

# Polygon Power

## Brief Overview:

Students will learn to identify types of lines and basic polygons, specifically parallel lines, intersecting lines and perpendicular lines. Polygons include triangles, quadrilaterals, pentagon, hexagon, and octagon. This unit there will also focus on identifying quadrilaterals and their properties.

## NCTM Content Standard/National Science Education Standard:

Analyze characteristics and properties of two-dimensional geometric shapes and develop mathematical arguments about geometric figures.

- Identify, compare, and analyze attributes of two-dimensional shapes and develop vocabulary.
- Classify two-dimensional shapes according to their properties and develop definitions of classes of shapes such as triangles.

Use visualization, spatial reasoning, and geometric modeling to solve problems.

- Build and draw geometric objects.
- Create and describe mental images of objects, patterns and paths.

## Grade/Level:

Grade 3

## Duration/Length:

3 days/60-90 minutes per lesson

## Student Outcomes:

### Maryland Voluntary State Curriculum

Standard 2.0 Knowledge of Geometry

#### A. Plane Geometric Figures

- a. Identify or describe points, lines, line segments, rays, and angles
- b. Identify or describe polygons
  - i. Assessment limit: use triangle, quadrilaterals, pentagons, hexagons, or octagons and the number of sides and vertices
- c. Identify or describe quadrilaterals
  - i. Assessment limit: use squares, rectangles, rhombi, parallelograms, and trapezoids and the length of sides

## **Materials and Resources:**

- Newspaper
- Magazines
- Art supplies
- Construction Paper
- Chart Paper
- Pipe cleaners
- Overhead/visualizer
- Shape Up By: David A. Adler
- Popsicle Sticks

## **Development/Procedures:**

### **Lesson 1**

#### **Pre-assessment**

Students will complete a “Matching Sheet”, Student Resource 1. The “Matching Sheet” will include pictures and definitions of parallel lines, intersecting lines, and perpendicular lines. Answers are provided on Teacher Resource 2.

#### **Launch**

- Present definitions of the following: point, line, line segment, and ray. Definitions can be found on Teacher Resource 1.
- Students will construct and identify items using their hands and arms.

#### **Teacher Facilitation**

Present new vocabulary words: parallel lines, perpendicular lines, and intersecting lines.

- Explain that parallel lines are two lines that will never touch because they are equal distance apart. For example, yellow lines on a road will never meet because they are equal distance apart. Model parallel lines using your arms. Students will mimic the teacher model.
- Explain that perpendicular lines are two lines that form a  $90^\circ$  angle when they intersect. For example, the edge of a white board/chalk board. Model perpendicular lines using your arms. Students will mimic teacher model.
- Explain that intersecting lines are two lines that will cross each other at a certain point. For example, the hour hand and the minute hand on a clock. Model intersecting lines using arms. Students will mimic teacher model.

#### **Student Application**

Students will identify and create lines using real life examples.

- Students will identify real life situations that involve the different types of lines.

- Students will record examples on a class chart paper.
- Students will create a picture using real life examples, using at least two examples of each type of line.
- Students will have 15 minutes to create their pictures using crayons, markers, or colored pencils.
- Students will take a gallery walk of portraits.
- In whole group, students will discuss similarities and differences using teacher facilitated questions. Refer to Teacher Resource 3.

### **Embedded Assessment**

Informally assess student understanding through informal observation and questions regarding concepts during student application time. Chart student responses using Teacher Resource 4.

### **Reteaching/Extension**

Extension Activity- Students who have displayed an understanding of the lesson will complete a tri-fold. The tri-fold will classify and include more pictures of real life examples. The use of magazines, newspapers, or photographs is acceptable.

Reteaching Activity- Students who have not displayed an understanding of the lesson taught will complete a tri-fold with teacher guidance. The tri-fold will classify and include more pictures of real life examples. The use of magazines, newspapers, or photographs is acceptable.

## **Lesson 2**

### **Pre-assessment**

Students will complete a Polygon Power worksheet, Student Resource 2. The worksheet will include sorting polygons according to their properties. Answers will vary.

### **Launch**

- Students will model parallel lines, intersecting lines, and perpendicular lines using their arms.
- Conduct an interactive read aloud titled Shape Up by David A. Adler, which defines geometric shapes and angles.

### **Teacher Facilitation**

Revisit pre-assessment and review classifications. Facilitate discussions based on student responses. Conduct a whole class sort, using the shapes found on Teacher Resource 5. Introduce new geometric vocabulary and definitions:

- Polygon- a closed plane figure made up of straight line segments.
- Triangle- a polygon with three sides and three angles.
- Quadrilateral- a polygon with four sides and four angles.
- Pentagon- a polygon with five sides and five angles.

