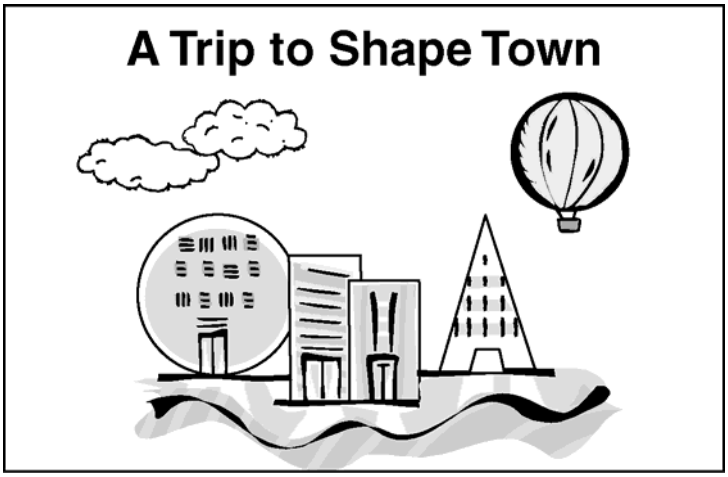
SITES-M Mathematics Challenge



Level: Kindergarten

Standard: Geometry and Measurement

Learning Target: Focus on Shapes

Checks for Understanding

0006.4.1	Identify, name, and describe a variety of shapes (i.e. circles, squares, triangles, rectangles, hexagons, trapezoids) shown in various positions.
0006.4.3	Sort plane figures into groups, name and describe the attributes of the shapes (such as number of sides and corners).

SITES-M Mathematics Challenge

Grade K–Focus on Shapes
A Trip to Shape Town

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. Each Challenge includes a set of tasks that require higher-order thinking skills. Because these types of tasks may be new for students and they will have varying levels of understanding, the student responses will vary. The Challenges and guiding questions were designed to help teachers plan their implementation and elicit, analyze, and act on evidence of student understanding.

You will be able to choose which Mathematics Challenge Packet to implement each month, according to the learning needs of your students and your teaching context. Each packet contains all the materials necessary to implement the Mathematics Challenge including a grade-appropriate Challenge, the Mathematics Challenge Meeting Protocol, and the Guiding Questions for Analyzing Student Responses to Mathematics Challenges.

For each Challenge, you will complete a six step process of planning, implementation, and analysis and reflection.

The Mathematics Challenge Process

Stage	Step	Task
Planning	Step 1.	Review the Mathematics Challenge Meeting Protocol
	Step 2.	Review and solve the Mathematics Challenge prior to your Professional Learning Community (PLC) meeting. Think about your responses to the guiding questions on the Meeting Protocol
	Step 3.	Hold your PLC meeting and discuss your responses to the Guiding Questions on the Meeting Protocol
Implementation	Step 4.	Implement the Mathematics Challenge with your class
Analysis and Reflection	Step 5.	For your own planning and documentation, respond to the Guiding Questions on the Analyzing Student Responses Protocol
	Step 6.	To help us improve the Challenges and to provide recommendations for teachers implementing them in future years, complete the Mathematics Challenge Feedback Log and provide copies of all student work to the Assessment Coordinator

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.
TSM40017

SITES-M Mathematics Challenge

Grade K–Focus on Shapes
A Trip to Shape Town

Mathematics Challenge Meeting Protocol

Each month, your Professional Learning Community will meet to discuss the implementation of one Mathematics Challenge. In preparation for your monthly meeting, please print and review this month's Mathematics Challenge, solve all tasks within the Challenge, and think about the guiding questions below. These questions will be used to facilitate a group discussion regarding the implementation of the upcoming Mathematics Challenge.

