

Title: Mathematical Movements (Flips, Slides and Turns)

Brief Overview:

This four-day lesson moves students through a mathematical dance of flips (reflections), slides (translations), and turns (rotations). Students will learn to identify congruent figures in order to describe the properties of slides, flips and turns for two-dimensional objects through the use of student-centered investigations including comic strips, finger painting, pattern blocks and designing a dream bedroom.

NCTM Content Standard/National Science Education Standard:

- Describe a motion or a series of motions that will show that two shapes are congruent
- Apply transformations and use symmetry and analyze mathematical situations
- Predict and describe the results of sliding (translations), flipping (reflections) and turning (rotations) two-dimensional shapes
- Identify and describe line and rotational symmetry in two-dimensional shapes and designs

Grade/Level:

Grade 3

Duration/Length:

4 days for 60-70 minutes daily; 1 day will be used for assessment

Student Outcomes:

Students will:

- Define, identify and compare two shapes that are congruent
- Identify the properties of a turn (rotation) of a two-dimensional shape
- Identify the properties of a flip (reflection) of a two-dimensional shape
- Identify the properties of a slide (translation) of a two-dimensional shape
- Define, identify and compare a turn (rotation), flip (reflection) and a slide (translation)

Materials and Resources:

Lesson 1

- Mathematical Movements Pretest (Teacher & Student Resource Sheets # 1)

- 2 Centimeter Grid Paper – Transparency and Students Copies (Student Resource Sheet # 2)
- 2 centimeter overhead snap cubes
- 2 Centimeter snap cubes
- Crayons
- Large plain white paper (one for each student)
- pencil
- Dream Bedroom Key (Teacher Resource Sheet # 2)
- Brief Constructed Response (BCR) (Student Resource Sheet # 3)
- Teacher’s scoring rubric (Teacher Resource Sheet # 3)
- Student scoring rubric (Student Resource Sheet # 4)
- Note: Please make sure the size of your snap cubes matches the size of the squares on your grid paper.

Lesson 2

- Large sheet of white paper (one for each student)
- pencil
- Paper plate
- Straw
- Glue
- Dr. Turning (Teacher Resource Sheet # 4)
- Dr. Turning’s comic strip (Student Resource Sheet # 5)
- Dr. Turning comic strip answer key (Teacher Resource Sheet # 5)
- Brief Constructed Response (BCR) (Student Resource Sheet # 6)
- Teacher’s scoring rubric (Teacher Resource Sheet # 3)
- Student scoring rubric (Student Resource Sheet # 4)

Lesson 3

- Large sheet of white paper (one for each student)
- Pencil
- Sponge cut in a NON-SYMETRICAL shape (fish, E, frog, etc.)
- Finger paints (one color)
- Paper plate (to hold finger paints)
- Marker
- Construction paper (one for each student)
- Scissors for each student
- Brief Constructed Response (BCR) (Student Resource Sheet # 7)
- Teacher’s scoring rubric (Teacher Resource Sheet # 3).
- Student scoring rubric (Student Resource Sheet # 4)

Development/Procedures:

Lesson 1: Congruency and Slides (Translations)

Preassessment

Administer Mathematical Movements Pre-test (Teacher & Student Resource Sheets # 1) to determine students' background knowledge of congruency, slides (translations), flips (reflections), and turns (rotations).

Launch

- Instruct students to place their hands palm to palm. Ask students what they notice about their hands when they are placed palm to palm. Is what you see on the left the same thing that you see on the right? Students will respond, "yes." Instruct students that their hands are congruent figures because they are the same shape and size.
- Instruct students to place their hands palm to palm again with the back of the left hand facing them. Have students gently slide the right hand out from behind the left hand, until the hands are side-by-side. Tell students this is an example of a slide because the figure was moved up, down, or sideways.
- Give students a large sheet of blank paper. Have students trace his or her hand onto the large sheet of paper. Students are to select the direction that their hand is to slide. Slide the hand to the desired direction and trace. Explain to students that this is an example of a slide.