- Hexagon- a polygon with six sides and six angles.
  - Octagon- a polygon with eight sides and eight angles.
- Sort geometric shapes based on the number of sides and angles. Discuss classification of polygons. Explain that a circle is a closed figure but is not classified as a polygon because it is not made up of straight lines.

### **Student Application**

- Students will be given pipe cleaners to construct shape people, made up of polygons and line segments.
- Students will be required to use at least one of each polygon that was discussed.
- Students will have 15 minutes to complete assignment.
- Students will come together in groups of 4-5 to present polygon people to one another.
- Students will sketch a picture of their polygon person in their journals.

### **Embedded Assessment**

Teacher will informally assess through observation of group presentations.

### **Reteaching/Extension**

Extension Activity- Students who have displayed an understanding of polygons will be given a take home assignment, Student Resource 3. Students will find and record polygons found at home.

Re-teaching activity- students who do not display an understanding of polygons will be given a take home assignment, Student Resource 4. Students will have to identify and color shapes given. Answers can be found on Teacher Resource 6.

## **Lesson 3**

### **Pre-assessment**

Have students choose two shapes and complete the Venn Diagram, Student Resource 5. Answers will vary. Allow at least five minutes for completion.

### **Launch**

Review polygons learned during previous lesson. Facilitate, “Name that Polygon”. Teacher will give a definition and students will identify the polygon given.

- I have five sides. What shape am I? (pentagon)
- I have four sides. What shape am I? (quadrilateral)
- I have eight sides. What shape am I? (octagon)
- I have three sides. What shape am I? (triangle)
- I have six sides. What shape am I? (hexagon)

### **Teacher Facilitation**

- Revisit Shape Up by David A. Adler, specifically using the section on quadrilaterals
- Model author directions given on an overhead/visualizer using centimeter grid paper, Teacher Resource 7.
- Shape 1 is a trapezoid. A trapezoid is a quadrilateral with one pair of parallel sides.
- Shape 2 is a parallelogram. A parallelogram is a quadrilateral in which two sets of parallel sides are opposite each other.
- Shape 3 is a rectangle. A rectangle is a quadrilateral/parallelogram with four right angles.
- Shape 4 is a rhombus. A rhombus is a quadrilateral/parallelogram with four equal sides.
- Shape 5 is a square. A square is a quadrilateral/parallelogram with four equal sides that form four right angles.

### **Student Application**

- Students will use popsicle sticks and glue to create their own quadrilaterals.
- Students will label their quadrilaterals.
- Facilitate discussion of quadrilaterals: How are they similar? How are they different? What shape is this? How do you know?

### **Embedded Assessment**

Collect assignment and check for accuracy.

### **Reteaching/Extension**

Reteaching- Assist those students who are having a difficult time understanding the concept.

### **Summative Assessment:**

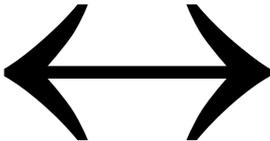
Student will take an assessment, Student Resource 6-8, consisting of matching, identifying, and brief constructed responses. Answers found on Teacher Resource 8-10. Questions will include concepts taught in this unit. This will be a way to evaluate and measure the mastery of skills taught.

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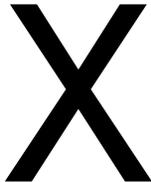
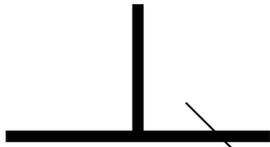
Teacher Resource 1

| Name         | Picture  | Definition   |
|--------------|--|--|
| Point        |     | An exact location  |
| Line         |    | A straight path extending in both directions with no endpoints         |
| Line Segment |   | A part of a line with 2 endpoints                                      |
| Ray          |  | A part of a line with 1 endpoint that extends forever in one direction |

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Directions: Match the picture to its description.



These two lines cross over each other.

