

## **Title: Identifying, Classifying, and Creating Quadrilaterals - Qualifying Quadrilaterals**

### **Brief Overview:**

Through problem solving, oral and written communication, higher-order thinking and a variety of manipulatives, students will identify, classify and create quadrilaterals according to their attributes.

### **NCTM Content Standard:**

#### Geometry

- The students should be able to analyze characteristics and properties of two dimensional geometric shapes and develop mathematical arguments about geometric relationships.
- The students should be able to use visualization, spatial reasoning, and geometric modeling to solve problems.

### **Grade/Level:**

Fourth – Fifth Grade.

### **Duration/Length:**

Three class periods. (60-90 minutes each).

### **Student Outcomes:**

Students will:

- Identify quadrilaterals by attributes.
- Distinguish quadrilaterals from non-quadrilaterals.
- Analyze quadrilaterals to identify specific members (square, rectangle, trapezoid, parallelogram and rhombus) of the group.

### **Materials and Resources:**

- Cardboard cut outs of various quadrilaterals.
- Paper lunch bags, one per group, containing several Pattern Blocks of each quadrilateral.
- One large piece of paper per student.
- Geoboard dot paper.
- Geoboards and one geoband per student.
- Quadrilateral Glossary Sheet
- Mystery Block (SR1)

- Round Table Activity (TR2)
- Building Geoboard Quadrilaterals Worksheet (SR4)
- Check for Understanding Teacher Sheet (TR3)
- Who Belongs?-Teacher Sheet (TR4)
- Tangram sets for each student
- One set of overhead tangrams
- Tangram Creation Sheet (SR5)
- Tangram Creation Answer Key (TR6)
- Building Geoboard Quadrilaterals Answer Key (TR7)
- Summative Assessment (SR6)
- Summative Assessment Rubric (TR8-10)

## **Development/Procedures:**

### **Lesson 1**

*Preassessment* – Draw examples of perpendicular and parallel lines on the board. Have students identify the lines as either perpendicular or parallel. Have them describe the lines. Make sure they use math terms such as 90 degrees to describe the perpendicular and parallel lines.

*Launch* – Give each team a set of 4 – 5 quadrilaterals cut out of cardboard (TR1). Have the students feel around the edges and then write down what they notice about each shape. For example, how many sides, how many corners, what kind of corners and lines. They should include ways their various shapes are alike and different. When all teams are finished have students report their findings to the class.

*Teacher Facilitation* – Record student generated properties of quadrilaterals on the board. Explain to students that they will be using the properties of quadrilaterals and their sense of feel to locate shapes. Hold a bag containing several of each kind of Pattern Block. Ask a child to reach into the bag, and, without looking, pick out a shape that is a quadrilateral and show it to the class. Invite another child to reach into the bag and pick out a different shape that is a quadrilateral and show it to the class. Ask the children to explain how they selected the shapes they picked. Discuss how the students used properties to identify the quadrilaterals.

*Student Application* – Divide students into teams of 3 – 4 members. Students will take turns reaching into their bag and picking out a block that fits the first description on the paper entitled, Mystery Block (SR1). Students will record the blocks that they choose from the bag that fit the description. They will then continue to take turns as they search for blocks that fit each of the other descriptions on the list. Be sure to return the blocks to the bag after each search.

*Embedded Assessment* – Give each pair of students two different cardboard quadrilaterals. Students should trace around each quadrilateral on a large piece of paper, and then write beside each outline the name of the shape and two or three complete sentences describing it.

*Reteaching/Extension –*

- For those who have not completely understood the lesson, the teacher will meet with them in a small group to discuss the shapes that were in the bag and reasons why they fit the descriptions.
- As an extension, have children work in small groups to write their own list of descriptions for blocks to be found by reaching into the bag. Have groups exchange lists and try to find all the blocks that fit each description.

## **Lesson 2**

*Preassessment –* Using the Round Table activity (TR2). Students will draw and label quadrilaterals from their prior knowledge.

*Launch –* Give each student a geoboard and geobands. Students will explore to make as many quadrilaterals as they can. Remind students of the properties of quadrilaterals that they generated the day before. Students should record the quadrilaterals that they find on geoboard paper (SR2).