Teacher Facilitation

- Announce to the students that we are going to rearrange our classroom; using the math skills we are studying today.
- On the overhead, show the students a grid that will represent the classroom.
- Create a list on the board of the objects in the classroom that can be moved (teacher desk, student desk, reading table, etc.)
- Match the objects on the board to a color of snap cubes (color coding) and label the color next to the objects on the board.
- Designate the number of snap cubes for each of the above-mentioned items.
- Have each student come up to the overhead to place the designated items in the position it now holds in the classroom.
- Ask for students volunteers to select an object and tell you in which direction and how many units to slide the object.
- Continue this process until all objects have found a new position on the classroom grid.
- Review and discuss why the movements of the objects represent slides (translation).

Student Application

- Brainstorm with the students what their dream bedroom would look like.
- Have the "paper passer" hand out a copy of the grid paper (Student Resource Sheet # 2) to each student.
- Have the materials manager retrieve a bag of snap cubes for their table from the manipulative bin.

- Direct the students to observe the key for their dream bedroom on the overhead (See Teacher Resource Sheet # 2).
- Allow the students' time to snap together the various formations represented on the key.
- Instruct the students that the objects may slide across the floor of the grid however it may not be flipped or turned in order to try to fit the object into the room.
- Students are to use the key to now create the floor plan of their dream bedroom.
- After the students have their objects in their desired locations allow the students to color in the objects locations on the grid.

Embedded Assessment

- Students will complete a Brief Constructed Response (BCR) (Student Resource Sheet # 3) in order to demonstrate and explain what a slide is. There are two scoring rubrics for the BCR. The teacher's rubric is labeled (Teacher Resource Sheet # 3).

Reteaching/Extension

- Have the students score their BCR with the students scoring rubric (Student Resource Sheet # 4) in order to compare the score they received versus the predicted score they thought they earned.

Lesson 2: Turns (Rotations)

Preassessment/Launch

- In order to review congruency, instruct students to place their hands palm to palm. Ask students what they notice about their hands when they are placed palm to palm. Is what you see on the left the same thing that you see on the right? Students will respond, "yes." Instruct students that their hands are congruent figures because they are the same shape and size.
- Instruct students to place their hands palm to palm again with the back of the left hand facing them. Have students gently turn (rotate) the left hand clockwise while keeping the right hand still. This will show the students the original position as well as a turn. Tell students this is an example of a turn (rotation) because the figure has been moved like a wheel.
- Give students a large sheet of blank paper. Have students trace his or her hand onto the large sheet of paper. Students are to select the direction that their hands are to turn. Turn the hands to the desired direction and trace. Explain to students that this is an example of a turn.

Teacher Facilitation

- Make a copy of Dr. Turning (Teacher Resource Sheet # 4) and cut him out. Place the dot on the top of Dr. Turning's hat in the center of the paper plate and glue him down. Next push a straw through the center of the paper plate which will be used as a handle in order to show the rotation of the paper plate and Dr. Turning.
- Tell the students that today they will have a guest for their math lesson. The teacher introduces the special guest (Dr. Turning) to the students. The teacher will say, "Class, Today Dr. Turning has agreed to help us with our lesson on turns (rotations). He is an expert who knows all about doing turns (rotations)."
- The teacher will demonstrate that Dr. Turning is turning because the figure has been moved like a wheel.

Student Application

- The students will create a comic strip (Student Resource Sheet # 5) showing the character, Dr. Turning, rotating (turning) and they will use words to describe the movement. Teacher can use answer key for Dr. Turning comic strip (Teacher Resource Sheet # 5), if needed.

Embedded Assessment

- Students will complete a Brief Constructed Response (BCR) (Student Resource Sheet # 6) in order to demonstrate and explain what a turn is. There are two scoring rubrics for the BCR. The teacher's rubric is labeled (Teacher Resource Sheet # 3).

Reteaching/Extension

- Have the students score their BCR with the students scoring rubric (Student Resource Sheet # 4) in order to compare the score they received versus the predicted score they thought they earned.

Lesson 3: Flips (Reflections)

Preassessment/Launch

- In order to review congruency, instruct students to place their hands palm to palm. Ask students what they notice about their hands when they are placed palm to palm. Is what you see on the left the same thing that you see on the right? Students will respond, "yes." Instruct students that their hands are congruent figures because they are the same shape and size.