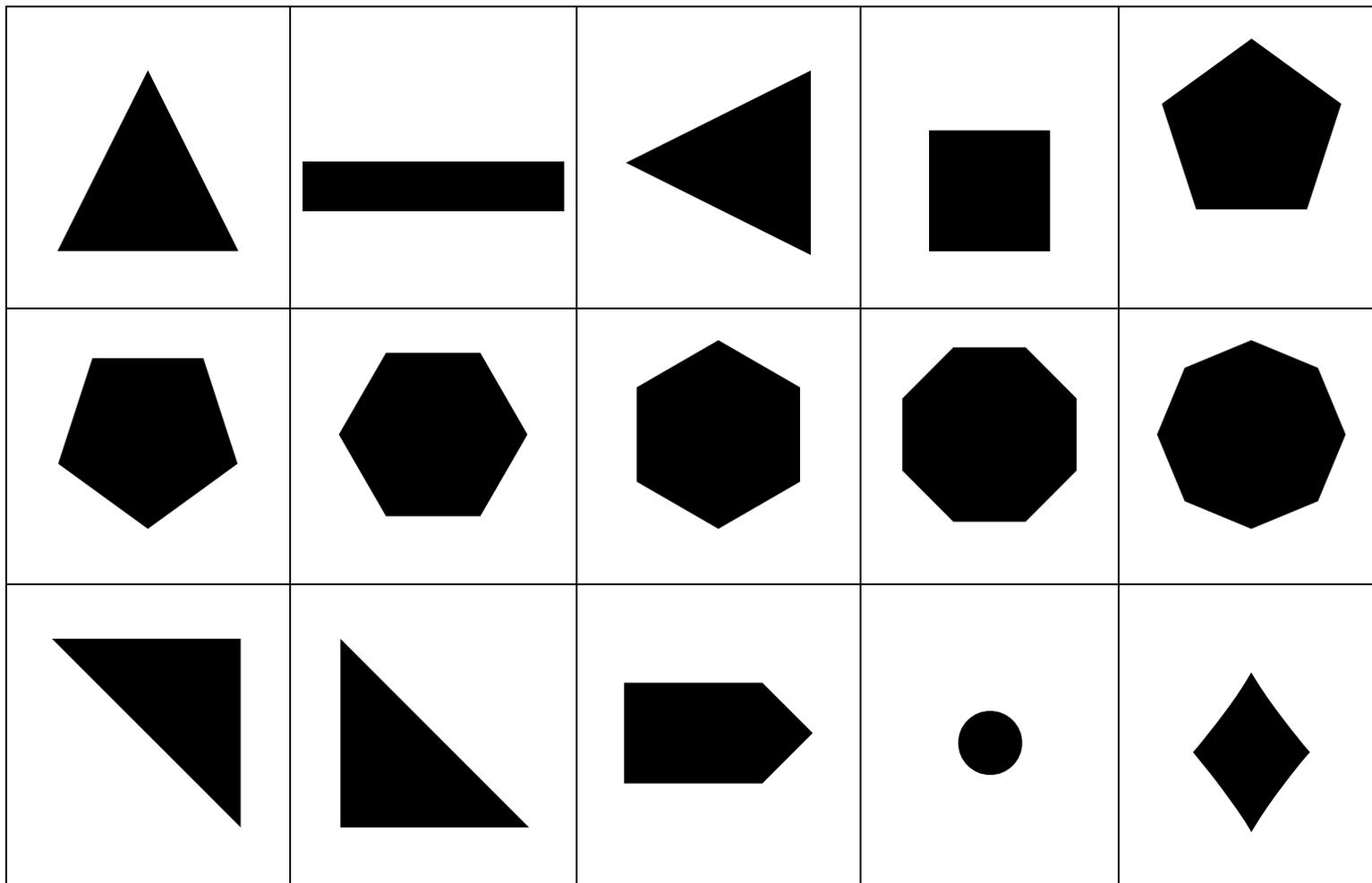
These 2 lines meet to form a 90° angle.

These 2 lines will never touch because they are equal distance apart.

Examples of teacher facilitated questions:

- Who used parallel lines to represent the same thing? What did it represent?
- Did any of your friends use parallel lines to represent something different than you did? What did they use them to represent?
- Who used perpendicular lines to represent the same thing? What did it represent?
- Did any of your friends use perpendicular lines to represent something different than you did? What did they use them to represent?
- Who used intersecting lines to represent the same thing? What did it represent?
- Did any of your friends use intersecting lines to represent something different than you did? What did they use them to represent?