Guiding Questions for Implementing the Mathematics Challenges

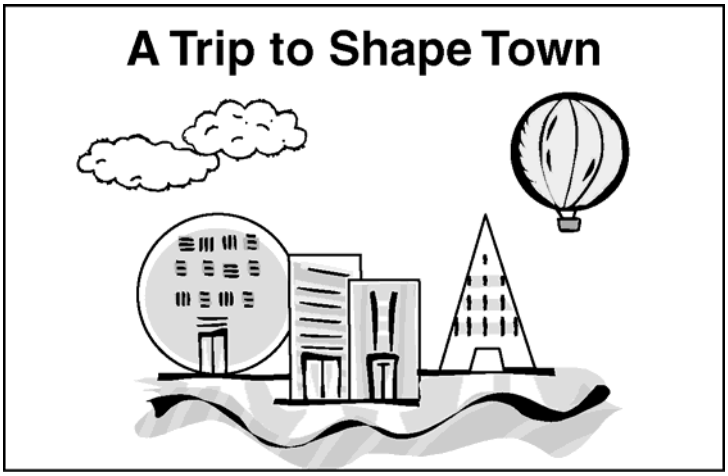
1. What is the title of the Challenge that you will use this month?
2. What skills or standards is this Challenge measuring?
3. Where does this Challenge fit within your curriculum? Within which unit?
4. At what point during the unit will you administer this Challenge (e.g., At the beginning of a unit to determine what students do or do not know, at the end of a unit to assess what students have or have not learned, in the middle of a unit to determine where to go next instructionally)?
5. How will your students complete this Challenge (e.g., individually, one-on-one, in small groups, as a class)? Why?
6. Are there any prerequisite skills, common misunderstandings, or vocabulary needs that you will have to address? What are they?
7. What difficulties do you anticipate your students will have with the Challenge? How will you address them?
8. Are these skills and difficulties different for special needs students, ELL students, etc.? How? Will you do anything different for these students? What?
9. How will you evaluate student responses (e.g., grade responses with the provided rubric, scan responses to identify common mistakes/misconceptions, have students evaluate one another's responses, have students evaluate their own response)?
10. What will student responses to this Challenge tell you about student understanding?
11. How might you use this evidence of student understanding to adapt your teaching and learning?
12. What other materials, resources, or support might you need? Where can you get them?
13. How can your colleagues assist you in the analysis of student understanding?
14. What other questions or concerns do you have about this Mathematics Challenge?

After you have implemented the challenge with your class, be sure to respond to the Guiding Questions on the Analyzing Student Responses Protocol.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.
TSM40017

SITES-M Mathematics Challenge

Grade K–Focus on Shapes



Standard: Geometry and Measurement

Learning Target: Focus on Shapes

Claims:
Students should understand and be able to explain or demonstrate how to:

- ✓ Identify, name, and describe a variety of shapes (i.e. circles, squares, triangles, rectangles, hexagons, trapezoids) shown in various positions;
- ✓ Sort plane figures into groups, name and describe the attributes of the shapes (such as number of sides and corners).

Task Preparation:
Each student will need a copy of the Student Response Sheet, a pencil, and red, blue, and green crayons.

Stimulus Cards (Drawing or Word Description):
None

Manipulatives/Supplies:
Pencils; red, blue, and green crayons

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

Grade K–Focus on Shapes

Cues/Directions:

Distribute student response sheets. If a student is unable to respond in writing, a scribe may be appointed or verbal answers may be accepted, but these responses will need to be documented for scoring. Students should be directed to look carefully at each figure. Allow students time to answer.

1. Instruct students to follow along as you read aloud and say: **Below are some of the shapes found in Shape Town. (TEACHER NOTE:** Have students look at the shapes. You may want to give students the opportunity to make observations about the shapes. **) Color all the circles green. (TEACHER NOTE:** You may give the coloring instructions one at a time or all at once. Students should color the 3 circles green.**) Color all the triangles red. (TEACHER NOTE:** Students should color the 4 triangles red.**) Color all the squares blue. (TEACHER NOTE:** Students should color the 3 squares blue.**) Circle one shape that you did not color. Describe that shape. (TEACHER NOTE:** On page 1, students should circle one shape that they did not color. In the box on page 2, students should describe the shape that they circled.**)**

2. **Here is the Mayor of Shape Town. (TEACHER NOTE:** Have students look at the mayor. You may want to give students the opportunity to make observations about the mayor. **) Check one shape that goes with each part of the mayor. His nose is already checked. (TEACHER NOTE:** Students should put one check in each row of the table. Other ways of marking the correct boxes are permitted.**)**

3. **Here are some signs found in Shape Town. (TEACHER NOTE:** Have students look at the signs and shapes. You may want to give students the opportunity to make observations about the signs and shapes. **) Draw a line from the sign to the shape of the sign. (TEACHER NOTE:** Students should draw lines from each sign to its corresponding shape. You may want to alert students to the fact that not all shapes on the right will be used.**)**

4. **Fill in the table. (TEACHER NOTE:** You may want to go over the row for Shape A with the students since it has already been done. Students should write the name of each shape if they know it, and then write the number of sides and corners of each shape.**)**