*Teacher Facilitation –* Show a quadrilateral on the overhead geoboard. Ask students to identify the shape and describe the shape. Record student responses on the board. Have student volunteers create their previously designed quadrilaterals on the overhead. As a class, students will list characteristics of that particular quadrilateral and predict the name of the quadrilateral. Then using the Quadrilateral Glossary (SR3), students will check their predictions. Continue with further volunteers until many different quadrilaterals have been explored and identified.

*Student Application –* Give each student a copy of Building Geoboard Quadrilaterals (SR4). Students will create the quadrilaterals on the geoboards using the given instructions on the worksheet. Students should record the quadrilaterals on geoboard dot paper. Answers may be found on TR7a.

*Embedded Assessment –* Distribute two different color index cards to each student. Explain that one will symbolize a yes response and one will symbolize a no response. Using Lesson 2 Check for Understanding (TR3), ask each question and allow time for each student to display their answer by holding the card in the air after each question is posed.

*Reteaching/Extension –*

- For those who have not completely understood the lesson, review in small group with the teacher using the geoboards and the glossary.
- For those who have understood the lesson, allow students to pair and take turns verbalizing descriptions for their partner to create on the geoboard.

## **Lesson 3**

*Preassessment –* Perform Who Belongs activity (TR4) to assess students' understanding of quadrilateral properties and names.

*Launch* – Give each student a set of tangrams. Working in pairs, one student will create a design with all 7 tangrams and the partner will recreate that design. Roles will switch. Allow a few minutes for sharing of design strategies.

*Teacher Facilitation* – Teacher will model, using overhead tangrams, how to make 2 versions of the same quadrilateral using a different number of tangram pieces. Teacher will demonstrate how each named quadrilateral has particular attributes but may have more than one appearance.

*Student Application* – Give students the Tangrams Creation Sheet (SR5). Students will complete the sheet by drawing the pieces used to form each quadrilateral. Answers may be found on TR6.

*Embedded Assessment* – Discuss which quadrilaterals were able to be made and have students model their creations on the overhead.

*Reteaching/Extension* –

- For those who have not completely understood the lesson, they will be paired with someone who did to create the quadrilaterals that they could not.
- For those who have understood the lesson, they will be paired with those who did not. The student who understood will model how the quadrilateral can be created.

**Summative Assessment:**

The students will complete the Summative Assessment Activity (SR6). Answers may be found on TR8ae and TR9, and TR10. They will apply their knowledge of classifying quadrilaterals. They will be required to not only name quadrilaterals but to make comparisons between different quadrilaterals. Students will demonstrate their knowledge of classifying attributes and apply this knowledge in a compare/contrast activity.

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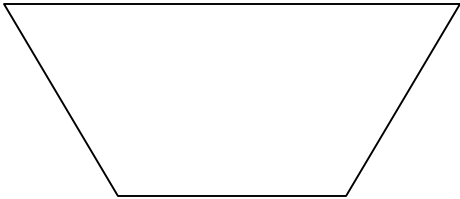
### Quadrilateral Patterns



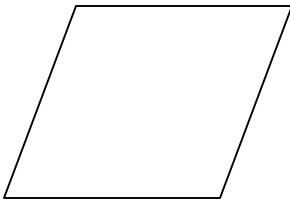
Square



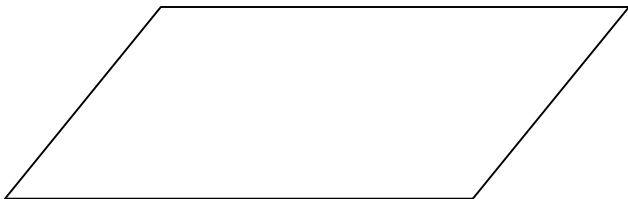
Rectangle



Trapezoid



Rhombus

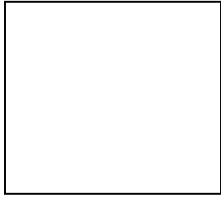


Parallelogram

### Round Table Activity

- This activity works best if students are sitting in groups of 3 or 4.
- Students each have a piece of paper and a pencil.
- Instruct students that they will be drawing and labeling quadrilaterals in a time controlled activity.
- Each student will draw a quadrilateral when the teacher tells the whole group to start.
- The quadrilateral should be labeled with its name.
- When the teacher announces switch (after approximately 1 minute), students will pass their paper to the left.
- Each student will create a **new** quadrilateral on the new paper passed to them. They will also label this drawing.
- After a minute, pass will be called again.
- If the student cannot draw a new quadrilateral, they should pass on the turn.
- Allow for about 5 switches.
- Have each table count the number of different quadrilaterals.
- As a whole group, discuss what each table drew and have them brainstorm what they might have missed.