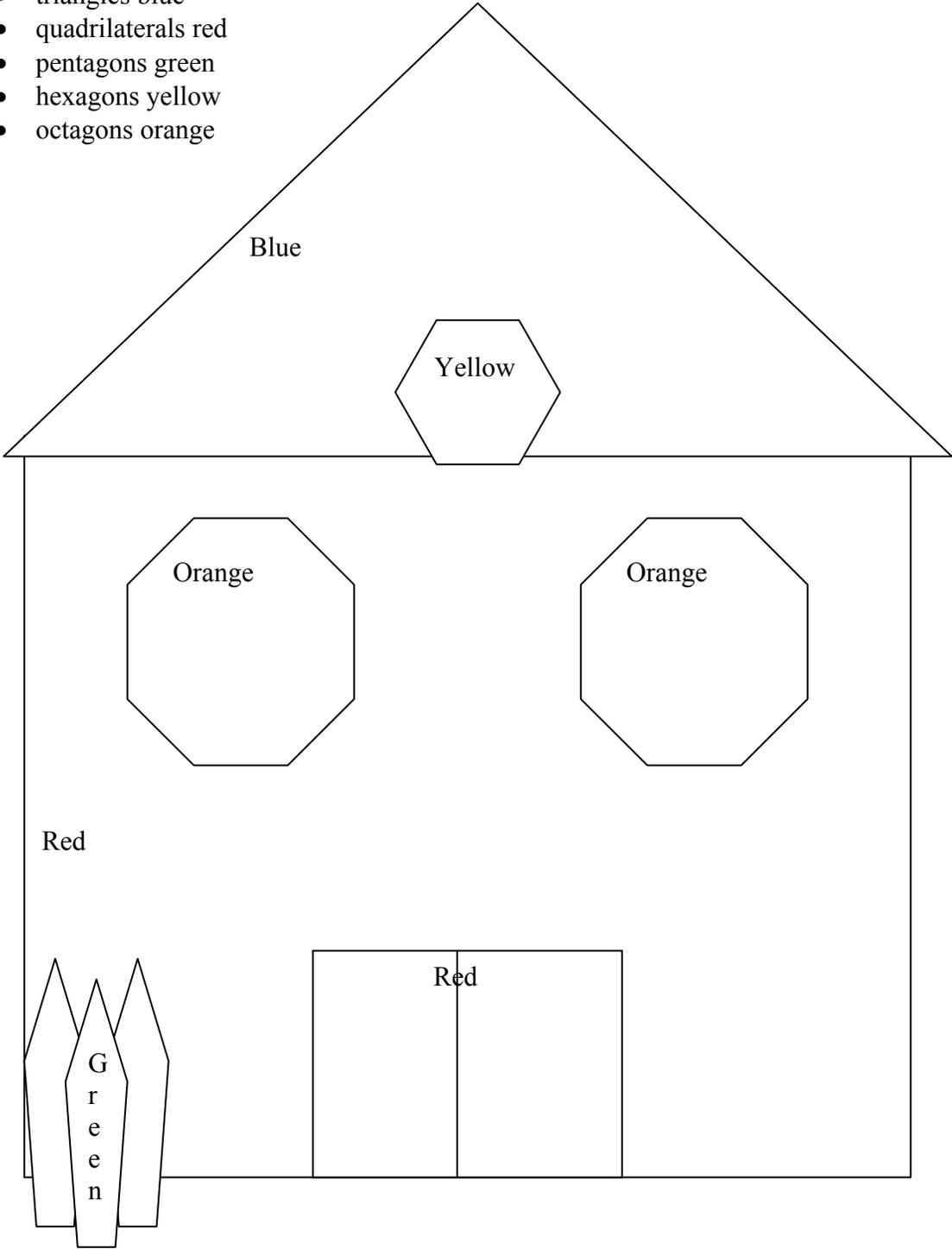


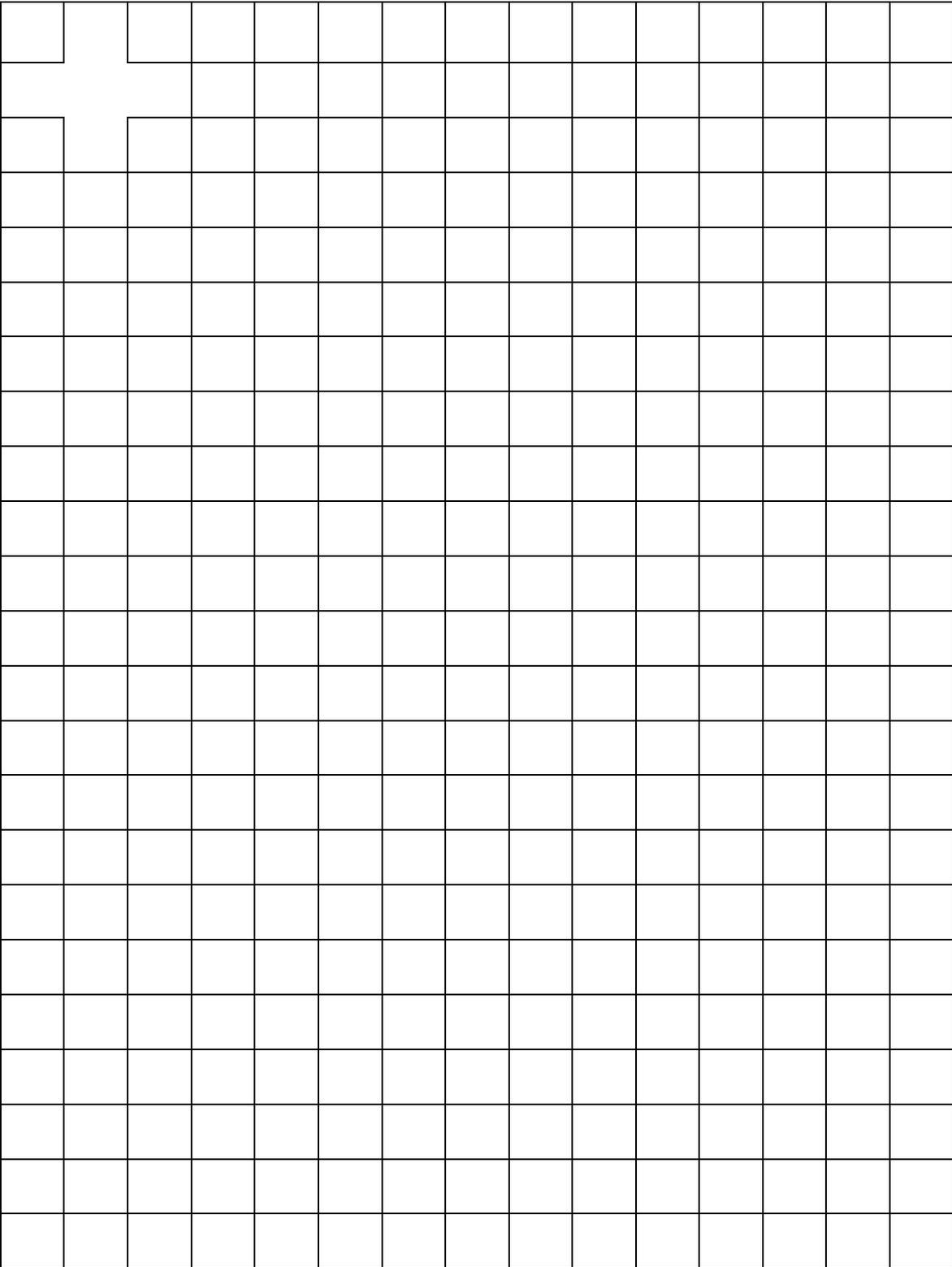
Name: \_\_\_\_\_

Date: \_\_\_\_\_

Directions: Color the following:

- triangles blue
- quadrilaterals red
- pentagons green
- hexagons yellow
- octagons orange





Name: \_\_\_\_\_

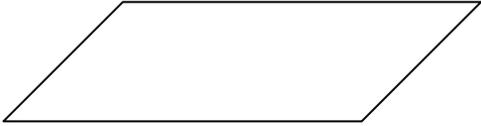
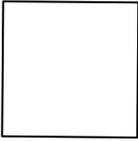
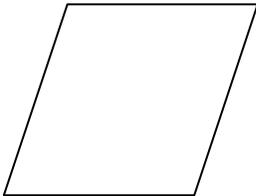
Date: \_\_\_\_\_

Directions: Match the word to the correct definition.

- |                  |    |  |
|------------------|----|--|
| 1. hexagon       | a. | an exact location  |
| 2. line segment  | b. | 4 sided polygon  |
| 3. point         | c. | part of a line with 2 endpoints                                      |
| 4. quadrilateral | d. | 8 sided polygon  |
| 5. line          | e. | a straight path that extends<br>forever in both directions           |
| 6. octagon       | f. | 5 sided polygon  |
| 7. ray           | g. | part of a line that extends in one<br>direction and has one endpoint |
| 8. triangle      | h. | 6 sided polygon  |
| 9. pentagon      | i. | 3 sided polygon  |

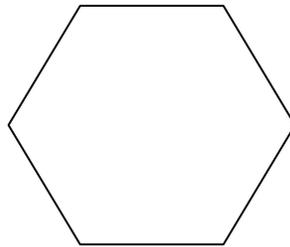
**Teacher Resource 9**

Directions: Identify the following quadrilaterals.

|   |               |
|---|---------------|
|    | rectangle     |
|    | trapezoid     |
|    | parallelogram |
|   | square        |
|  | rhombus       |

Brief Constructed Response  
Grade 3

Amy drew this polygon:



Step A:  
What is the name of Amy's polygon?

hexagon

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Step B:  
Explain why your answer is correct.  
Use what you know about polygons in your explanation.  
Use words and/or numbers in your explanation.

