Grade 8 Mathematics
Geometry: Lesson 5

Read aloud to the students the material that is printed in **boldface type** inside the boxes. Information in regular type inside the boxes and all information outside the boxes should **not** be read to students. Possible student responses are included in parentheses after the questions.

NOTE: The directions read to students may depend on the available materials. Read only those parts of the lesson that apply to the materials you are using.

Any directions that ask you to do something, such as to turn to a page or to hand out materials to students, will have an arrow symbol (⇨) by them.

Purpose of Lesson 5:

- In this lesson, the tutor and the students will
  - ✓ understand the terms *clockwise* and *counterclockwise*; and
  - ✓ given a figure, identify the translation (slide), the reflection (flip) or rotation (turn) of the figure.

Equipment/Materials Needed:

- A few pieces of a jigsaw puzzle (optional)
- Copies of Student Sheets 39 – 41

Preparations before beginning Lesson 5:

- Run off a copy of Student Sheet 39 for yourself. Cut out the letters. (You do not have to cut out the interiors of the letters.
- Run off one copy of Student Sheets 40 and 41 for each student.
- Have paper and pencils available.

Lesson 5: Geometry

After your introductory remarks, say:

Have any of you ever worked on a jigsaw puzzle? If you dropped the pieces, some would flip over, some would turn upside down, and some would be turned to the right or to the left. Would the pieces change? (No.) **In geometry, in art, and on computers, we sometimes turn figures, flip them over, or just move them; but the figures themselves do not change.**

⇨ Place one of the *A*'s on the desk in front of the students. Place the second *A* on top of it.

Say:

If we turned *A* upside down, what would it look like? Draw a picture on your paper. Pause, allow the students to draw. **Would one of you turn the top *A* upside down so that you can check your drawings? Place the upside *A* below the other *A*.** A

"

You are making *rotation* of the *A*. You are turning or rotating the *A* upside down, not flipping it. This movement is also called a 180° turn or rotation.

⇨ Replace the *A* on top of the other *A*.

Say:

In the last lesson, we talked about right angles. They are also called 90° angles. They looked like this one. Draw a 90° angle. (⌊ or ⌋) **What if we turn or rotate the *A*, 90°? What would it looks like?**

A or A

How do we know which is correct? If you are microwaving a meal, and the instructions tell you to turn or rotate the meal 90°, either is correct. However, we sometimes want to know which way to turn the meal. We can use the words *clockwise* or *counterclockwise* to describe the turn. *Clockwise* is the direction that the hands move on a clock. *Counterclockwise* would involve moving in a direction opposite to the direction that the hands move on a clock.

⇨ Put the *A*'s away and use the two *P*'s. Place the *P* in front of you and place the second *P* on top.

Say:

If we rotated the *P* upside down, what would it look like? Draw a picture on your paper. Pause; allow them to draw. **Would one of you turn the top *P* upside down so that you can check your answers**? Place the upside down *P* below the other *P*.

P
d **How much have we rotated the *P*?** (180°)

⇨ Replace the *P* on the top of the other *P.*

Say:

What if we turned the *P* clockwise 90°? What would it look like? Draw a picture of what you think the turned *P* would look like.

(Response: P **) Would one of you take the top *P* and turn it clockwise 90°. Were you correct?**

⇨ Replace the ***P*** on top of the other ***P.***

Say:

What if we turned the *P* counterclockwise 90°? What would it look like? Draw a picture of what you think the turned *P* would look like.

P P **Would one of you take the top *P* and turn it counterclockwise 90°. Were you correct?**

⇨ Give Student Sheet 40 to the students. Answers:

1) C 2) B 3) D 4) B

⇨ Replace the *P* on top of the other *P***.**

Say:

Sometimes I just move a letter up or down, left or right, but I do not rotate it, nor do I flip it over. This type of motion is called a *slide* or a *translation*. Move the top *P* a few times in different directions, but make sure you do not flip or turn it.

⇨ Replace the *P* on top of the other *P*.

We have been looking at translations (slides) and at rotations (turns). What if we flipped or reflected the *P* over to the right? What would it look like? Draw a picture of what you think the flipped *P* would look like.

(Response: P ꟻ) **A *reflection* is a move in which a figure is flipped over a line. The line helps us decide which way to flip or reflect the figure. Suppose we want to flip the P upside down? What would it look like? Draw a picture of what you think the reflected P would look like.**

P

ꟻ

Would one of you take the top *P* and flip it upside down. Place the flipped *P* below the other *P*. Were you correct?

