

**Topic:** geometry

### Overview

In this geometry activity, students explore and discover the properties of 3 quadrilaterals- square, rhombus, and trapezoid. The shapes in this lesson are having an “identity crisis” and students must help the shapes understand themselves. Using a SmartBoard with an interactive website students analyze the components of each shape to identify each shape by its attributes. This interaction is designed to make each shape memorable so that students can transfer their knowledge when the shapes are slid, flipped, or turn from the original model. This lesson serves to augment the “Investigations 2: Triangles and Quadrilaterals” in the Picturing Polygons unit of the Investigations math series but is useful for any geometry unit for fifth grade.

### Grade 5

### Time Allotment

One or two 60-minute periods

### Learning Objectives

On completion of this lesson, students will be able to:

- Analyze a shape for its basic attributes of line and angle to identify it as a specific quadrilateral shape- square, rhombus, or trapezoid.
- Differentiate (compare/contrast) one shape from the other by looking for and identifying its attributes.
- Demonstrate by manipulating (sliding, flipping, and turning) that shapes retain their basic lines and angles even when they are turned, flipped, or slid.

This lesson addresses VA Math SOLs 5.15a and 5.15e.

### NCTM standards:

- Students identify, compare, and analyze attributes of two -dimensional shapes and develop vocabulary to describe these attributes.
- Students will predict and describe the results of sliding, flipping, and turning two dimensional shapes
- Students will describe the motions or series of motions that show that two shapes are congruent.

### Media Components:

- Computer with web access and SmartBoard software installed
- SmartBoard
- LCD projector
- Optional- set of laptops for the last learning activity and culminating activity- no more than 2 groups of paired students per laptop.
  
- Websites:

[http://ejad.best.vwh.net/java/patterns/patterns\\_i.shtml](http://ejad.best.vwh.net/java/patterns/patterns_i.shtml) Pattern block tool is available here. (This applet allows the user to place the shapes being analyzed on a geometric grid. **JAVA capability** needed to use this site. If unavailable the SmartBoard tools in the NoteBook application can be used to create the shapes needed for this lesson).  
<http://www.math.com/school/subject3/lessons/S3U2L3DP.html> or  
<http://www.math.com/school/subject3/lessons/S3U2L3GL.html> provides definitions and illustrations of the geometric shapes used in this lesson. Here students match their understanding with the mathematical definition of the particular shape. (Students can use the glossary in their math textbook if this site is unavailable.)

### Materials and Student Handouts

Per pair of students

- Polygon shapes or pattern blocks: rhombus, trapezoid, and square. 1 set for every pair (i.e. 12 sets of the 3 shapes for a class of 24).

Per student:

- Centimeter paper-2 sheets
- pencil
- Ruler
- Math journal (optional)

### Teacher Preparations

- Bookmark or PortaPortal websites for easy access on all computers being used.
- Duplicate shapes.

### Introductory Activity

Divide class in pairs. Give each pair a set of the 3 shapes and pass out the centimeter paper and rulers.

**Focus:** The three shapes that you were just given are having an ‘identity crisis’. They do not know what they are and are desperate to find out. Your job is to analyze your figures to find out what makes each one the shape it is and determine what makes your shape unique and different from the other two.”

**Activity:** I need a volunteer to come to the SmartBoard and drag the three shapes onto the grid. (Display the [http://ejad.best.vwh.net/java/patterns/patterns\\_i.shtml](http://ejad.best.vwh.net/java/patterns/patterns_i.shtml) website on the SmartBoard.) Make sure you give them plenty of room for proper analysis!

**Follow-up:** I want you to trace your figures on your centimeter paper. Place the top of each figure on a line and leave space all the way around each figure to give you plenty of room to draw and take notes.

### Learning Activities

1. **Focus:** Once you have drawn your figures label them A, B, C for easy identification as we go through the lesson. Make sure that our shapes have the same labels. (Mark the square A, the rhombus B, and the trapezoid C on the SmartBoard.)

**Activity:** Students label their shapes.

**Follow-up:** Make sure students have labeled the shapes the same as on the board.

2. **Focus:** With your pencil and using your ruler as a guide, draw a line on the top of each figure extending it beyond both edges. (Demonstrate the same using the SmartBoard pens) Do the same for the bottom lines for each. (Demonstrate).

**Activity:** Students mark their figures as you have described and modeled.

**Follow-up:** Look at what you've drawn. What do you notice? (All lines are parallel for each).

3. **Focus:** I need a volunteer to draw the lines for the sides on the SmartBoard while the rest of you do the same on your grid paper. (Child will come up and models the procedure on the board (for more challenged students you may need to do this yourself)

**Activity:** Each child draws the lines for the sides while you circulate again to make sure the class is doing the same.

**Follow-up:** What do you notice about each figure? Is there a difference? (The trapezoid-figure C-will not have parallel lines as the others do. Discuss this with the children and note next to figure C- SAY: Next to figure C write: one pair parallel lines: one pair intersecting lines on the SmartBoard next to the trapezoid. Have them do the same on their paper.)



4. **Focus:** Next, let's look at angles. (Draw arcs for all four angles within the shape A with the black electronic pen.) I need a volunteer to come up to the SmartBoard to do the same for the shape B and shape C. I want the rest of the class to mark the angles the same way.

**Activity:** Students make the arcs on their all three figures while you circulate to make sure all are doing what they are asked to do.

**Follow-up:** What do you notice about the angles? (Focus their attention to each arc and outline it to be clear students see what kind of angle they are seeing) Do this yourself on your figure or take your shape and draw each angle on the back of your paper to make it clear. Students will trace over the angles if not easily clear to them or draw them on the back of the centimeter paper by just tracing about a centimeter out from each vertex on each figure. Circulate and question to make sure each child can clearly see the right, obtuse, or acute angles that occur in the figures.