It is a polygon with six sides and six angles.

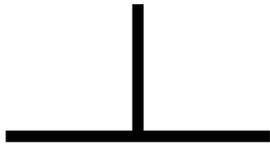
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## Student Resource 1

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Directions: Match the picture to its description.



These 2 lines meet to form a  $90^\circ$  angle.



These two lines cross over each other.



These 2 lines will never touch because they are equal distance apart.

## Student Resource 2

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Directions: Cut out the shapes. Sort the shapes into groups and glue on a separate piece of paper. Explain how you sorted your shapes.

Explanation: \_\_\_\_\_

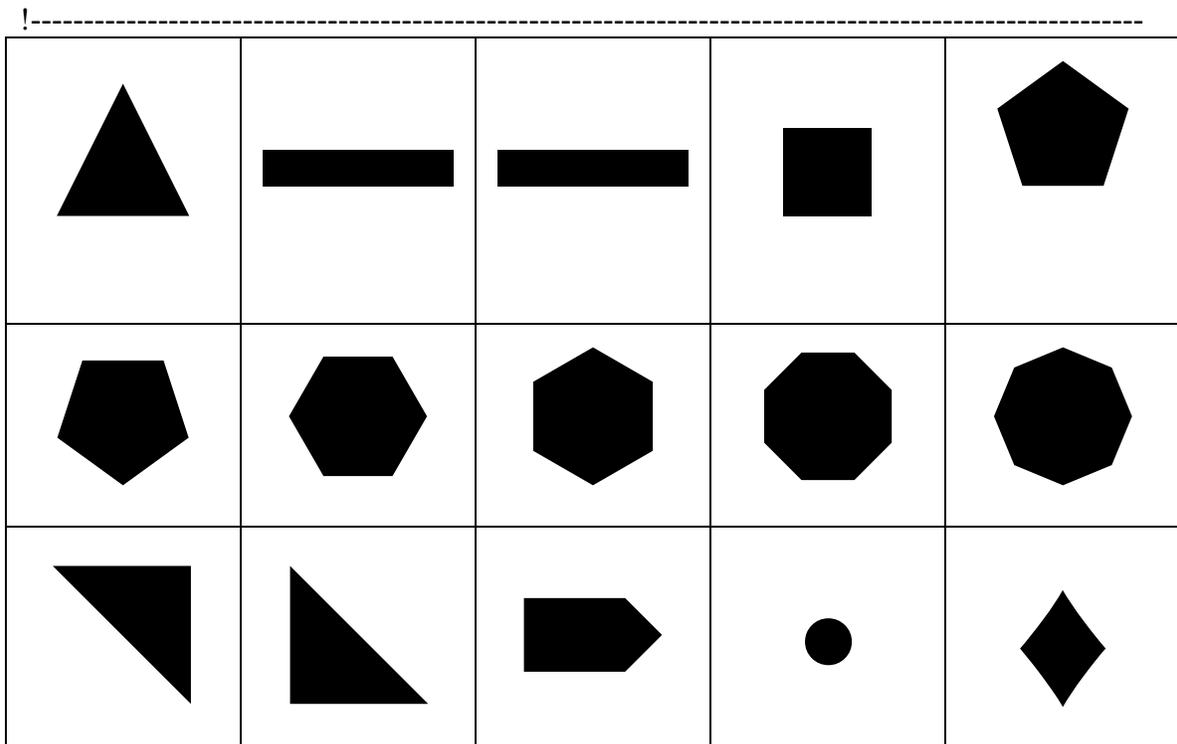
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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Directions: Look around your house. Find things in or around your home that are the following shapes. For example, your window has four sides. Therefore it is a quadrilateral. Find one example of each and then illustrate your findings.