⇨Give Student Sheet 41 to the students.

Say:

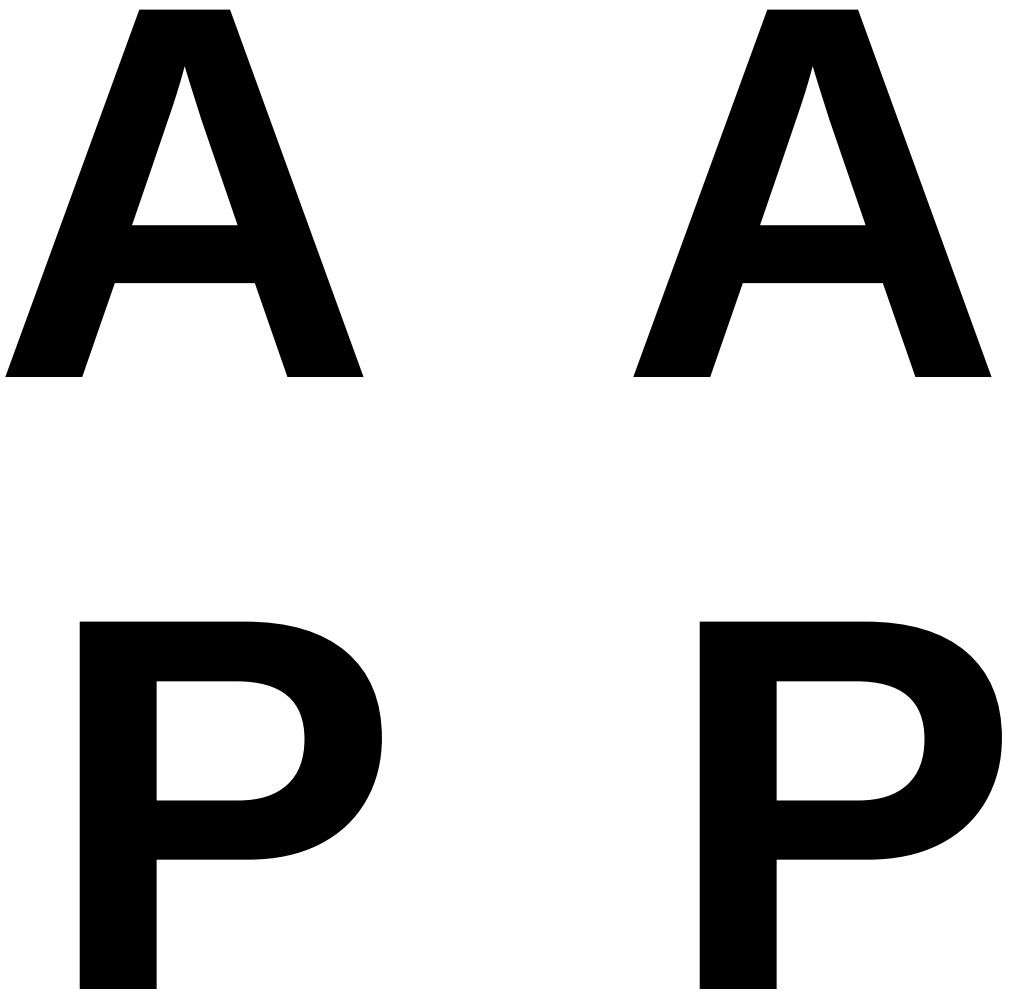
Sometimes it helps to use a cross or grid to show these ideas. Using a cross or grid will give you lines over which to flip the figures. Figure A shows the heart being translated down and to the right. Figure B shows the arrow being rotated 180°. Figure C shows the heart being rotated 90°. Figure D shows the arrow being reflected across the vertical line.

Answers:

1) Reflection over the vertical line.
2) Clockwise rotation of 90°
3) Reflection over the horizontal line or translation
4) Translation
5) Translation
6) Counterclockwise rotation of 90°
7) Translation
8) Reflection over the horizontal line or rotation of 180°

⇨ Have one student summarize today's lesson. Emphasize that the students have been turning and flipping letters or figures. These figures have moved, but they have not changed.

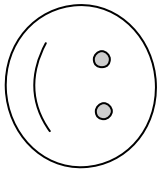
Student Sheet 39 (Geometry: Lesson 5)



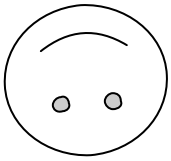
Student Sheet 40 (Geometry: Lesson 5)

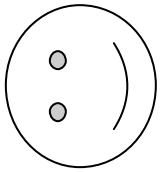
1. Look at the shape below.

