

Grade 8 Mathematics

Geometry: Lesson 4

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 (\Rightarrow) by them.

Purpose of Lesson 4:

- In this lesson, the tutor and the students will
 - ✓ understand the concept of symmetry,
 - ✓ determine whether a figure has symmetry,
 - ✓ draw figures with symmetry,
 - ✓ understand the concepts of similarity and congruence, and
 - ✓ determine whether two figures are similar or whether they are congruent.

Equipment/Materials Needed:

- Copies of Student Sheets 35 – 38
- Two pieces of paper per student
- Paper and pencils
- One pair of scissors for each student

Preparations before beginning Lesson 4:

- Run off one copy of Student Sheet 35 for yourself. Cut out the picture and letters. Run off one copy of Student Sheet 37 for yourself.
- Run off one copy of Student Sheets 36 and 38 for each student.
- Have paper and pencils available.

Lesson 4: Geometry


⇒ Use the cutout pictures from the top of Student Sheet 35. Fold the teardrop in half, making the two sides match.

Say:

I just folded the teardrop in half. The two parts matched exactly. This picture has *symmetry*. When a picture or figure has symmetry, it can be folded in half so that the two parts match exactly. Where you fold the shape, or the fold line, is called the *line of symmetry*. Do you think the library has a line of symmetry? (Yes.) Where should I fold the picture of the library to see whether it has symmetry? (between the 2 middle columns)

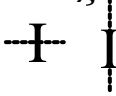
⇒ Give Student Sheet 36 to the students. Pick up your cutout letter *B*.

Say:

Can we fold this letter in any way that will give us two parts that match exactly? If you think it can be done, on your sheet, draw a line through the *B* where you think you would fold it. (Response: )
Allow a student to fold the *B*. **Did anyone do it a different way? (No. There is only one way.) This figure has only one line of symmetry.**

⇒ Next, pick up the letter *I*.

Say:

Can we fold the letter *I* in any way that will give us two parts that match exactly? If you think so, draw a line through the *I* on your paper where you think we could fold it? Response: 
Both are correct.
Allow a student to fold your letter *I*. **Did anyone fold it in a different way?**
Allow a second student to fold your letter *I*. **Did anyone fold it a third way? (No. There is no third way to fold this letter.) This figure has two lines of symmetry.**

⇒ Next show the letter *F*. You will use the *J* later.

Say:

Can we fold the letter *F* in any way that will give us two parts that match exactly? If you think so, draw a line through the *F* on your paper where you think we could fold it. Pause, allow them to try, but there is no way to fold it. This letter has no line of symmetry.

Say:

Look at the letters at the bottom of the sheet. Draw the lines of symmetry. Some letters have one line; some have more than one line; and some have no lines of symmetry at all.

Answers:


1) 1 line 

2) 2 lines 

3) 2 lines 


4) No line

5) No line. They may have to cut and fold this one.

6) 1 line 

7) 1 line 

8) L, no line, They may have to cut this one out and try to fold it.

9) 1 line 

⇒ Have the students put that sheet away.

Say:

If someone says to you that you look similar to someone else, what do they mean? (look alike, almost the same) In geometry, *similar figures* look alike. They have the same shape, but they may not be the same size. Have you ever used a copy machine? Some machines will enlarge or reduce a picture. Here is an example.

⇒ Show the top of Student Sheet 37.

Ask:

What do you notice? (The triangles are the same shape, but not the same size. The triangles look alike; but some are larger; some are smaller.)

Does it matter that some of the triangles are turned sideways or upside down? (No.) Do they still have the same shape? (Yes.) Similar figures can be turned, flipped, or just moved, but they are still similar.

⇒ Give the students Student Sheet 38, problems 1 – 4.

Answers: 1. D 2. No 3. Yes 4. No

Say:

Sometimes figures are both the same size and the same shape. These figures are *congruent* to one another. Congruent figures can be turned or flipped, but they are still congruent.

⇒ Place the cut out *J* (from Student Sheet 37) in front of you.

Say:

If I place the other *J* on top of this *J*, the letters will match exactly. They are the same size and shape, so they are congruent to one another. When you make a copy of a picture on a copy machine, you are making a congruent picture.

⇒ Show the bottom half of Student Sheet 37. This sheet shows congruent figures.

