

## Grade 8 Mathematics

### Patterns, Relations and Functions: 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 ( $\downarrow$ ) by them.

#### *Purpose of Lesson 4:*

- In this lesson, the tutor and the students will
  - ✓ recognize patterns involving objects or figures,
  - ✓ identify missing shapes in a sequence or pattern of geometric shapes, and
  - ✓ determine how many shapes would be present if a pattern continued.

#### *Equipment/Materials Needed:*

- Copies of Student Sheets 79 – 81
- Paper and pencils
- Chalkboard

#### *Preparations before beginning Lesson 4:*

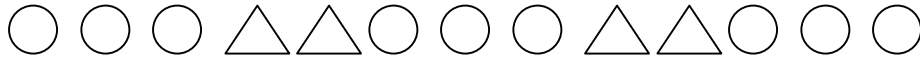
- Run copies of Student Sheets 79 – 81 for each student.
- Have paper and pencils available.

## Lesson 4: Patterns

Say:

**Today, we are going to find missing shapes in a pattern.** Note: It is important to do Lesson 1 in Patterns before doing this lesson.

**Suppose I draw a pattern like this one on the board.**



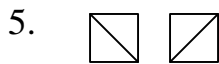
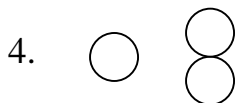
**What shape would come next in the pattern?** (triangle) **What shape would come after the triangle in the pattern?** (another triangle) **Suppose I put my hand over part of the pattern. What shapes are missing?** Cover up the 3<sup>rd</sup> circle and the first triangle. (circle, triangle) Cover up some other parts and see whether they can tell you what shapes are missing.

Give students Student Sheet 79.

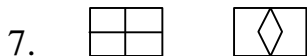
Answers: The answers on this sheet may vary. Sometimes students see different patterns. For example, on number 1, some students might think that this pattern is a growing pattern. They might see 2 planes, 1 bus, 3 planes, 1 bus, 4 planes, 1 bus, etc. If this pattern is the pattern a student is seeing, that student would answer *plane*, then *bus*. As long as the students can explain what they are seeing, accept the pattern.

Answers:

1. Bus, plane
2. Straight face, frown
3. Two eyes



6. 1 finger, 2 fingers, 5 fingers



8. ¢ ¢ \$

Give students Student Sheet 80.

Say:

**Sometimes we can recognize a pattern and figure out what would happen if we continued the pattern.**

Discuss problem 1. You want them to see that for every 4 circles, you draw 2 squares, and that for every 2 squares, you draw 4 circles, etc. In problem 2, a third figure is introduced into the pattern. Now for every 1 circle, there are 2 squares and for every 1 circle there are 3 triangles. Also for every 2 squares, there are 3 triangles. Problem three continues with 3 different figures.

Answers:

- A. circle      B. 12 circles      C. 16 circles      D. 20 circles
- A. circle      B. 2 squares      C. 8 squares      D. 12 squares  
E. 18 triangles
- A. circle      B. 3 squares      C. 12 squares      D. 9 squares  
E. 3 triangles

Say:

**Sometimes patterns extend in more than one direction.** Draw this pattern on the board.

|   |   |   |
|---|---|---|
| ○ | △ | □ |
| △ | □ | ○ |
| □ | ○ | △ |

Say:

**What patterns do you see in this figure?** (There are many, but here are some answers.)

On the 1<sup>st</sup> row, we have ○ △ □.

On the 1<sup>st</sup> column, we have ○ △ □.

On the diagonal, starting with a △, we have 2 △'s.

On the diagonal starting with a □, we have 3 □'s.

On the diagonal starting with a ○, we have 3 ○'s.

We have 3 of every figure.

Say:

**Look at this pattern of colors.** Draw this pattern on the board.

|      |      |      |      |
|------|------|------|------|
| Red  | Blue | Blue | Red  |
| Blue | Blue | Red  | Blue |
| Blue | Red  | Blue | Blue |
| Red  | Blue | Blue | Red  |

**Cover up the blue square in the second row and second column. What color do you think I have covered up? (blue) Explain why you think that color.** (Some students will see the red, blue, blue, red, blue, blue pattern. Some will see the blues on a diagonal.) Continue covering up different squares. Ask students to tell you what color is covered.

] Give students Student Sheet 81. Have them find the missing objects.