- Instruct students to place their hands palm to palm again with the back of the left hand facing them. Have students gently swing their right hand to the right in order to flip (reflection), while keeping the left hand still. The students should have the back of both hands facing them in order to create the flip (reflection). This will show the students the original position as well as a flip (reflection). Tell students this is an example of a flip (reflection) because the figure has been picked up and turned over.
- Give students a large sheet of white paper. Have students trace his or her hand onto the large sheet of paper. Students are to select the direction that their hand is to flip. Flip the hand to the desired direction and trace. Explain to students that this is an example of a flip (reflection) because the figure has been picked up and turned over.

Teacher Facilitation

- Prior to the lesson, cut a sponge in the shape that you would like it to take (fish, frog, something NOT symmetrical). Also, have a paper plate with a sufficient amount of finger paint it. Take the large sheet of white paper, fold it in half, and use a marker to trace the centerline of the paper. Dip the one side of the sponge into the paint on the paper plate. Press the painted side on the left side of the white paper, leaving a print in the shape of the sponge. Next, fold the paper in half, along the traced centerline. Press gently. This should leave the paint on the opposite side of the page, creating a flip for the students to see.
- The teacher will discuss this is a flip (reflection) because the figure has been picked up and turned over.

Student Application

- Have the materials manager pass out a sheet of construction paper to each student.
- Have each student fold the construction paper in half horizontally so that the horizontal line is the longer line.
- Have students write the letter of his or her first name in block or bubble letters so that the bottom of each letter of the name is touching the folded edge of the paper.
- Students should use the scissors to cut out the name, cutting both the side he or she drew on and the paper behind it as well.
- When the student is finished cutting, he or she can unfold the paper along the folded edge. The letters will show a flip because the figure has been picked up and turned over.

Embedded Assessment

- Students will complete a Brief Constructed Response (BCR) (Student Resource Sheet # 7) in order to demonstrate and explain what a flip is. There are two scoring rubrics for the BCR. The teacher's rubric is labeled (Teacher Resource Sheet # 3).

Reteaching/Extension

- Have the students score their BCR with the students scoring rubric (Student Resource Sheet # 4) in order to compare the score they received versus the predicted score they thought they earned.

Summative Assessment:

- Students will be able to identify congruent figures in order to describe the properties of slides (translations), flips (reflections) and turns (rotations) for two-dimensional objects in order to successfully complete the Posttest (Student Resource Sheet # 8). Answer key is on (Teacher Resource Sheet # 8).

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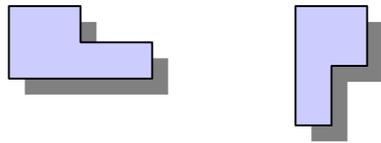
Name _____

Mathematical Movements Pre-Test

Directions: Match the vocabulary word on the left with the figures and definitions on the right.

- | | |
|------------------------|--|
| 1. Flip (reflection) | The picture of a figure has been moved like a wheel. |
| 2. Congruent | The figure moves up, down or side ways. |
| 3. Slide (translation) | Figures that have the same size and shape. |
| 4. Turn (rotation) | The figure has been picked up and turned over. |
-

5. Flip (reflection)



6. Slide (translation)



7. Turn (rotation)



Name _____

Mathematical Movements Pre-Test

Directions: Match the vocabulary word on the left with the figures and definitions on the right.

1. Flip (reflection)

The picture of a figure has been moved like a wheel.

2. Congruent

The figure moves up, down or side ways.

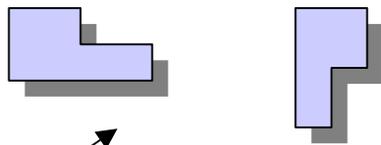
3. Slide (translation)

Figures that have the same size and shape.

4. Turn (rotation)

The figure has been picked up and turned over.

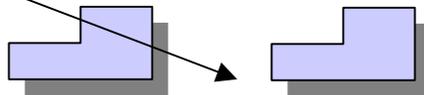
5. Flip (reflection)

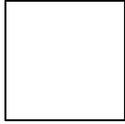


6. Slide (translation)

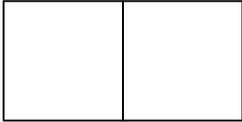


7. Turn (rotation)





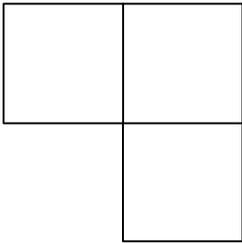
1 block is a chair.