**Triangle:**

**Quadrilateral:**

**Pentagon:**

**Hexagon:**

**Octagon:**

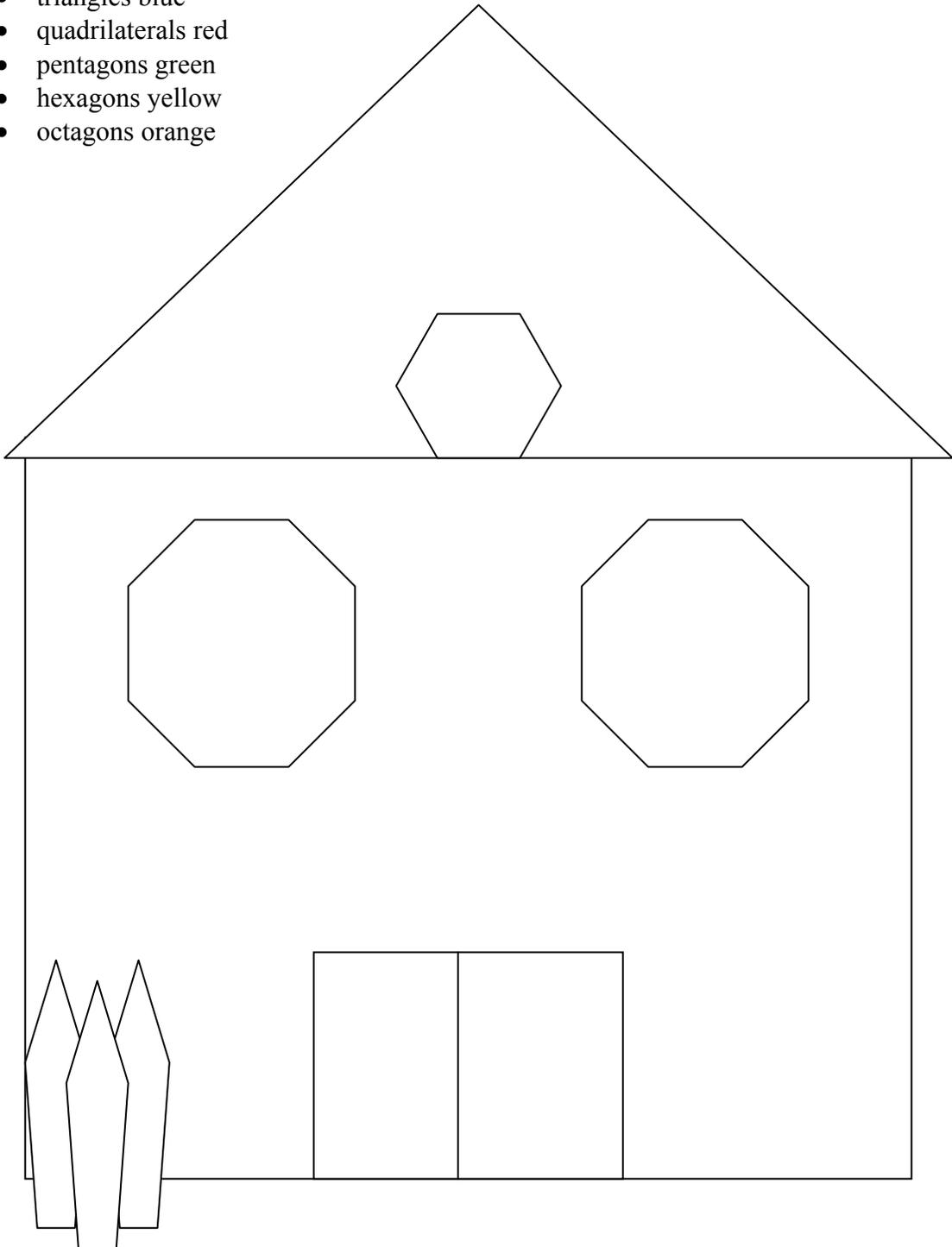
## Student Resource 4

Name: \_\_\_\_\_

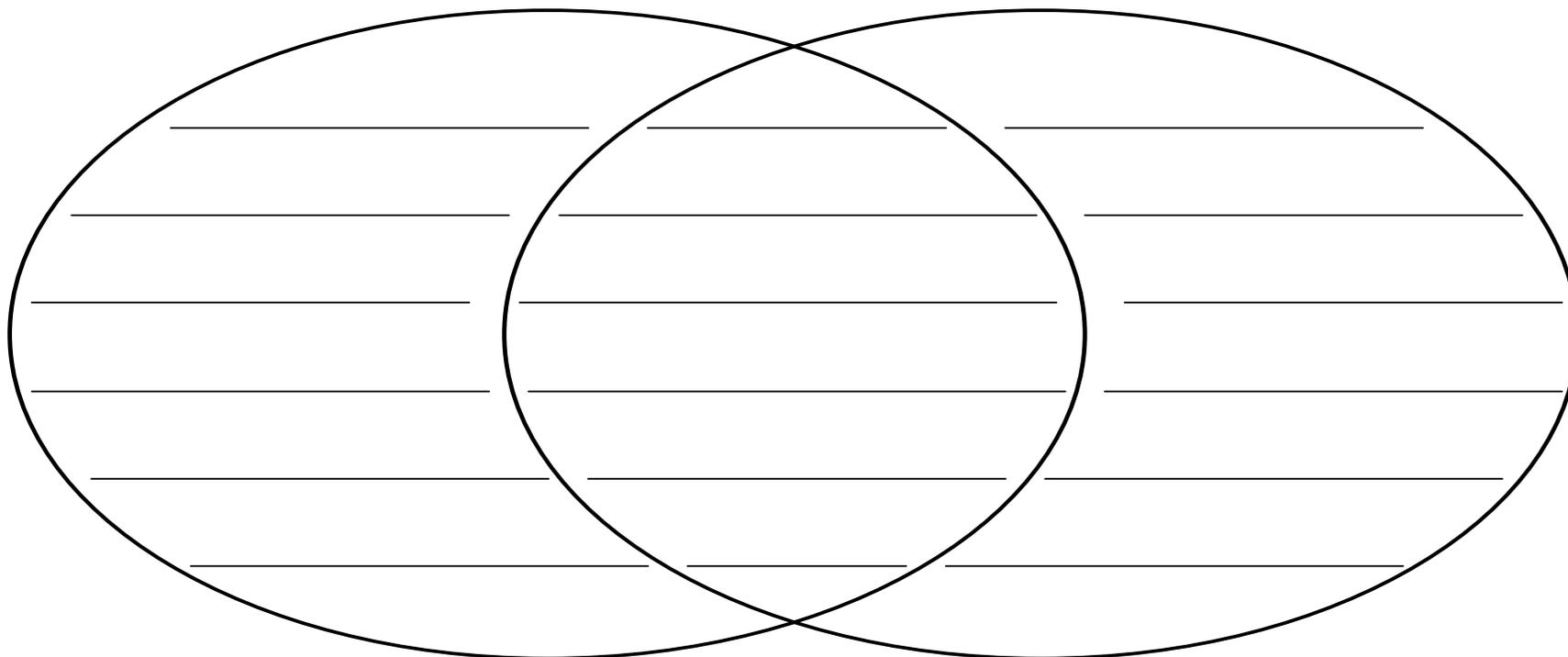
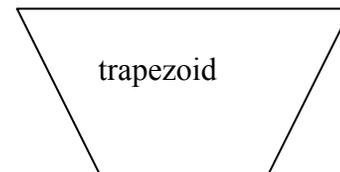
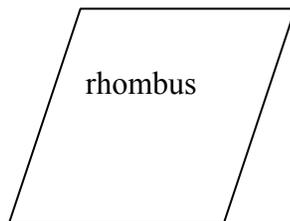
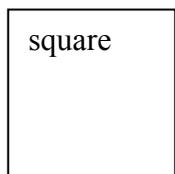
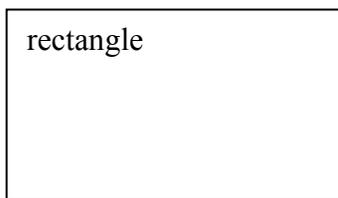
Date: \_\_\_\_\_

Directions: Color the following:

- triangles blue
- quadrilaterals red
- pentagons green
- hexagons yellow
- octagons orange



Directions: Choose two of the following shapes and compare.



## Student Resource 6

Name: \_\_\_\_\_

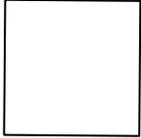
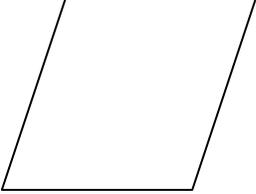
Date: \_\_\_\_\_

Directions: Match the word to the correct definition.

- |                  |   |
|------------------|---|
| 1. hexagon       | j. an exact location  |
| 2. line segment  | k. 4 sided polygon  |
| 3. point         | l. part of a line with 2 endpoints                                      |
| 4. quadrilateral | m. 8 sided polygon  |
| 5. line          | n. a straight path that extends<br>forever in both directions           |
| 6. octagon       | o. 5 sided polygon  |
| 7. ray           | p. part of a line that extends in one<br>direction and has one endpoint |
| 8. triangle      | q. 6 sided polygon  |
| 9. pentagon      | r. 3 sided polygon  |

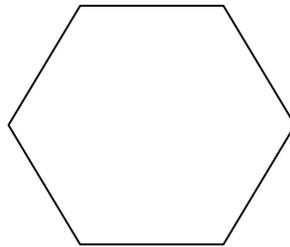
**Student Resource 7**

Directions: Identify the following quadrilaterals.

|   |  |
|---|--|
|    |  |
|    |  |
|    |  |
|  |  |
|  |  |

Brief Constructed Response  
Grade 3

Amy drew this polygon:



Step A:  
What is the name of Amy's polygon?

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Step B:  
Explain why your answer is correct.  
Use what you know about polygons in your explanation.  
Use words and/or numbers in your explanation.

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