5. **Look at your table. (TEACHER NOTE:** Have students look at the table on page 5.**) How are shape C and shape D alike? (TEACHER NOTE:** Students should write their descriptions in the box.**) How are shape C and shape D different? (TEACHER NOTE:** Students should write their descriptions in the box.**)**

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

6. **(TEACHER NOTE:** This task may be a stretch for some students. If you feel it is beyond the scope of your class, you may omit it, use it as enrichment, or use it as a whole-class or small-group activity.**)**

   Look at your table. (TEACHER NOTE: Have students look at the table on page 5.**) What other shape in the table is like shape C and shape D? (TEACHER NOTE:** Students should write letter of the correct shape on the line.**) How is it like them? (TEACHER NOTE:** Students should write their descriptions in the box.**)**

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.
TSM40017

SITES-M Mathematics Challenge

Grade K–Focus on Shapes

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.
TSM40017

SITES-M Mathematics Challenge

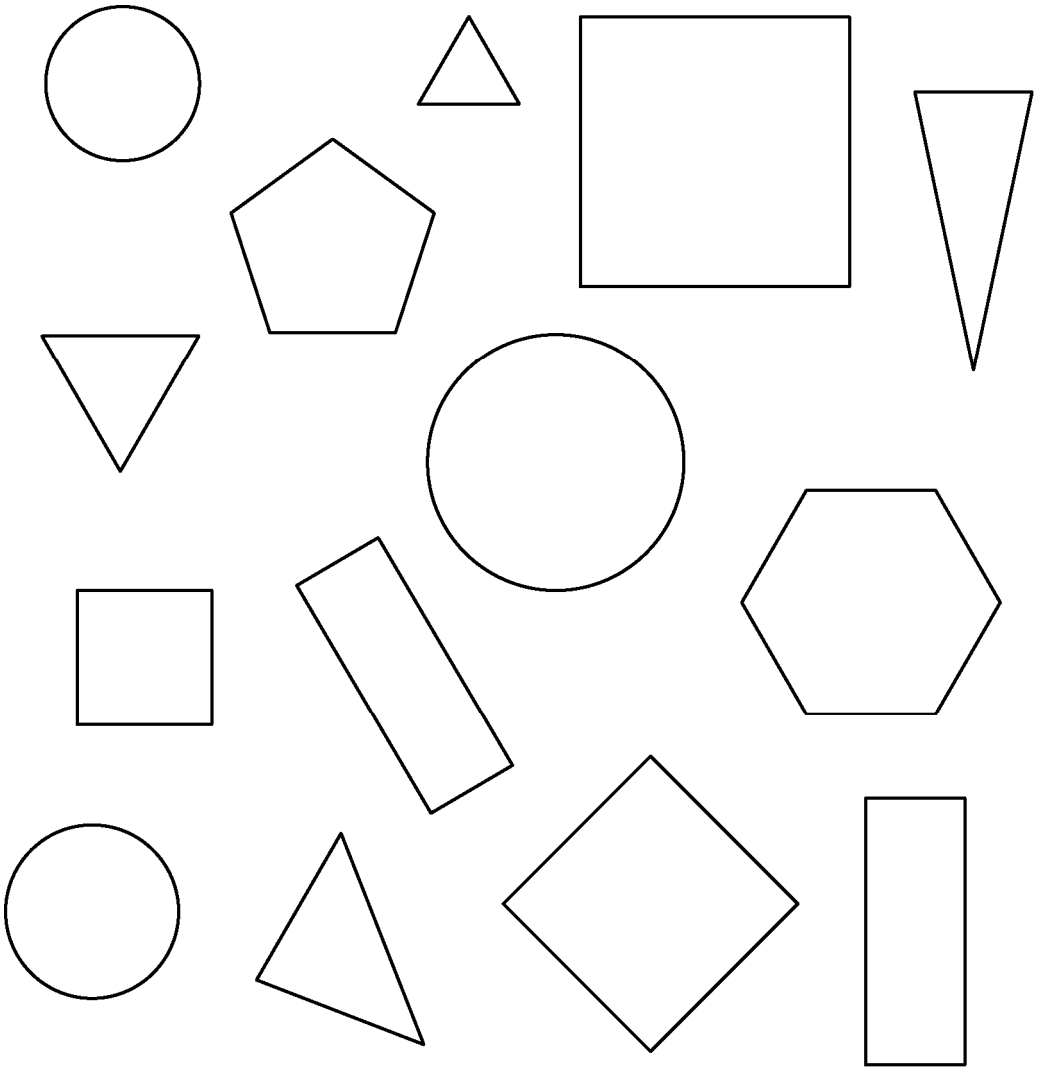
Grade K–Focus on Shapes

Student Response Sheet

A Trip to Shape Town

Name: _____ **Date:** _____

1. Below are some of the shapes found in Shape Town.



© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

a. Color all the circles green.