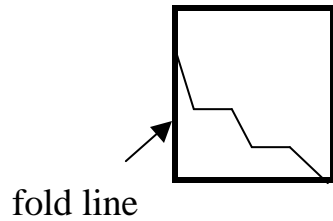
⇒ Have students work problems 5 – 10 on Student Sheet 38.

Answers: 5) B 6) C 7) no 8) no 9) no
10) yes, the circles in #7

Extension:

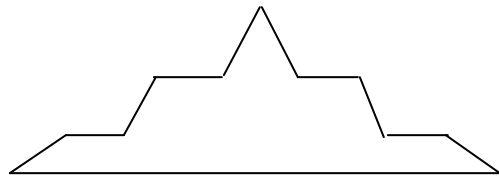
⇒ Give the students 2 sheets of paper.

Sometimes we can tell the whole figure if we are given just half of it and if we are told that the figure is symmetric. Fold one sheet of paper in half. It does not matter which way you fold it. Draw a figure like this one next to the fold line.



Say:

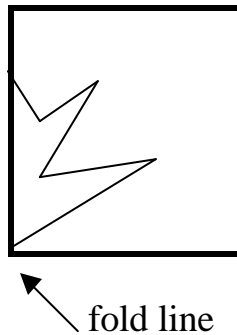
If we cut out the figure and open it up, what do you think it will look like? Pause, give the students time to draw, then have the students cut out the figure and open it up. They should **not** cut the fold line.



Say:

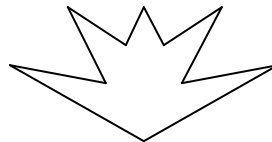
Fold the second sheet of paper in half. Draw this figure.

⇒ Draw a figure like this one.



Say:

If we cut out the figure and opened it up, what do you think it would look like? Draw your picture. Once you have drawn the picture, cut out the figure and open it up. Do not cut the fold line.

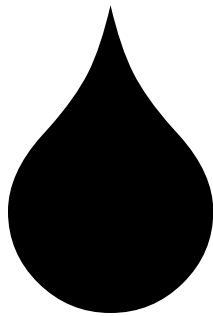


Say:

Symmetry is a part of our everyday lives. When you sew from a pattern, you often lay the pattern piece on a fold line and cut the pattern out. Both sides will match exactly.

⇒ Have one student summarize today's lesson. Make sure that the students understand the difference in *similarity* and *congruence*.

Student Sheet 35 (Geometry: Lesson 4)



B

I

F

J

J

Student Sheet 36 (Geometry: Lesson 4)

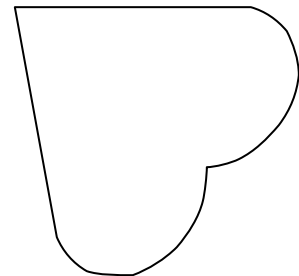
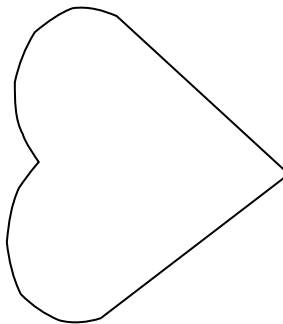
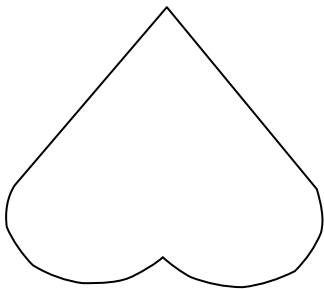
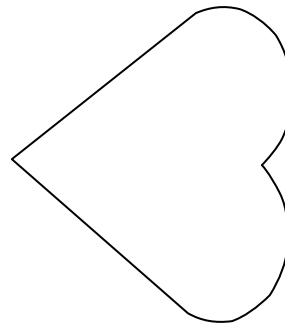
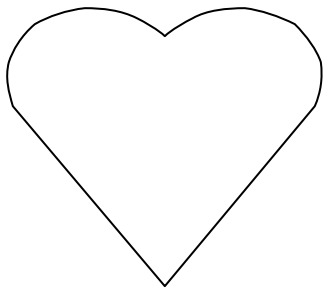
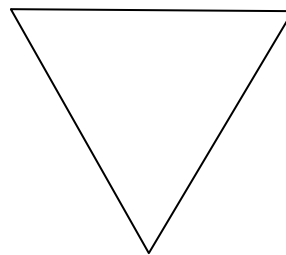
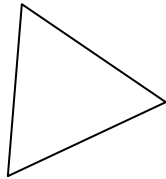
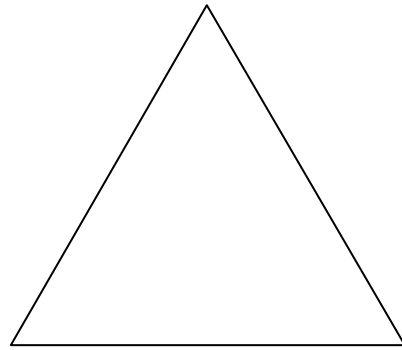
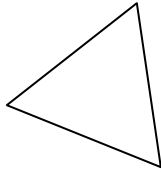
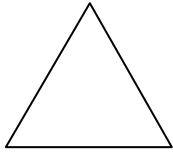
B I F