Lesson 2 Check for Understanding



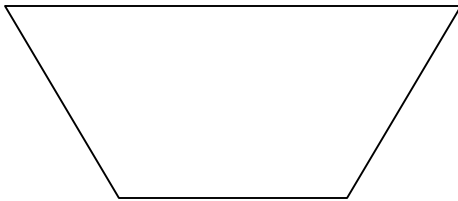
1. Is a square a quadrilateral with four equal parallel sides and with four right angles?

Students response = YES



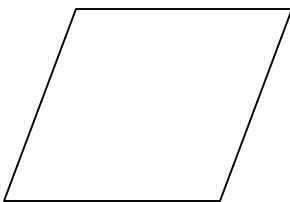
2. Is a rectangle a quadrilateral with two sets of equal parallel sides and four right angles?

Student response = NO



3. Is a trapezoid a quadrilateral with exactly one pair of parallel sides?

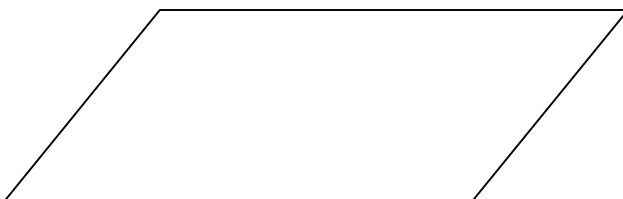
Student response = YES



4. Is a rhombus a quadrilateral with four equal sides and one set of parallel sides?

Student response = NO

5. Is a parallelogram a quadrilateral with two pairs of parallel sides?

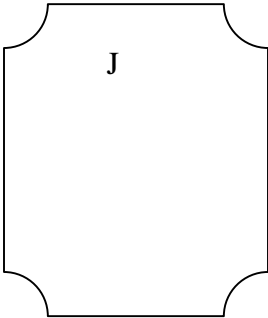
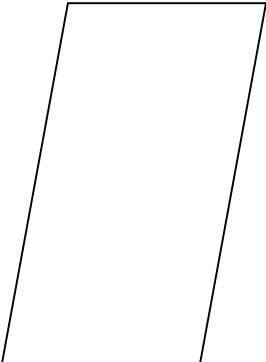
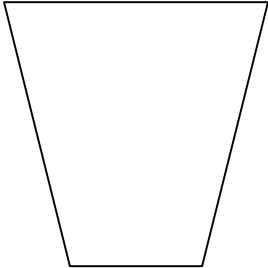
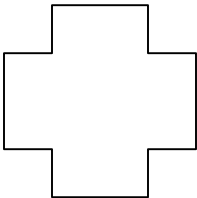
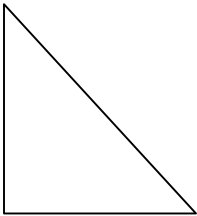
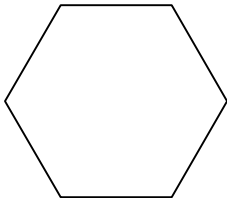
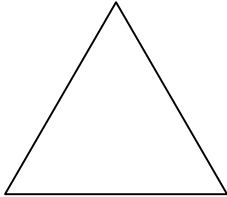
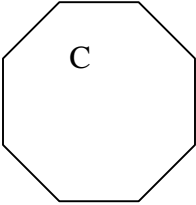
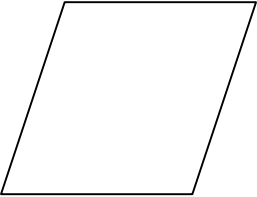
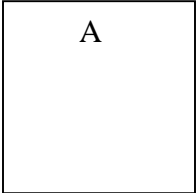