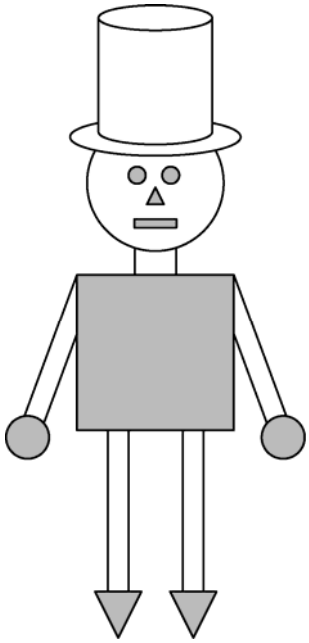
b. Color all the triangles red.

c. Color all the squares blue.

d. Circle one shape that you did not color. Describe that shape.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

2. Here is the Mayor of Shape Town.



Check one shape that goes with each part of the mayor. His nose is already checked.

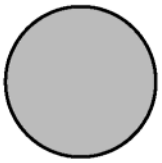
Parts of the Mayor	Circle	Rectangle	Square	Triangle
Nose				✓
Eyes				
Mouth				
Body				
Hands				
Legs				
Feet				

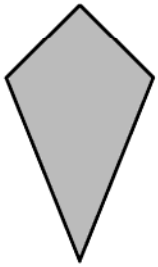
© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

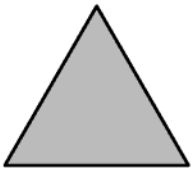
3. Here are some signs found in Shape Town. Draw a line from the sign to the shape of the sign.

Sign

Shape







© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

4. Fill in the table.

Shape	Name of Shape	Number of Sides	Number of Corners
A	Trapezoid	4	4
B			
C			
D			
E			

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

5. Look at your table.

How are shape C and shape D alike?

How are shape C and shape D different?

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

6. Look at your table. What other shape in the table is like shape C and shape D?

_____

How is it like them?

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

Learning and Teaching Considerations

Task 1:

A) Be sure that students are able to identify (by correctly coloring) all of the circles, triangles and squares. Be sure that students are able to identify (by circling) one shape that is not like the others.

B) If a student says or writes, "I just know," prompt him or her by saying something like "I'm glad you know, but it's important in math to be able to explain your answers so other people can understand what you're thinking."

C) If a student says or writes, "I don't know," say something positive like "Let's start with what you do know about this problem." Students often know more than they think or say, and encouraging them to vocalize or write about that knowledge is all they need.

D) Students may describe the number of sides, number of corners, or lengths of sides. Students may answer in words, in pictures, or by using manipulatives.

E) Students may identify shapes but may not find all of them.

Task 2:

A) Be sure that students are able to identify all of the shapes in the mayor.

B) Students may recognize the square as a rectangle and therefore check off rectangle for body, which is correct by definition. Definitions of a rectangle vary, but the square is always a type of rectangle. For example, a rectangle can be considered a quadrilateral with two pairs of parallel sides and all right angles or a quadrilateral with opposite sides equal and four right angles.

C) Students may have the misconception that **all** rectangles are squares and therefore check off square for the mouth.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

Task 3:

A) Be sure that students are able to match each sign with the correct shape.

B) The teacher could encourage students to explore items in the classroom that form a circle, square, triangle, and rectangle or manipulatives such as pattern blocks to discuss properties of the shapes.

C) Students may have the misconception that the circle is the same as the oval. The teacher could ask questions that encourage the students to discuss the similarities and differences.

Task 4:

A) Be sure that students are able to name each shape along with its respective number of sides and corners.

B) Students may have the misconception that shape D is a square. Students may have the misconception that **all** rectangles are squares, which is not true. Some rectangles are squares. The teacher could ask questions that encourage the students to discuss the similarities, differences, and definitions of a square and rectangle.

C) Students may recognize the square as a rectangle and write rectangle for shape C, which is correct by definition. Definitions of a rectangle vary, but the square is always a type of rectangle. A rectangle can be considered a quadrilateral with two pairs of parallel sides and all right angles or a quadrilateral with opposite sides equal and four right angles.