Which shows the shape turned upside down?

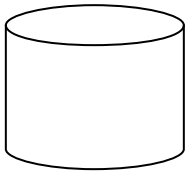
A. 

B. 

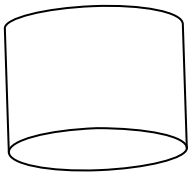
C. 

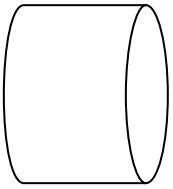
D. 

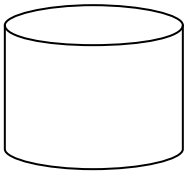
2. Look at the shape below.

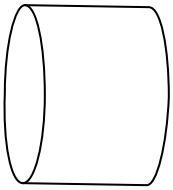


Which shows the shape turned clockwise 90º?

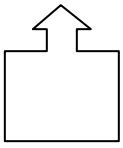
A. 

B. 

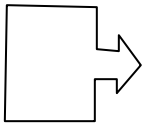
C. 

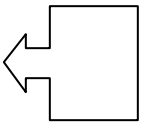
D. 

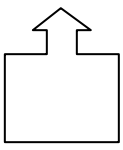
3. Look at the shape below.

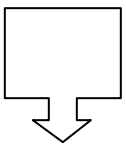


Which shows the shape turned 180°?

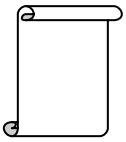
A. 

B. 

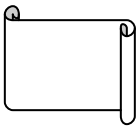
C. 

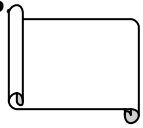
D. 

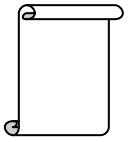
4. Look at the shape below.

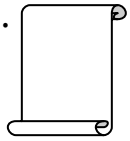


Which shows the shape turned counterclockwise 90º?

A. 

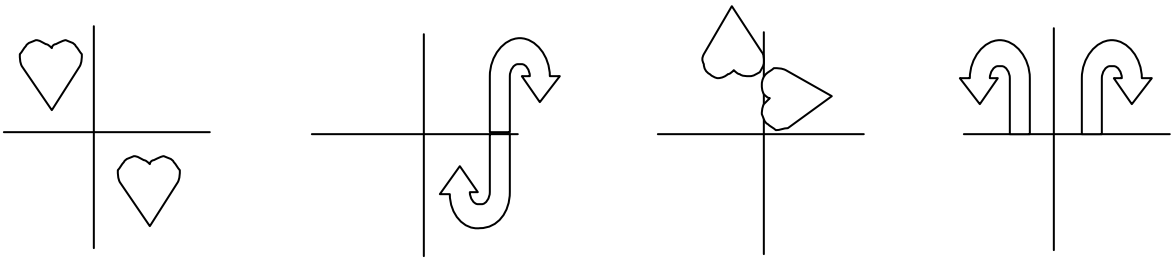
B. 

C. 

D. 

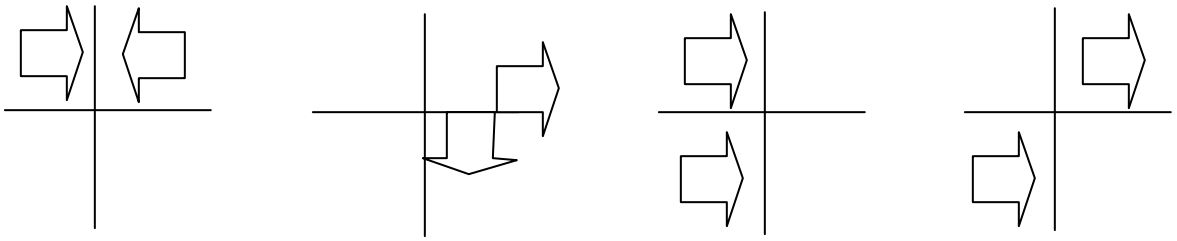
Student Sheet 41 (Geometry: Lesson 5)

Figure A **Figure B** **Figure C** **Figure D**



Which best describes how the top figure in each problem has been moved? Sometimes more than one answer is correct.
Translation (slide) **Reflection (flip)** **Rotation (turn)**

1. **2.** **3.** **4.**



5. **6.** **7.** **8.**