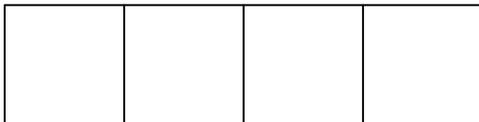
2 blocks sideways are a television/DVD



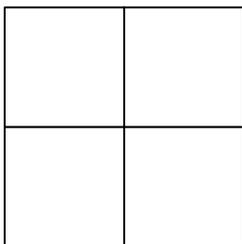
2 blocks up and down are a stereo.



3 blocks are a desk.



4 blocks in a rectangle are a bed.



4 blocks in a square are bookcase.

Brief Constructed Response

Step A

Draw the movement of the following polygon in order to show a slide.



Step B

Use what you know about slides to explain why you choose your answer. Use words and/or numbers in your explanation.

Mathematics BCR Rubric

- 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.
 - Explanation¹ of and/or justification² 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.³
- 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.
 - Explanation¹ of and/or justification² 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.³
- 0 The response is completely incorrect, irrelevant to the problem, or missing.⁴**

Notes:

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

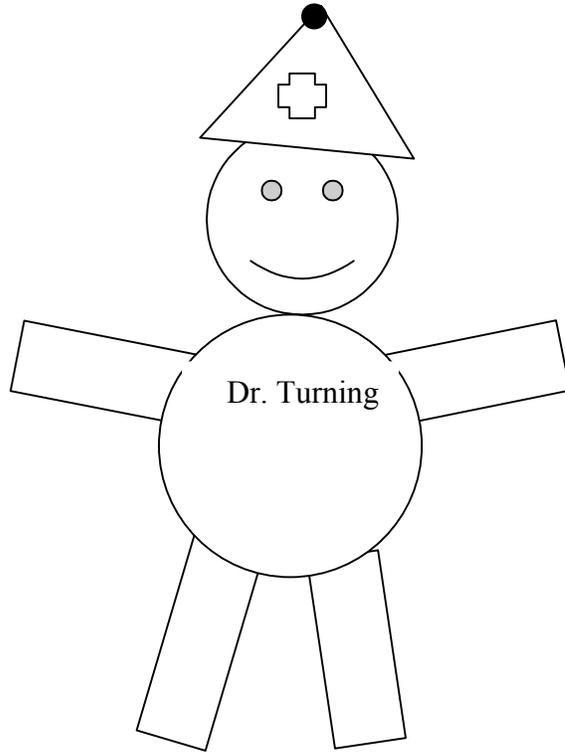
² **Justification** refers to students' ability to support the reasoning used to solve a problem, or to demonstrate **why** the solution is correct using mathematical concepts and principles.

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

⁴ Merely an exact copy or paraphrase of the problem will receive a score of "0".

MSA Brief Constructed Response “Kid Speak” Mathematics Rubric Grades 1 through 8

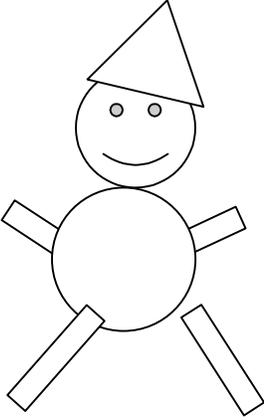
Score	
2	<p>My answer shows I completely understood the problem and how to solve it:</p> <ul style="list-style-type: none"> • I used a very good, complete strategy to correctly solve the problem. • I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well-organized and logical. • I applied what I know about math to correctly solve the problem. • I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.
1	<p>My answer shows I understood most of the problem and how to solve it:</p> <ul style="list-style-type: none"> • I used a strategy to find a solution that was partly correct. • I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well-organized or logical. • I partly applied what I know about math to solve the problem. • I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.
0	<p>My answer shows I didn’t understand the problem and how to solve it:</p> <ul style="list-style-type: none"> • I wasn’t able to use a good strategy to solve the problem. • My strategy wasn’t related to what was asked. • I didn’t apply what I know about math to solve the problem. • I left the answer blank.