Task 5:

A) Be sure that students are able to recognize similarities and differences in characteristics, such as number of sides, number of corners, and/or side lengths.

B) Students may answer in words, in pictures, or by using manipulatives.

Task 6:

A) Students should be able to recognize that shape A also has four sides and four corners.

B) Students may say that shape B is like shape C and shape D because it has equal sides like shape C.

C) The teacher could encourage students to explore items in the classroom that form a square, triangle, trapezoid, hexagon, and rectangle or manipulatives such as pattern blocks to discuss properties of the shapes.

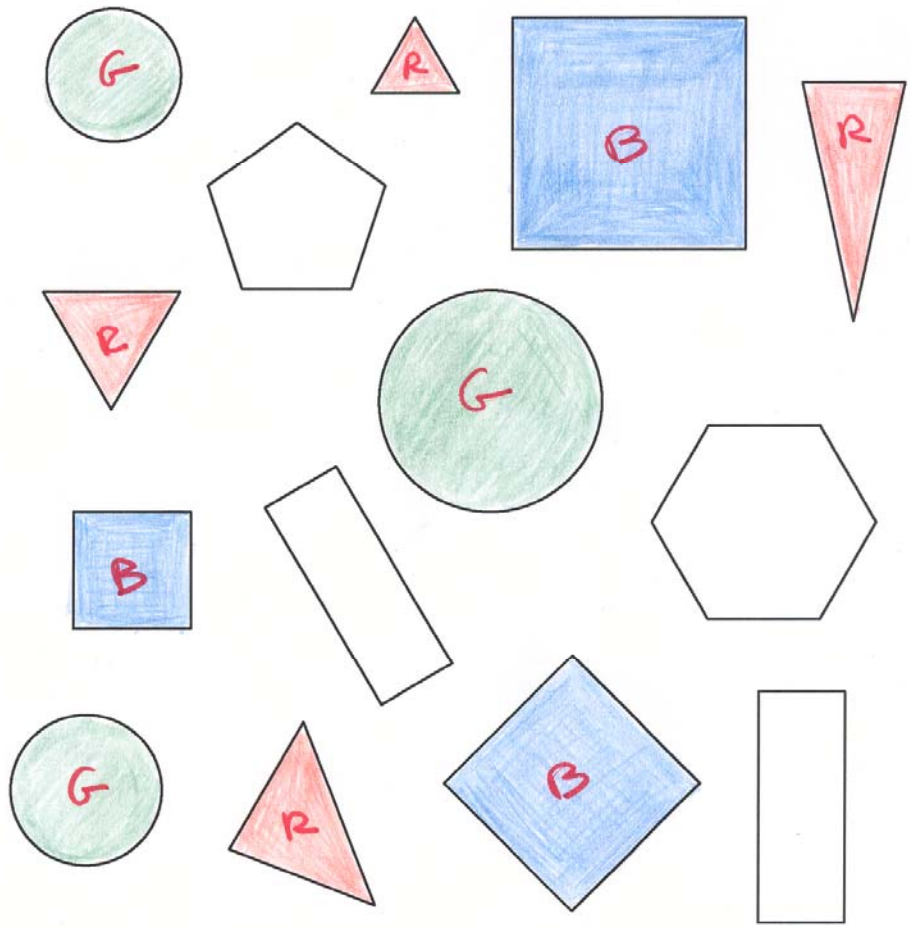
© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

Student Response Sheet

A Trip to Shape Town

Name: ANSWER KEY Date: _____

1. Below are some of the shapes found in Shape Town.



G → GREEN
R → RED
B → BLUE

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

a. Color all the circles green.

b. Color all the triangles red.

c. Color all the squares blue.

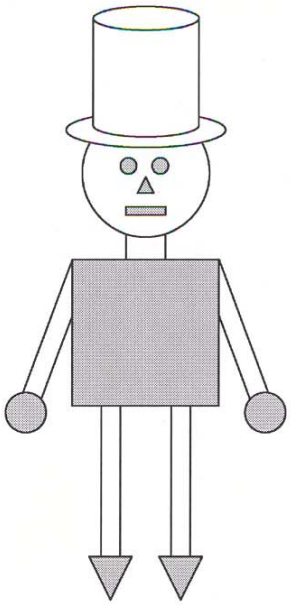
SEE P. 1

d. Circle one shape that you did not color. Describe that shape.