Student response = YES

### Who Belongs

- Teacher will distribute a set of paper polygons and one 12” piece of yarn or string to each student.
- Teacher will have an enlarged set of the same paper polygons.
- Students will be instructed to lay out all of the polygons.
- Students will be told to lay the yarn to divide their desk in half, vertically.
- The teacher will choose an attribute to classify quadrilaterals **without** telling the students. The students will find the qualifying attribute by finding other polygons that have that same attribute.
- Divide the board into two columns.
- The teacher will choose one shape that possess that attribute and display it on one column of the board. The students will put the teacher’s chosen shape in one column on their desk.
- Students will be instructed to find a polygon that belongs with the one displayed. Students will guess the letter of a polygon and the teacher will tell the class that it belongs with her or it does not.
- Teacher will either put the guessed polygon in the column with hers/his or in the other column.
- Students will correctly place the guessed polygon on their desk.
- Students will continue to guess which polygons belong with the chosen one until the rule has been guessed. Emphasize the explanation of the rule.
- This can be played again using a new polygon and new rule.





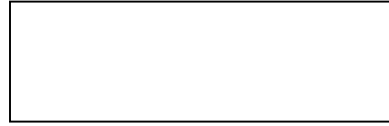
Summative Assessment

Selected Response

Choose the best answer for each question.

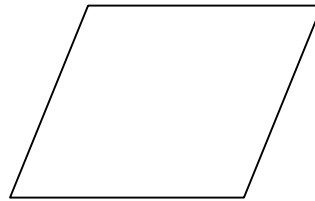
1. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



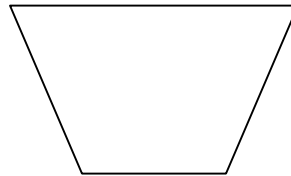
2. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



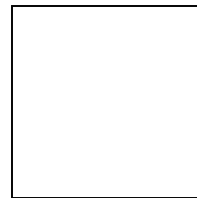
3. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



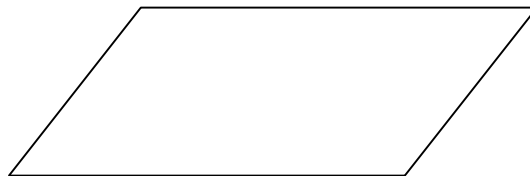
4. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus

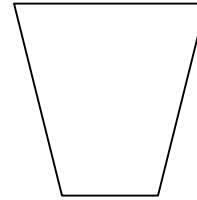


5. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



Brief Constructed Response



**PART A**

What is the name of this quadrilateral?

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**PART B**

Use what you know about quadrilaterals to explain why the name of your quadrilateral is correct. Use words and/or numbers in your explanation.

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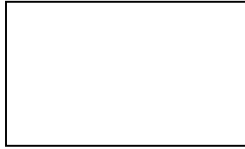
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Extended Constructed Response

**PART A**

Identify these two quadrilaterals.



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**PART B**

Use what you know about these two shapes to explain how you know they are quadrilaterals. Also explain all the ways these two shapes are alike or different. Use words and/or numbers in your explanation.

