

Algebra/Geometry Institute Summer 2007

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J. Z. George Junior High School

8th grade

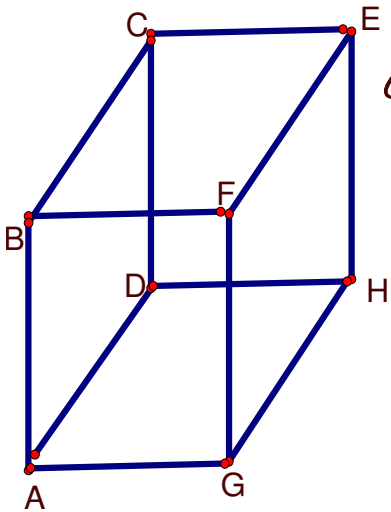


Teaching Objective(s)

- a. The student will identify, describe, compare and classify geometric figures.*

Instructional Activities

a. Bell-ringer



Use the figure to answer the following questions.

- 1. Name three line segments that are parallel to segment AB.*
- 2. Name three line segments that are parallel to segment FE.*
- 3. What segment(s) intersect(s) with segment DH?*

Teacher Procedure Introduction

b. Discuss the bell-ringer. Question #1 Line segment CD, line segment EH, and line segment FG are parallel to line segment AB. Question #2 Line segment CB, line segment AD, and line segment GH are parallel to line segment FE. Question #3 Line segment CD, and line segment EH intersect line segment DH.

c. Tell the students that today they will learn about some of the traffic signs and the polygons that are used to form them. Next, explain that a polygon is a closed geometric

shape with at least three segments that intersect each other only at their endpoints. Ask the students, "What is the least number of segments needed to make a polygon?" (3) What is the name of this polygon? (triangle)

d. Give the students a little background on traffic signs.

Traffic signs or road signs provide important information to road users. Since language differences can create barriers to understanding, international signs using symbols in place of words have been developed in Europe and adopted in most countries and areas of the world. Signs convey information to travelers not only by their messages and color, but through their shape as well. Special shapes are specifically assigned to certain types of signs so that travelers can recognize them quickly and react appropriately.

The earliest road signs were milestones, giving distance or direction. But traffic signs became more important with the development of automobiles. The basic patterns of most traffic signs were set in 1908. Today they are almost all metal with retro reflective sheeting of various types for nighttime and low-light visibility.

In general, the greater number of sides on a sign, the more critical a message it conveys. This is why a circular shape was adopted for the Railroad Advance warning sign because of the infinitely many number of sides of a circle. The octagon shape is used for the STOP sign. There are of course exceptions to this rule - a pentagonal County Route marker is typically no greater threat than a standard square route marker, and even though they have only 3 sides, the YIELD and No Passing Zone signs are still rather important.

e. The polygons and circle are special shapes, specifically assigned to certain types of signs so that travelers can recognize them quickly and react appropriately. However, several of the shapes are used but there are other triangles and quadrilaterals not shown that are also polygons. Today, class, our goal is to identify, describe, compare, and classify geometric figures.

Pass out handout 1 to each student. (See handout 1) Allow the student time to brainstorm about what each sign/shape represents.

f. Discuss the different characteristics of the shape of the traffic signs. Instruct the students to write the characteristics of the shapes beside them. A quadrilateral is a four-sided polygon. Where quad means four and lateral means side. Then discuss the other polygons from the handout

Activity 1

g. The students will be in groups of three. The students will fold paper to create polygons. Each group will be given 3 half of sheets of 9 by 12 typing paper and instructions (see Geo-Fold Handout).

h. Summarize and discuss the polygon created in the paper folding activity.

Guided Practice

Students will go to the board and draw the following figures for each given clue. Call in different order.

- Three sided figure with no congruent sides. (scalene triangle)
- Three sided figure with all congruent sides. (equilateral triangle)
- Three sided figure with at least two congruent sides. (isosceles triangle)
- Three sided figure with three angles less than 90° . (acute triangle)
- Three sided figure with one angle more than 90° . (obtuse triangle)
- Three sided figure with one angle equal to 90° . (right triangle)
- Four sided figure. (quadrilateral)
- Quadrilateral with opposite sides parallel & congruent. (parallelogram)
- Four sided parallelogram with four right angles. (rectangle)
- Four sided parallelogram with four right angles and four congruent sides. (square)
- Four sided polygon with four congruent sides. (rhombus)
- Four sided polygon with only two parallel sides. (trapezoid)
- Five sided figure. (pentagon)
- Six sided figure. (hexagon)
- Seven sided figure. (heptagon)
- Eight sided figure. (octagon)
- Nine sided figure. (nonagon)
- Ten sided figure. (decagon)

Independent Practice

j. Next students will be given worksheet 1 (see Geo-Shape Worksheet).