THERE ARE 4 SHAPES THAT COULD BE CIRCLED: A PENTAGON, A HEXAGON, & 2 RECTANGLES. STUDENT COULD DESCRIBE THE SHAPE BY NAME, OR BY THE NUMBER OF SIDES, OR POSSIBLY BY SAYING WHAT MAKES THE SHAPE DIFFERENT FROM A CIRCLE, TRIANGLE, & SQUARE.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

2. Here is the Mayor of Shape Town.

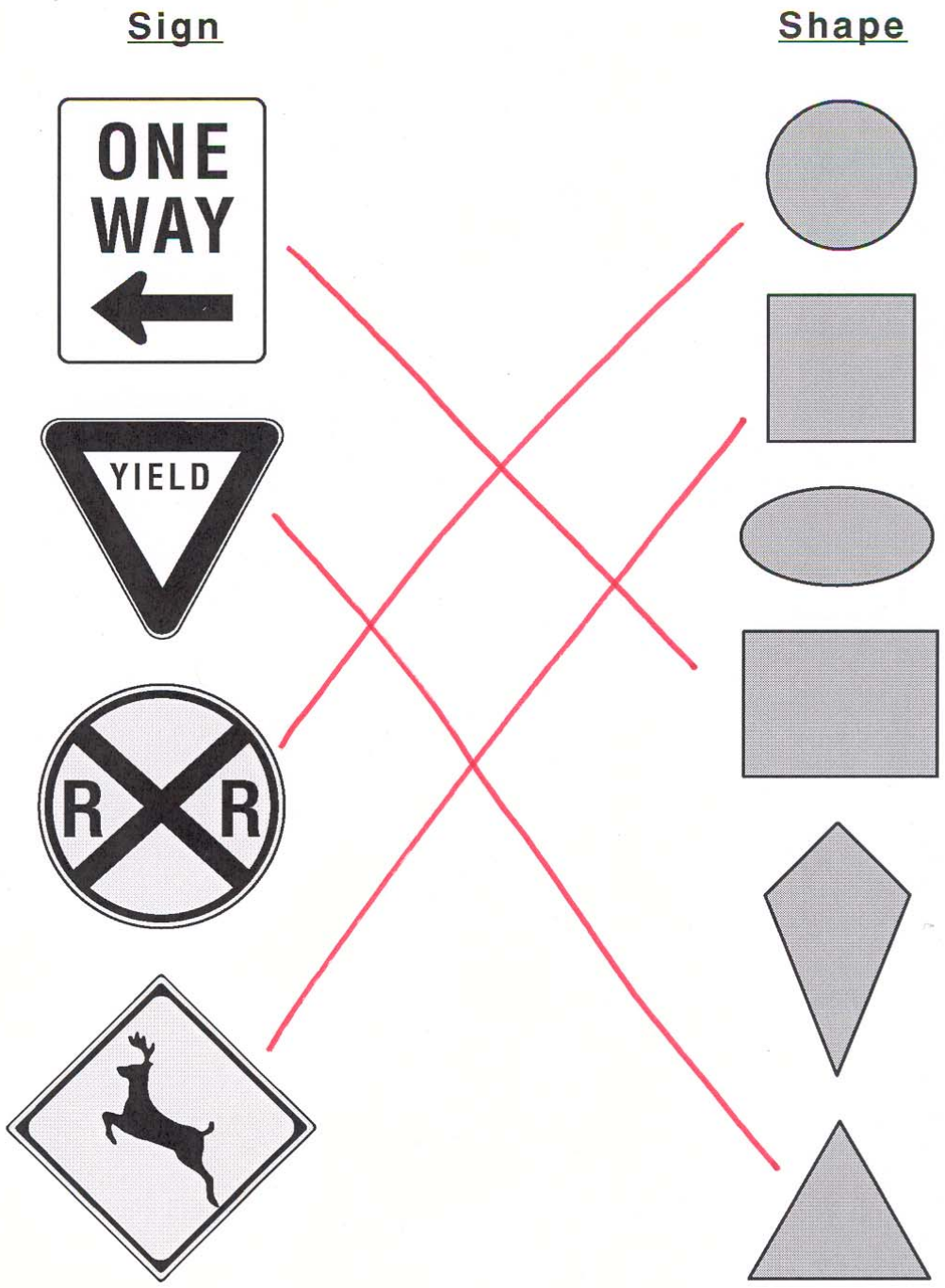


Check one shape that goes with each part of the mayor. His nose is already checked.