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## Mystery Block

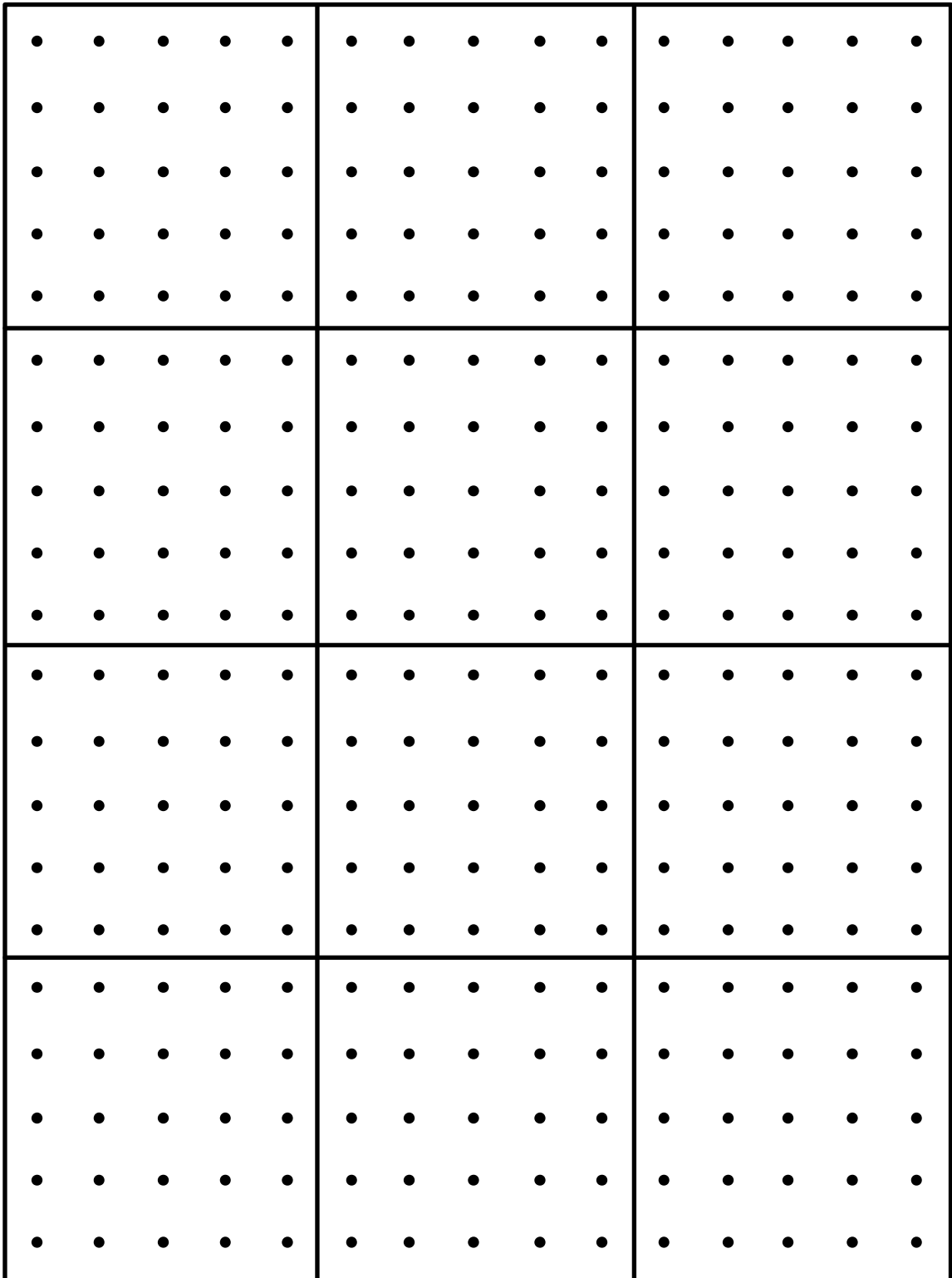
- Working with your partner, take turns pulling a pattern block out of the bag that fits the description below.
- Draw a picture of the block that matches the description.
- Use your sense of touch and what you know about attributes of quadrilaterals to find a block that fits all of the descriptions.
- You may not use your eyes!
- Sometimes there is only one block that fits each description, and sometimes there is more than one.

### Mystery Block Clues

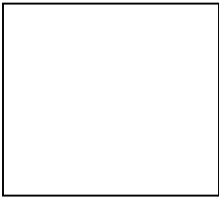
1. a block with only acute angles.
2. a block that has no right angles.
3. a block with only obtuse angles.
4. a block with 2 sets of parallel sides.
5. a block that has all equal sides.
6. a block with only 1 set of parallel sides.
7. a block with both acute and obtuse angles.

# Geoboard Dot Paper

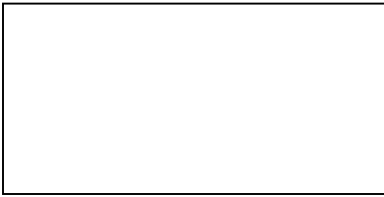
Student Resource Sheet #2



Quadrilateral Glossary



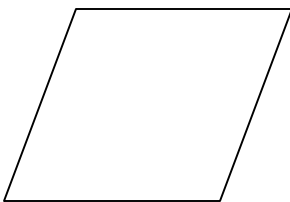
A square is a quadrilateral with four equal parallel sides and four right angles.