Closure

Ask students to give examples of what they learned today.
Ask students if they know the names of polygons with more than ten sides. Tell students that there are other polygons with more than ten sides some don't have a specific name. They are called n -gons, where n is the number of sides on the figure.

Materials and Resources

a. Material

- 1. Overhead projector*
- 2. Geo-Fold handout*
- 3. Traffic Sign Handout*
- 4. Geo-Shape Handout*
- 5. Geo-Shape Worksheet*

b. Resources

1. JBHM Education Group, LLC, et. al. The Achievement Connection 8th Grade Math 3rd Grading Period, 2004, pg. 30-31.

2. Wikipedia contributors, Manual on Uniform Traffic Control Devices, 18 June 2007 08:02 UTC. Wikipedia, The Free Encyclopedia. 13 June 2007 19:16.

<http://en.wikipedia.org/w/index.php?>

Assessment

Observe students' participation in the shape activity.

Grade the geo-shape worksheet.

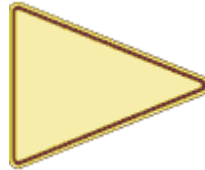
Traffic signs

Standard sign shapes used as traffic signs

Triangle (three-sided figures)



Equilateral Triangle



Isosceles triangle

Quadrilateral (four-sided figures)



Rectangle



Rectangle



Square



Trapezoid

Pentagon (five-sided figures)



Pentagon

Octagon (eight-sided figures)



Octagon

Dodecagon (12-sided figures)



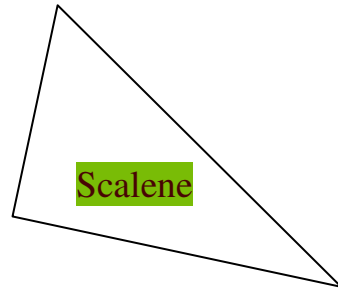
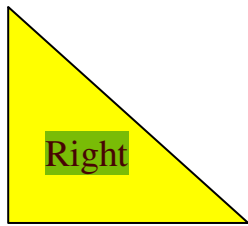
Dodecagon

Circle (infinitely many-sides)

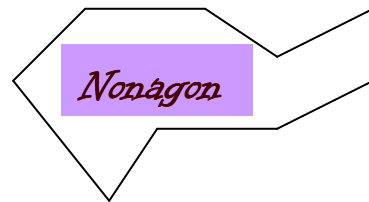
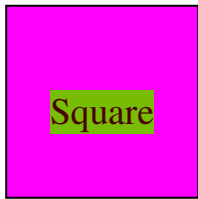


Circle

Triangles

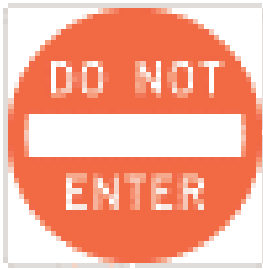


Quadrilateral



Geo-Shape Handout

A.



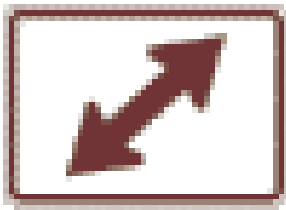
B.



C.



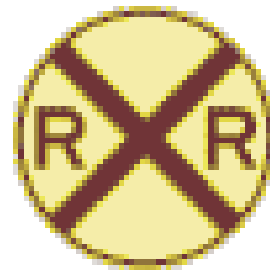
D.



E.



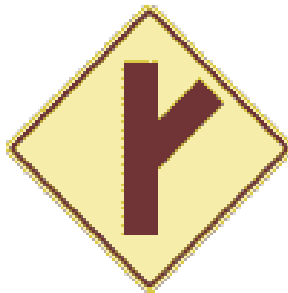
F.



G.



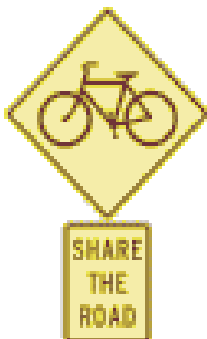
H.