Name _____

Dr. Turning's Comic Strip

Directions: Create a comic strip that will show the turning movement using the character of Dr. Turning. Be sure to write captions to tell us what is going on in your comic strip.

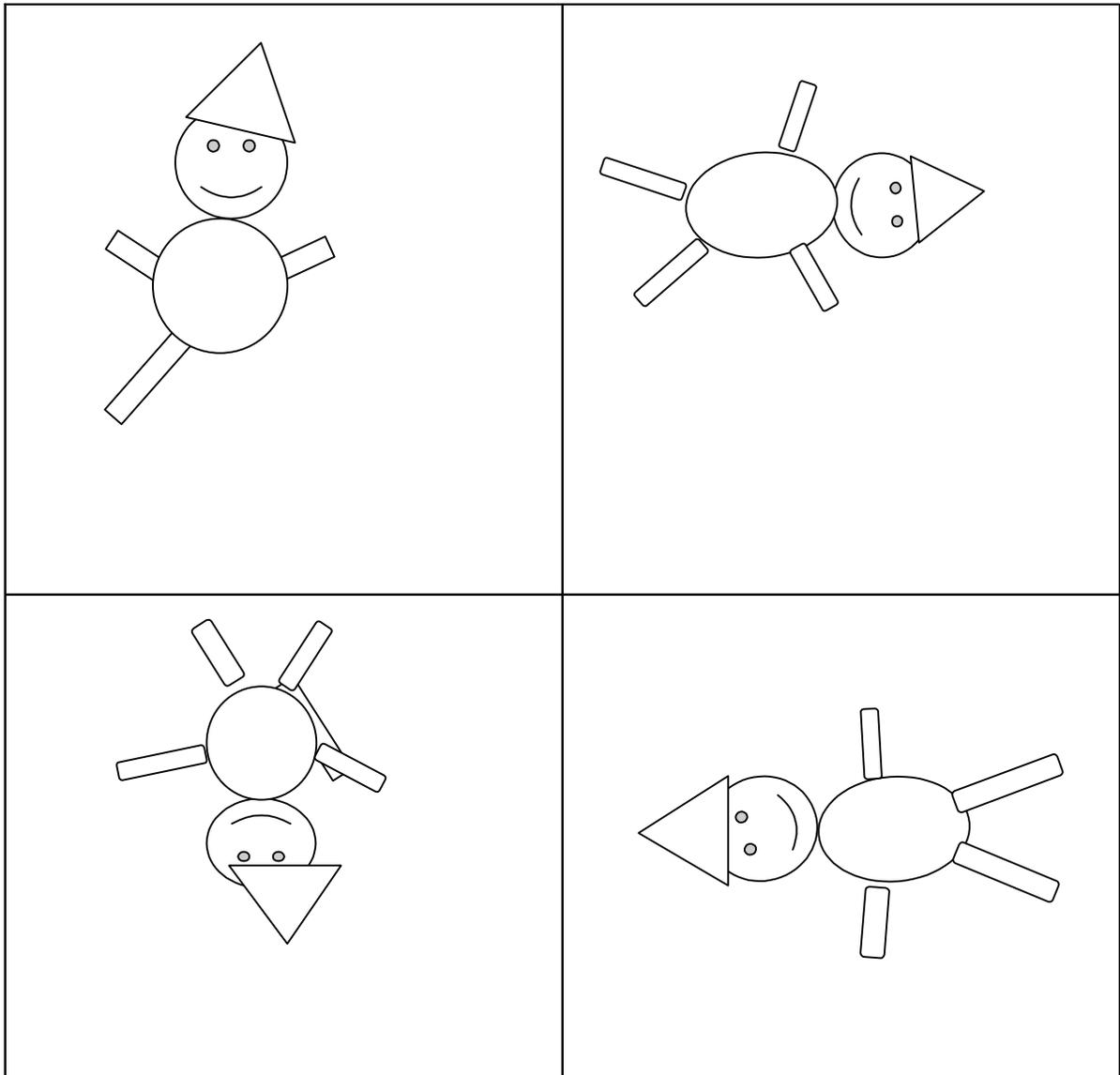
	

Use words to describe the movement of Dr. Turning.

