{2}$ of her money on rides, $\frac{1}{4}$ of her money on food, and $\frac{1}{10}$ of her money on parking. How much did Suki spend on rides? … on food? … on parking?

Formulate For problems **2–4,** write an equation and find the answer.

2. (21) Hank says that the horse trough holds 18 buckets of water. If a bucket holds 3 gallons, how many gallons does the trough hold?

3. (21) Kareem chopped a tree that was 52 feet tall into four logs of equal length. How many feet long was each log?

***4.** (16) After 20 minutes Carlotta had answered 17 of the 45 questions on the test. How many questions remained for Carlotta to answer?

5. (28, 29) How many seconds are in 1 hour?

6. (13)
$$\begin{array}{r} \$56.37 \\ \$34.28 \\ +\ \$\ 9.75 \\ \hline \end{array}$$

7. (14)
$$\begin{array}{r} 5286 \\ -\quad k \\ \hline 4319 \end{array}$$

8. (13)
$$\begin{array}{r} \$40.00 \\ -\ \$39.56 \\ \hline \end{array}$$

9. (10)
$$\begin{array}{r} 67 \\ 72 \\ 43 \\ 91 \\ 48 \\ 19 \\ 648 \\ +\quad m \\ \hline 996 \end{array}$$

10. (24, 26) $936 \div (36 \div 9)$

11. (29)
$$\begin{array}{r} 596 \\ \times\quad 600 \\ \hline \end{array}$$

12. (26) $\frac{\$46.56}{8}$

13. (29) $\$4.07 \times 80$

14. (15, 18) $9 \times 12 \times 0$

15. (26) $936 \div 7$

16. (Inv. 3) Compare: $\frac{1}{3}$ of 60 ◯ $\frac{1}{5}$ of 100