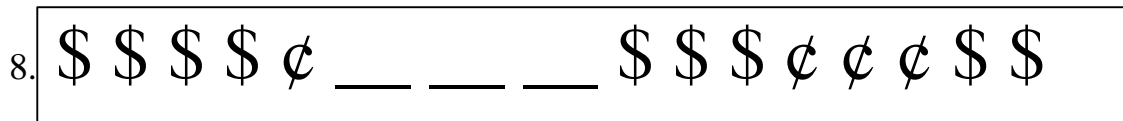
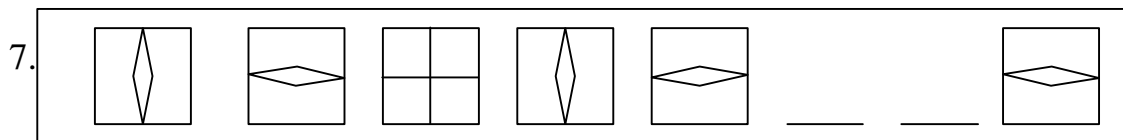
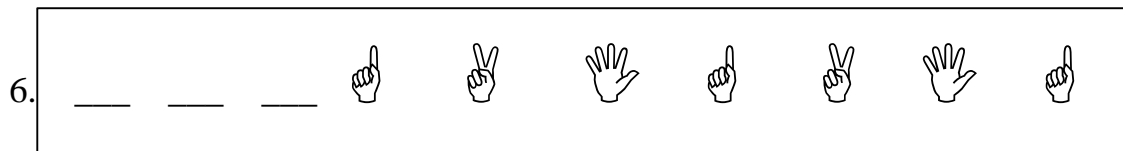
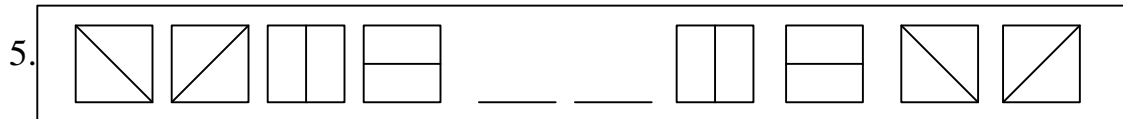
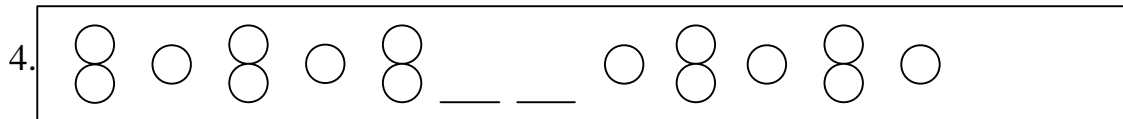
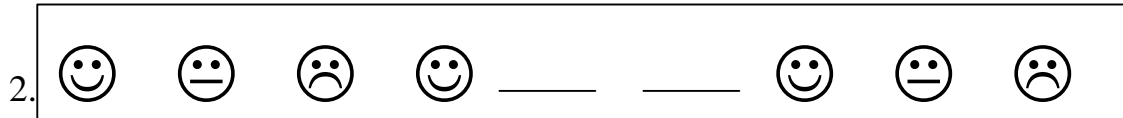
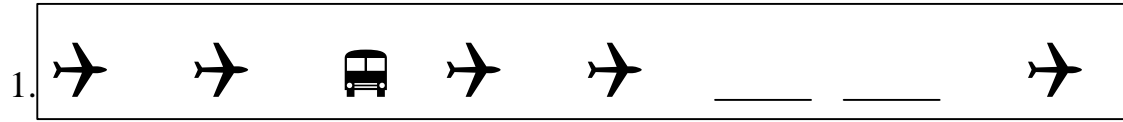
Answers:

1. 3<sup>rd</sup> row – smiling face  
4<sup>th</sup> row – frowning face
2. 2<sup>nd</sup> row – black square  
4<sup>th</sup> row – black circle
3. 3<sup>rd</sup> row – Z  
4<sup>th</sup> row – Y
4. 3<sup>rd</sup> row – -  
4<sup>th</sup> row – -

] Have one student summarize today's lesson. Analyzing patterns involving geometric shapes can improve spatial abilities in students.

Student Sheet 79 (Patterns: Lesson 4)

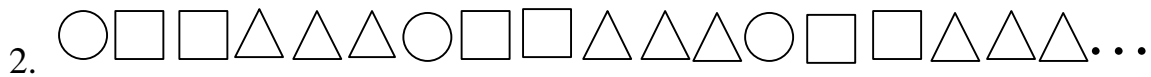
Look at the patterns in each row. What shapes are missing in each row?



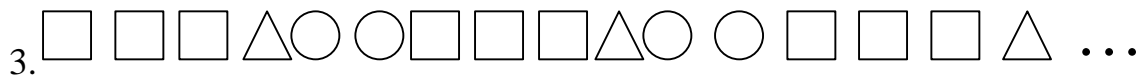
**Student Sheet 80 (Patterns: Lesson 4)**



- A. If we continued this pattern, what figure would come next?
- B. If we continued this pattern until there were 6 squares, how many circles would we have?
- C. If we continued this pattern until there were 8 squares, how many circles would we have?
- D. If we continued this pattern until there were 10 squares, how many circles would we have?



- A. If we continued this pattern, what figure would come next?
- B. For each one circle, how many squares are there?
- C. If we continued this pattern until there were 4 circles, how many squares would we have?
- D. If we continued this pattern until there were 6 circles, how many squares would there be?
- E. If we continued this pattern until there were 6 circles, how many triangles would there be?



- A. If we continued this pattern, what figure would come next?
- B. For each of the two circles, how many squares are there?
- C. If we continued this pattern until there were 4 triangles, how many squares would we have?
- D. If we continued this pattern until there were 6 circles, how many squares would there be?
- E. If we continued this pattern until there were 6 circles, how many triangles would there be?

**Student Sheet 81 (Patterns: Lesson 4)**

**Find the missing shapes. Be ready to explain your answers.**

1.

|  |   |   |  |
|--|---|---|--|
|  |   |   |  |
|  |   |   |  |
|  | ? |   |  |
|  |   | ? |  |

2.

|   |  |   |  |
|---|--|---|--|
|   |  |   |  |
|   |  | ? |  |
|   |  |   |  |
| ? |  |   |  |

3.

|   |   |   |   |
|---|---|---|---|
| X | Y | Z | X |
| X | Y | Z | Y |
| X | Y | ? | Z |
| X | ? | Z | X |

4.

|   |   |   |   |
|---|---|---|---|
| → | ↓ | ← | ↑ |
| ↓ | ← | ↑ | → |
| ← | ↑ | → | ? |
| ? | → | ↓ | ← |