Name _____

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Directions: Create a comic strip that will show the turning movement using the character of Dr. Turning. Be sure to write captions to tell us what is going on in your comic strip.

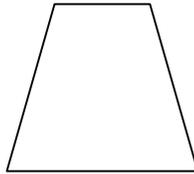


Use words to describe the movement of Dr. Turning.

Brief Constructed Response

Step A

Draw the movement of the following polygon in order to show a turn.



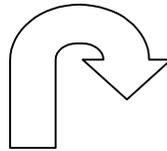
Step B

Use what you know about turns to explain why you chose your answer. Use words and/or numbers in your explanation.

Brief Constructed Response

Step A

Draw the movement of the following polygon in order to show a flip.



Step B

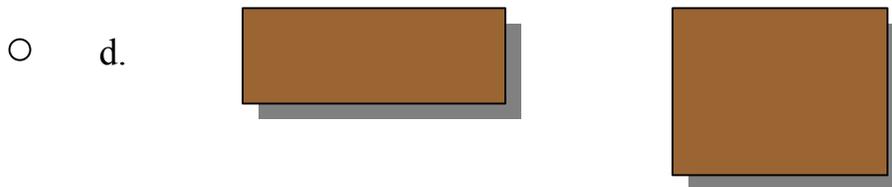
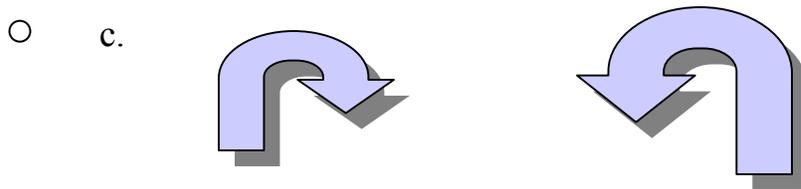
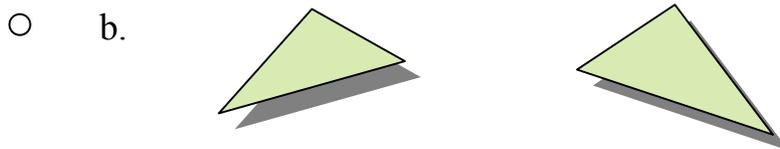
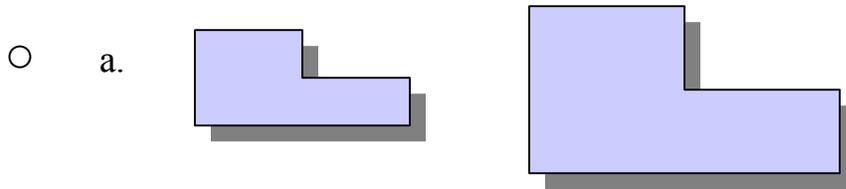
Use what you know about flips to explain why you chose your answer. Use words and/or numbers in your explanation.

Name _____

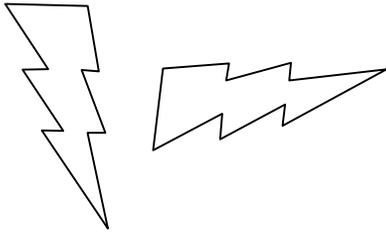
Geometry
Mathematical Movements Post-Test

Directions Fill in the \bigcirc for the correct answer.

1. Which of the following polygons are congruent?



2. Is it a slide, flip, or turn?

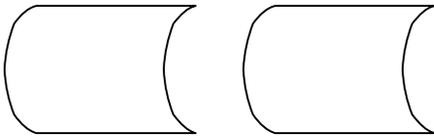


Slide

Turn

Flip

3. Is it a slide, flip, or turn?

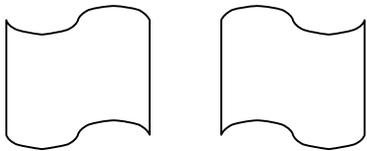


Slide

Turn

Flip

4. Is it a slide, flip, or turn?

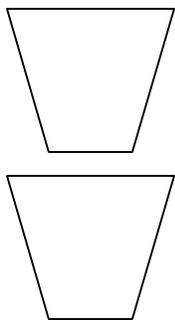


Slide

Turn

Flip

5. Is it a slide, flip, or turn?



Slide

Turn

Flip

Brief Constructed Response

Step A

Select a slide, flip, or turn in order to move the following figure.
Draw and write the name of the movement of the figure.