NOTE: Students should see that the square (figure A) has 4 right angles where the rhombus (figure B) and the trapezoid (figure C) have two obtuse and two acute angles.

5. **Focus:** We can now differentiate each shape from the others using lines and angles. What about the names? I need a volunteer come up and press on each shape on the left

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side of the grid to find out the names of each shape.

**Activity:** Have the students label the shapes as the child presses on the shape and the label appears.

**Follow-up:** Mark on your paper the name for each figure as they appear. (Circulate to make sure students label shape A square, shape B a rhombus, and shape C a trapezoid leaving room to write out the attributes beside each shape.) Now write out the attributes of each shape beside the shape. Notice and write that the square has 2 sets of parallel lines and has 4 right angles. Write it down. Notice that the rhombus has 2 sets of parallel lines and has one set of acute angles and 1 set of obtuse angles, Last, the trapezoid has 1 set of parallel lines, 1 set of intersecting lines, 1 set of obtuse angles and 1 set of acute angles. (Circulate to make sure this is being down.)

6. (Go to favorites on your computer that is hooked to the SmartBoard and open this site: <http://www.math.com/school/subject3/lessons/S3U2L3DP.html> or <http://www.math.com/school/subject3/lessons/S3U2L3GL.html> Scroll down to the definitions and picture display of each figure.)

**Focus:** Look at the figure display on this website that matches each of the figures we've drawn and look at the label and definition.

**Activity:** Check your definitions to the sites for accuracy. Now we can put an identity to our figures. Paste your centimeter paper in your math journal and title your page Quadrilateral Shapes- Square, Rhombus, and Trapezoid.

(Students paste their work in their math journal.)

**Follow-up:** (Turn off the LCD projector at this time and have the computer monitor face you so that no child can see the screen.) Now I want to see what you remember about what we have just done. (Hold up one of the pattern blocks students used to trace the figures from a student's desk. Ask what it is and what makes it what it is. Do this for each figure. Try to reach as many students as you can for this quick review.)

Congratulations! We have given these three shapes their identity and they no longer have an identity crisis! They know who they are and what makes them what they are!

## Culminating Activities

1. **Focus:** (Go back to [http://ejad.best.vwh.net/java/patterns/patterns\\_i.shtml](http://ejad.best.vwh.net/java/patterns/patterns_i.shtml).) Watch what happens as I move each figure and look to see if the figure changes as I move it. (Using the rotation tool on the website move each figure a little to the right, turn it, and rotate it on the SmartBoard.) Does the figure change if I move it around?

**Activity:** You trace the blocks at your desk the way we did in the last lesson. Then move them, turn, them, and rotate them just as I did on the screen and trace the moves you made. (Have students do this on the second sheet of centimeter paper.) When I move from side to side it's called a **slide**. When I turn it, that's called a **turn**. When I flip it over to reverse that's called a **flip**.

**Follow-up:** Label each movement you made and traced using the terms **flip, slide or turn**. (Check students' papers for accuracy.)

2. **Focus:** Can you see their attributes even if you move them? Do the angles change? Do the lines that were parallel become intersecting? No, they stay the same.

**Activity:** With partners, have each group come to the SmartBoard and move the figures as **slides**- move just to the side, **flips**-move the figure opposite to the original one, and **turns**- with the SmartBoard use the rotating tool. Ask each group individually the questions in the Follow-up to evaluate correct knowledge.

**Follow-up:** What do you notice? Do you see how the lines and angles are the same? They retain the same size and shape; therefore, they are congruent. (Most of your advanced or even average students would recognize this before you say it- give them the chance first.) While each team is going to the board, on the back of your centimeter sheet or on another centimeter paper, trace the shapes and trace a slide, a flip, and a turn. Label each one. (Collect these for assessment.)

**Alternative Activity:** If you have a set of laptops so that each group of 2 or 2 groups of 2 taking turns can work on the site. Have them do make additional rectangles, rhombi, and trapezoids turning, flipping, and sliding each figure. Circulate and ask them about the attributes, labels, and congruency.

### Assessment

- The teacher will circulate during each component of the lesson to monitor if students are applying the information. S/he should spot check to make sure that students are retaining the information they have analyzed by asking students what they know as they do the culminating activity.
- Use centimeter sheets for evaluation of the terms slide, flip, and turn.
- Evaluate student knowledge during pair activity at the SmartBoard.
- At the beginning of the next session, have a print out of the shapes with their definitions in front of you. Students will return to their pairs and be given the same shapes they had yesterday. Proceed to give definitions, then label (or mix them up) for each figure. Assess.
- As part of your unit test, have the 3 unlabeled shapes on your test. Direct each student to label the shape and justify why they have labeled it as such. (Points should be given for correct labels, line identification, and angle identification.)



### Community Connections

- Invite the families and community to come to the school at a Math Night and have volunteers from the class demonstrate their learning using the SmartBoard.

### Cross-Curricular Extensions

#### Language Arts

- Students can use the shapes to create poems about the shapes-using *line* and *angle* within the poem.
- Students could create shape poems using the shapes as a guide and writing about the shapes to form the pattern.

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- Creative writing of a story about the figure using line, angle, and label.
- Create metaphors as a comparison such as -a rhombus is a cock-eyed square. Then justify that connection.

**Science**

- Students can look through their science resources and textbooks to see if they can transfer the idea of these shapes to forms in nature.

**Physical Education**

- They can transform the 2 dimensional shapes into 3 dimensional shapes using their bodies to form lines and angles.

**Art**

- Pictures can be drawn incorporating the shapes as well as flips, slides, and turns.

**About the Author**

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