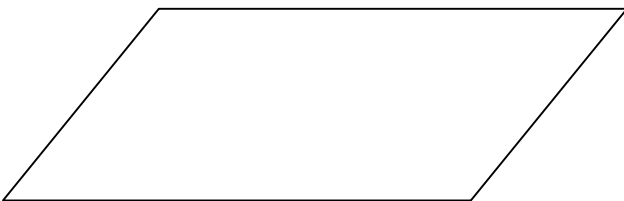
A rectangle is a quadrilateral with two sets of parallel sides and four right angles.



A trapezoid is a quadrilateral with exactly one pair of parallel sides.



A rhombus is a quadrilateral with four equal sides and two sets of parallel sides.

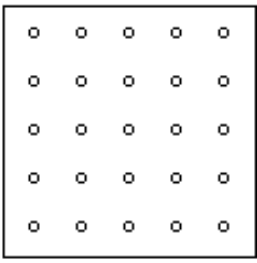


A parallelogram is a quadrilateral with two pairs of parallel sides. The opposite sides and angles are congruent.

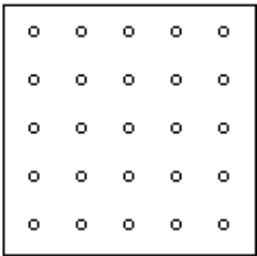
### Building Geoboard Quadrilaterals

Directions: Make a geoboard shape that fits the given conditions. You may use rulers to measure the sides of the shapes if you need to. Draw your geoboard shape on geoboard dot paper and identify it.

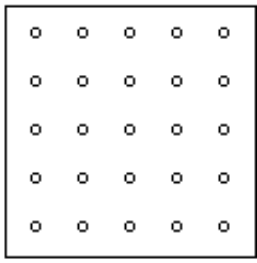
1. four sides; all sides equal; four right angles



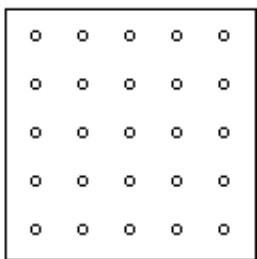
2. four sides; opposite sides equal; four right angles



3. four sides; opposite sides parallel; no right angles

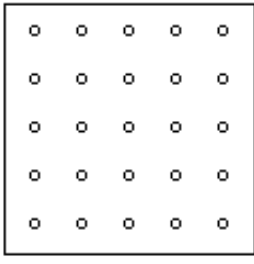


4. four sides; exactly two sides parallel

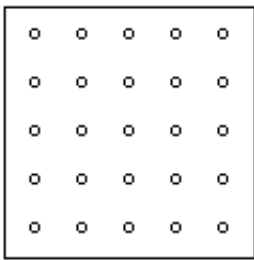




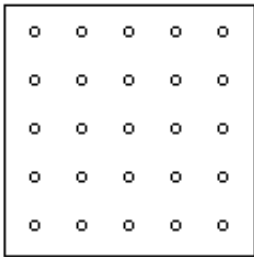
5. four sides; opposite sides equal; no sides perpendicular



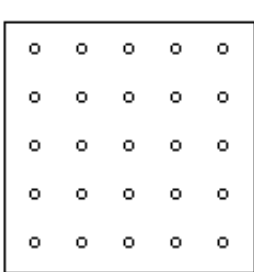
6. four sides; opposite sides parallel; adjacent sides perpendicular



7. four sides; all sides equal; no sides perpendicular



8. four sides; no sides parallel; no sides perpendicular



## Tangram Creation

Shape	Number of Tangram Pieces Used					
	2	3	4	5	6	7
Square						
Rectangle						
Trapezoid						
Rhombus						
Parallelogram						

## Tangram Creation

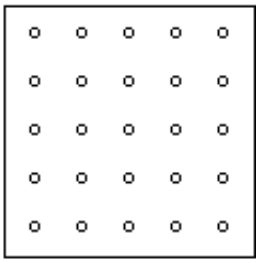
Shape	Number of Tangram Pieces Used					
	2	3	4	5	6	7
Square	2 large triangles or 2 small triangles	1 medium triangle and 2 small triangles.	1 large triangle, 2 small triangles, and 1 parallelogram, or 1 large triangle, 2 small triangles, or square..	May not be possible	May not be possible	All seven pieces.
Rectangle	May not be possible	2 small triangles and 1 square or 1 parallelogram and 2 small triangles.	2 small triangles, 1 parallelogram, 1 square.	2 large triangles, 2 small triangles and 1 parallelogram.	May not be possible	May not be possible
Trapezoid	1 parallelogram and 1 medium triangle.	1 small triangle, 1 parallelogram, and 1 medium triangle.	May not be possible	May not be possible	May not be possible	May not be possible
Rhombus	May not be possible	May not be possible	May not be possible	May not be possible	May not be possible	May not be possible
Parallelogram	2 large triangles or 2 small triangles.	1 parallelogram and 2 small triangles.	May not be possible	May not be possible	May not be possible	May not be possible