E

This movement is a _____.

Step B

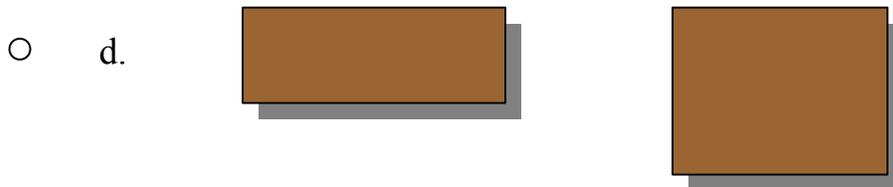
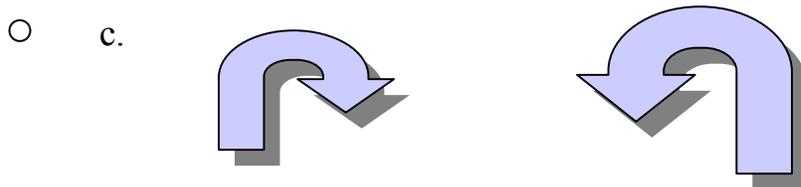
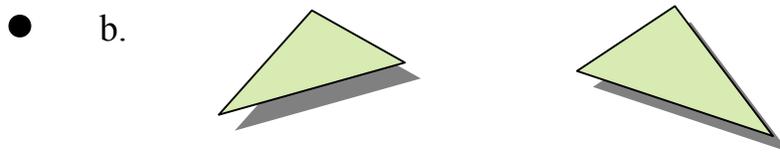
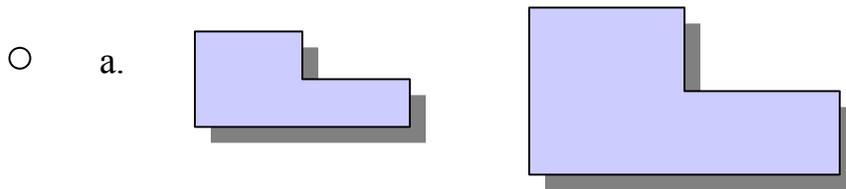
Use what you know about _____ to explain why you chose your answer. Use words and/or numbers in your explanation.

Name _____

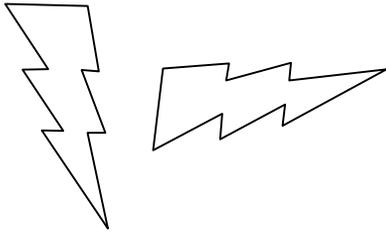
Geometry
Mathematical Movements Post-Test

Directions Fill in the \bigcirc for the correct answer.

6. Which of the following polygons are congruent?



7. Is it a slide, flip, or turn?

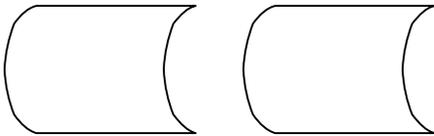


Slide

Turn

Flip

8. Is it a slide, flip, or turn?

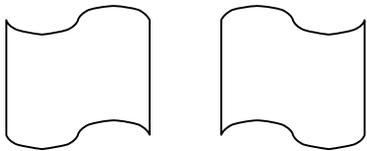


Slide

Turn

Flip

9. Is it a slide, flip, or turn?

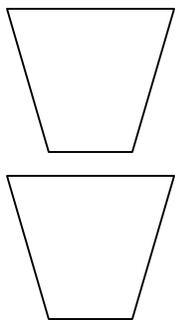


Slide

Turn

Flip

10. Is it a slide, flip, or turn?



Slide

Turn

Flip

Brief Constructed Response

Step A

Select a slide, flip, or turn in order to move the following figure.
Draw and write the name of the movement of the figure.

E

This movement is a _____.

Step B

Use what you know about _____ to explain why you
chose your answer. Use words and/or numbers in your
explanation.

**In order to score the BCR, use the scoring rubric (Teacher Resource Sheet # 7)