1. **M** 2. **H** 3. **X**

4. **G** 5. **Z** 6. **U**

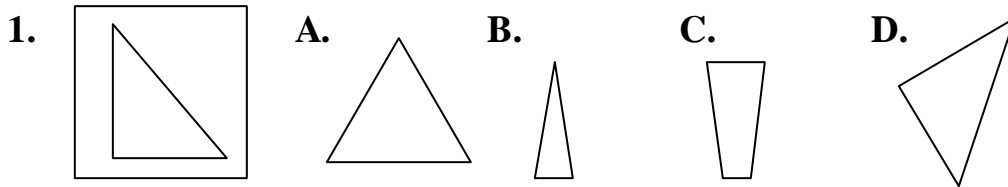
7. **C** 8. **L** 9. **T**

Student Sheet 37 (Geometry: Lesson 4)



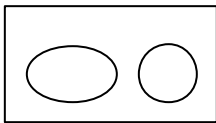
Student Sheet 38 (Geometry: Lesson 4)

Look at the figure in the box. Which figure in the row is similar to the figure in the box?

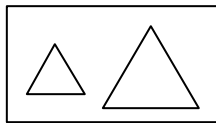


In each pair of figures below, are the figures similar. Circle yes or no.

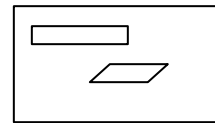
2. YES / NO



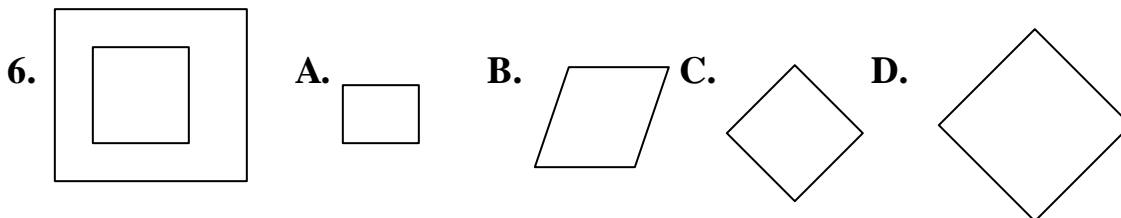
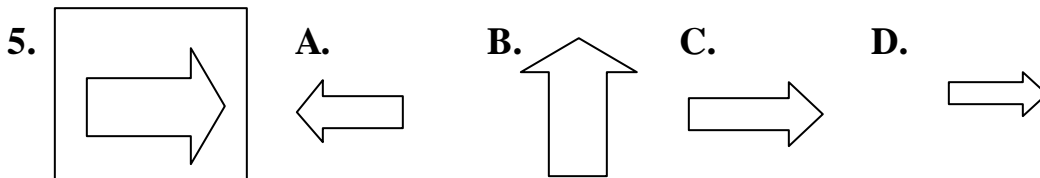
3. YES / NO



4. YES / NO

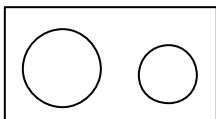


Look at the figure in the boxes below. Which figure in the row is congruent to the figure in the box?

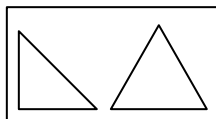


Do the figures in each box appear to be congruent? Circle yes or no.

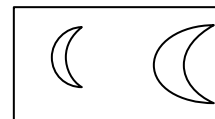
7. YES / NO



8. YES / NO



9. YES / No



10. **If you wrote no on any of the pairs of figures in 7 – 9, are any of the pairs of figures similar? Explain your answer.**