Building Geoboard Quadrilaterals

Directions: Make a geoboard shape that fits the given conditions. You may use rulers to measure the sides of the shapes if you need to. Draw your geoboard shape on geoboard dot paper and identify it.

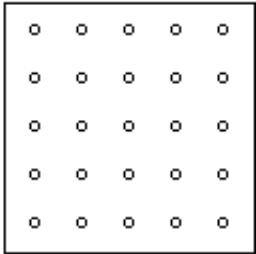
9. four sides; all sides equal; four right angles

Answer: Square



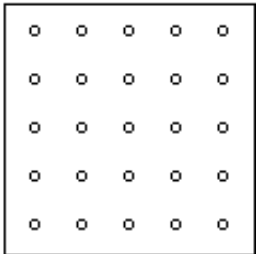
10. four sides; opposite sides equal; four right angles

Answer: Rectangle



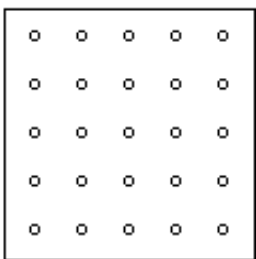
11. four sides; opposite sides parallel; no right angles

Answer: Rhombus

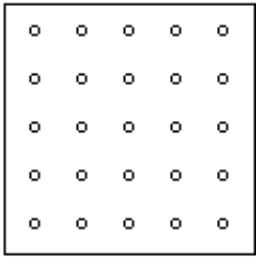


12. four sides; exactly two sides parallel

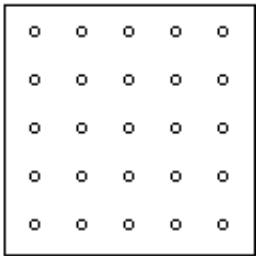
Answer: Trapezoid



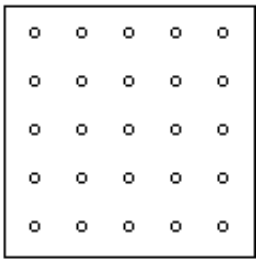
13. four sides; opposite sides equal; no sides perpendicular      Answer: Rhombus



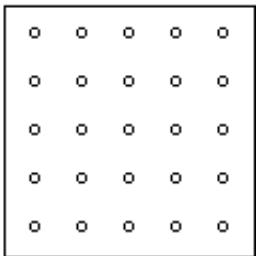
14. four sides; opposite sides parallel; adjacent sides perpendicular  
Answer: Rectangle or Square



15. four sides; all sides equal; no sides perpendicular      Answer: Rhombus



16. four sides; no sides parallel; no sides perpendicular      Answer: will vary.



Summative Assessment Answer Key

Selected Response

Choose the best answer for each question.

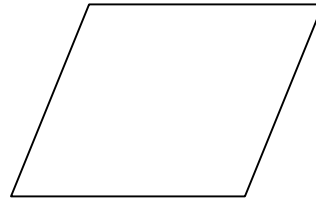
6. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



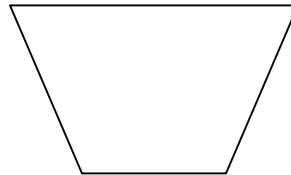
7. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



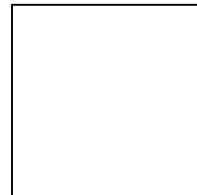
8. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



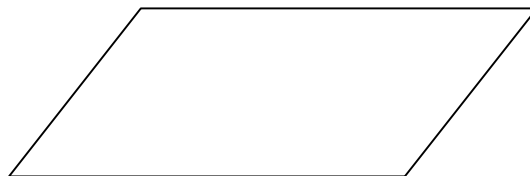
9. What is the name of this quadrilateral?

- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



10. What is the name of this quadrilateral?

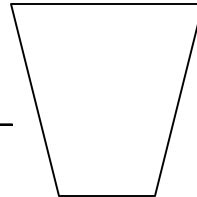
- a. Square
- b. Rectangle
- c. Trapezoid
- d. Parallelogram
- e. Rhombus



Brief Constructed Response: **EXAMPLE OF A HIGH QUALITY RESPONSE**

PART A

What is the name of this quadrilateral?



TRAPEZOID

PART B

Use what you know about quadrilaterals to explain why the name of your quadrilateral is correct. Use words and/or numbers in your explanation.

I know that a trapezoid has four sides. Only two of those sides are parallel. There are no right angles.

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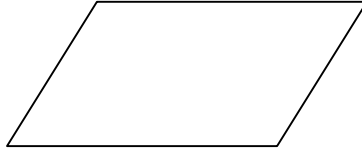
Extended Constructed Response: **EXAMPLE OF A HIGH QUALITY RESPONSE**

PART A

Identify these two quadrilaterals.



RECTANGLE



PARALLELOGRAM

PART B

Use what you know about these two shapes to explain how you know they are quadrilaterals. Also explain all the ways these two shapes are alike or different. Use words and/or numbers in your explanation.

I know that the rectangle and parallelogram are quadrilaterals because quadrilaterals  
have four sides.

These two shapes are alike because they have two sets of parallel sides, and opposite  
sides are equal. They are different because the rectangle has four right angles and the  
parallelogram had two obtuse and two acute angles.



## MSA Mathematics BCR Rubric Grades 3 through 8

### 2 The response demonstrates a complete understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation<sup>1</sup> of and/or justification<sup>2</sup> for the mathematical process(es) used to solve a problem is clear, developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear.
- Supportive information and/or numbers are provided as appropriate.<sup>3</sup>

### 1 The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation<sup>1</sup> of and/or justification<sup>2</sup> for the mathematical process(es) used to solve a problem is partially developed, logically flawed, or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or flawed.
- Supportive information and/or numbers may or may not be provided as appropriate.<sup>3</sup>

### 0 The response is completely incorrect, irrelevant to the problem, or missing.<sup>4</sup>

#### Notes:

<sup>1</sup> **Explanation** refers to students' ability to communicate **how** they arrived at the solution for an item using the language of mathematics.

<sup>2</sup> **Justification** refers to students' ability to support the reasoning used to solve a problem, or to demonstrate **why** the solution is correct using mathematical concepts and principles.

<sup>3</sup> Students need to complete rubric criteria for **explanation, justification, connections** and/or **explanation** as cued for in a given problem.

<sup>4</sup> An exact copy or paraphrase of the problem that provides no new relevant information will receive a score of "0".

## MSA Mathematics ECR Rubric Grades 5 through 8

### 3 The response demonstrates a comprehensive understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation<sup>1</sup> of and/or justification<sup>2</sup> for the mathematical process(es) used to solve a problem is clear, fully developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear and stated explicitly.
- Supportive information and/or numbers are provided as appropriate.<sup>3</sup>

### 2 The response demonstrates a general understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation<sup>1</sup> of and/or justification<sup>2</sup> for the mathematical process(es) used to solve a problem is feasible, but may be only partially developed.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or may be implied.
- Supportive information and/or numbers are provided as appropriate.<sup>3</sup>

### 1 The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation<sup>1</sup> of and/or justification<sup>2</sup> for the mathematical process(es) used to solve a problem is logically flawed or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are flawed or missing.
- Supportive information and/or numbers may or may not be provided as appropriate.<sup>3</sup>

### 0 The response is completely incorrect, irrelevant to the problem, or missing.<sup>4</sup>

#### Notes:

<sup>1</sup> **Explanation** refers to students' ability to communicate **how** they arrived at the solution for an item using the language of mathematics.

<sup>2</sup> **Justification** refers to students' ability to support the reasoning used to solve a problem, or to demonstrate **why** the solution is correct using mathematical concepts and principles.

<sup>3</sup> Students need to complete rubric criteria for **explanation, justification, connections** and/or **explanation** as cued for in a given problem.

<sup>4</sup> An exact copy or paraphrase of the problem that provides no new relevant information will receive a score of "0".