Parts of the Mayor	Circle	Rectangle	Square	Triangle
Nose				✓
Eyes	✓			
Mouth		✓		
Body			✓	
Hands	✓			
Legs		✓		
Feet				✓

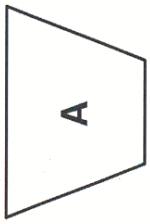
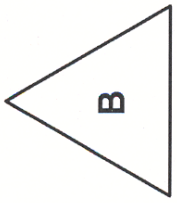
© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

3. Here are some signs found in Shape Town. Draw a line from the sign to the shape of the sign.



© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

4. Fill in the table.

Shape	Name of Shape	Number of Sides	Number of Corners
A 	Trapezoid	4	4
B 	TRIANGLE	3	3
C	SQUARE	4	4
D	RECTANGLE	4	4
E	HEXAGON	6	6

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

5. Look at your table.

How are shape C and shape D alike?

BOTH HAVE 4 SIDES.
BOTH HAVE 4 CORNERS.
BOTH HAVE "SQUARE" CORNERS (RIGHT ANGLES, 90°, PERPENDICULAR, ETC.)

HIGH-LEVEL RESPONSE

How are shape C and shape D different?

SHAPE C HAS ALL SIDES THE SAME LENGTH, BUT SHAPE D HAS 2 SIDES LONGER THAN THE OTHE 2 SIDES.

SOME MIGHT SAY THEY ARE DIFFERENT SHAPES, OR HAVE DIFFERENT NAMES, OR D LOOKS "BIGGER" THAN C. THESE ARE NOT AS GOOD AS TALKING ABOUT LENGTH.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

6. **Look at your table. What other shape in the table is like shape C and shape D?**

A

How is it like them?

SHAPE A ALSO HAS 4 SIDES + 4 CORNERS.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

SITES-M Mathematics Challenge

Grade K–Focus on Shapes
Rubric

CATEGORY	4	3	2	1
Mathematical concepts	**Response shows complete understanding of the mathematical concepts used to solve the problem(s).**	**Response shows substantial understanding of the mathematical concepts used to solve the problem(s).**	**Response shows some understanding of the mathematical concepts needed to solve the problem(s).**	**Response shows very limited understanding of the underlying concepts needed to solve the problem(s), OR the response is not written.**
	Response shows evidence in at least 5 of the following 6 tasks. **Task 1**. Students identifies (by correctly coloring) all of the circles, triangles and squares. Student identifies (by circling) one shape that is not like the others. **Task 2**. Student identifies all the shapes in the mayor. **Task 3**. Student matches each sign with the correct shape. **Task 4**. Student names each shape along with its respective number of sides and corners. **Task 5**. Student names 3 characteristics that are the same and talks of side lengths for differences. **Task 6**. Student is able to say that shape A also has 4 sides and 4 corners.	Response shows evidence in only 4 of the tasks described; may exhibit the following errors. **Task 1**. Student correctly identifies shapes, but may not find all of them. **Task 3**. Student matches only 3 of the 4 shapes correctly. **Task 5**. Student names only 1 or 2 characteristics in common; does not mention differences in side lengths.	Response shows evidence in only 3 of the tasks described; may exhibit errors as described in category 3.	Response shows evidence in only 3 of the tasks described; may exhibit errors as described in category 3.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

Grade K–Focus on Shapes
Rubric

CATEGORY	4	3	2	1
Explanation and communication	**Explanation is detailed and clear; uses appropriate terminology and/or notation.**	**Explanation is clear; uses some appropriate terminology and/or notation.**	**Explanation is a little difficult to understand, but includes critical components; shows little use of appropriate terminology and/or notation.**	**Explanation is difficult to understand, is missing several components, and does not use or include appropriate terminology and/or notation.**
	Response shows evidence in ALL of the following tasks. **Task 1**. Student gives a detailed description about the circled shape; describes the number of sides, the number of corners, the lengths of the sides. **Task 5**. Student explains that the shapes have the same number of sides, the same number of corners, AND that the corners are "square". A high-level response is one that mentions right angles, 90 degrees, or perpendicular sides. Also explains that the shapes are different because the lengths of the sides in C are the same, but D has 2 sides that are longer than the other 2. **Task 6**. Student explains that shape A has 4 sides AND 4 corners just like C and D.	Response shows evidence in ALL of the tasks, but may lack detail in explanation, as evidenced by the following. **Task 1**. Student only describes the circled shape by name, such as, "It is a rectangle." Student does not refer to number of sides, number of corners, or lengths of sides. **Task 5**. Student describes only 1 or 2 things that are the same, and does not talk about the lengths when describing differences. **Task 6**. Student describes either sides only or corners only.	Response shows evidence in only 1 or 2 explanations.	Response shows no explanations.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