I.



J.



Name _____

Date _____

GEO-SHAPE WORKSHEET

Find the traffic sign that characterizes the following statement from the handout. Choose the polygon that represents the statement and place the correct letter in the blank.

1. _____ *This traffic sign has two quadrilaterals; both have four right angles, opposite sides parallel, opposite angles congruent, but one figure has all sides congruent.*
2. _____ *This traffic sign is a decagon inside in a figure with four sides where opposite sides are parallel, and opposite angles are congruent.*
3. _____ *This traffic sign is not a polygon but does include a dodecagon.*
4. _____ *This traffic sign has two equilateral triangles.*
5. _____ *This traffic sign is a circle that encloses a rectangle.*
6. _____ *This traffic sign is a quadrilateral that includes an octagon.*
7. _____ *This traffic sign is an eight sided figure.*
8. _____ *This traffic sign is a quadrilateral with a dodecagon that forms a right angle.*
9. _____ *This traffic sign is an isosceles triangle.*
10. _____ *This traffic sign is a dodecagon.*

Teacher Answer Sheet

GEO-SHAPE WORKSHEET

Find the traffic sign that characterizes the following statement from the handout. Choose the polygon that represents the statement and place the correct letter in the blank.

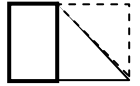
1. J This traffic sign has two quadrilaterals; both have four right angles, opposite sides parallel, opposite angles congruent, but one figure has all sides congruent.
2. D This traffic sign is a decagon inside in a figure with four sides where opposite sides are parallel, and opposite angles are congruent.
3. F This traffic sign is not a polygon but does include a dodecagon.
4. G This traffic sign has two equilateral triangles.
5. A This traffic sign is a circle that encloses a rectangle.
6. H This traffic sign is a quadrilateral that includes an octagon.
7. B This traffic sign is an eight sided figure.
8. I This traffic sign is a quadrilateral with a dodecagon that forms a right angle.
9. E This traffic sign is an isosceles triangle.
10. C This traffic sign is a dodecagon.

Geo-Fold Handout

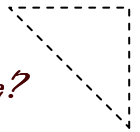
Students will follow these instructions.

1. Each group member will take a piece of the paper that is cut in half vertically and describe the shape it forms. What type of polygon do you have? (Quadrilateral). Give me some characteristics of the shape.

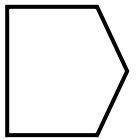
2. Turn your piece of paper so the long edge is horizontal and fold the top right corner down to the bottom edge so that the fold bisects the bottom right angle and the edge along the bottom are exactly even. What type of polygon do you have? (quadrilateral, trapezoid) Give me some characteristics of the shape.



3. Unfold the paper and look at the shape created when the paper was folded. What type of polygon was created? (triangle) What type of triangle? (Isosceles triangle) Give me some characteristics of the shape.



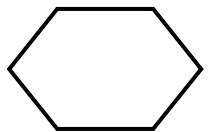
4. Now fold the triangle back down. Next fold the bottom right corner up to the top right corner so that one triangle covers the other triangle on the fold. What type of polygon do you have? (pentagon) Give me some characteristics of the shape.



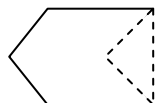
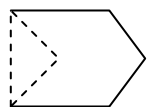
5. Now, unfold the last triangle. Next, fold the top left corner down to the bottom edge so that the fold bisects the bottom left angle and the edge along the bottom is exactly even. What type of polygon do you have? (parallelogram) Give me some characteristics of the shape.



6. Refold the bottom right corner up to the top right corner so that one triangle covers the other triangle on the fold. Repeat the fold on the bottom left corner up to the top left corner so that one triangle covers the other triangle on the fold. What type of polygon do you have? (hexagon) Give me some characteristics of the shape.

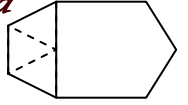


7. Fold the left vertex of the hexagon so that the fold line connects the two vertices as shown. What type of polygon do you have? (pentagon) Unfold



and repeat the same process on the right side of the paper. Give me some characteristics of the shape. What type of polygon do you have? (pentagon)

8. Unfold the paper back to the hexagon and now fold the tip of the left end triangle onto the crease you just created. What type of polygon do you have?(heptagon)



9. Repeat the process for the other end of the paper. What type of polygon do you have?(octagon)