SITES-M Mathematics Challenge

Grade K–Focus on Shapes
Rubric

CATEGORY	4	3	2	1
Mathematical accuracy	**All or almost all of the steps and solutions have no mathematical errors.**	**Most of the steps and solutions have no mathematical errors.**	**Some of the steps and solutions have no mathematical errors.**	**Few of the steps and solutions have no mathematical errors.**
	Student provides correct answers in ALL of the following tasks. **Task 1**. Student colors 3 circles green, 4 triangles red, 3 squares blue, and nothing else. Student circles 1 other shape. **Task 2**. Student identifies parts correctly, as shown on answer sheet. **Task 3**. Student correctly matches sign with shape as shown on answer sheet. **Task 4**. Student correctly names shapes, sides, and corners, as shown on answer sheet. **Task 6**. Student answers A and nothing else.	Student provides correct answers for only 4 of the tasks described in category 4.	Student provides correct answers for only 2 or 3 of the tasks described in category 4.	Student provides a correct answer for only 1 task or none of the tasks described in category 4.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

SITES-M Mathematics Challenge

Grade K–Focus on Shapes

Scoring Notes Checklist

Task	Check Yes	Category
Task 1		
Identifies (by correctly coloring) all of the circles, triangles and squares. Identifies (by circling) one shape that is not like the others.		Concept
Gives a detailed description about the circled shape. Describes the number of sides, the number of corners, the lengths of the sides.		Explanation
Colors 3 circles green, 4 triangles red, 3 squares blue, and nothing else. Circles 1 other shape.		Accuracy
Task 2		
Identifies all the shapes in the mayor.		Concept
Identifies parts correctly as shown on answer sheet.		Accuracy
Task 3		
Matches each sign with the correct shape.		Concept
Matches sign with shape, as shown on answer sheet.		Accuracy
Task 4		
Names each shape along with its respective number of sides and corners.		Concept
Names shapes, sides, and corners, as shown on answer sheet.		Accuracy
Task 5		
Names 3 characteristics that are the same and talks of side lengths for differences.		Concept
Explains that the shapes have the same number of sides, the same number of corners, AND that the corners are “square”. A high-level response is one that mentions right angles, 90 degrees, or perpendicular sides. Also explains that the shapes are different because the lengths of the sides in C are the same, but D has 2 sides that are longer than the other 2.		Explanation
Task 6		
Says that shape A also has 4 sides and 4 corners.		Concept
Explains that shape A has 4 sides AND 4 corners just like C and D.		Explanation
Answers A and nothing else.		Accuracy

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

SITES-M Mathematics Challenge

Grade K–Focus on Shapes

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.
TSM40017

SITES-M Mathematics Challenge

Grade K–Focus on Shapes

Analyzing Student Responses Protocol

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. They include extended responses, open-ended tasks, and tasks that require higher-order thinking skills. Because these types of tasks may be novel for students and they will have varying levels of understanding, the student responses will vary.

The guiding questions below were designed to assist you in analyzing your class' response to the Challenge and determining appropriate next steps for your teaching and learning. Responses to these questions are for your reflection and documentation and will not be collected.

Guiding Questions for Analyzing Student Responses to the Mathematics Challenges

1. When completing the Challenge, what did your students do well? How do you know?

2. When completing the Challenge, what did your students struggle with? How do you know?

3. When your students completed the Challenge, did they implement multiple correct solutions strategies? What insightful approaches to problem solving did you observe?

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.

4. What, if any, patterns (e.g., common errors/misconceptions) did you observe across your student responses?

5. What questions or concerns did your students have when working through this Challenge or a particular task? Are these things you should address for the class as a whole?

6. What, if any, feedback did you provide to your class? How did you provide it?

7. What did you learn about your students' mathematical understanding based on their responses to this Challenge?

Reminders:

1) After you have completed the Challenge with your class and responded to these Guiding Questions for Analyzing Student Responses, please complete the Challenge Feedback Log. A link to this Log is e-mailed to you each month. Responses will be used to improve the Challenges and to provide recommendations for teachers implementing the Challenges in future years.

2) Please provide copies of all student work to the Assessment Coordinator.

© 2010 by Tennessee State University. All Rights Reserved. Reproduction or distribution by permission only.
TSM40017