

Grade 4 Mathematics

Geometry: Lesson 2

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 2:

- In this lesson, the tutor and the students will
 - ✓ identify, draw, or name 2-dimensional figures (circles, triangles, quadrilaterals, rectangles, squares, rhombuses, pentagons, hexagons, and octagons);
 - ✓ describe the properties of the figures above (number of sides, number of angles, length of sides, whether there are right angles, and whether sides are parallel);
 - ✓ identify and name 3-dimensional figures (cylinder, cone, cube, pyramid, and sphere); and
 - ✓ **determine how many or what shapes are found in a geometric figure.**

Equipment/Materials Needed:

- Copies of Student Sheets 48 – 51
- A cylinder, cone, cube, pyramid, and sphere. You can use objects from the real world or borrow these from a mathematics teacher.
- Two paper clips or zip lock bags for each student

Preparations before beginning Lesson 2:

- Run off copies of Student Sheet 48. Cut out the figure names and the figures. Put each set in a zip lock bag, or paper clip each set together.
- Run off 1 copy of Student Sheets 49 and 50 for each student.
- Run off 1 copy of Student Sheet 51 for each student. Cut out the shapes and figure names. Put each set in a zip lock bag, or paper clip them together.

Lesson 2: Geometry

Say:

In the last lesson, we looked at points, lines, line segments, and angles. If we put line segments together, we can make geometric figures. We can make flat figures, figures that have two dimensions – length and width. These figures – such as squares and triangles – are called *plane figures*. We can also make figures that have three dimensions. These figures have length, width, and height. These figures - such as cubes and cones - are called *solid figures*.

⇒ Give out the shapes from Student Sheet 48. Do not give out the names yet.

Say:

All of the shapes that I have given you are polygons. Tell me some things about polygons. (It is important that the students notice that the sides are straight lines (really segments), that the figures have at least 3 sides, and that the figures are closed figures, or figures whose ends are connected.)

⇒ Draw a figure like this one.



Ask:

Is this figure a polygon? (No. It is not closed; the ends are not connected.)

⇒ Draw a circle.



Ask:

Is this figure a polygon? (No. It does not have straight sides.)

⇒ Draw a figure like this one.



Ask:

Is this figure a polygon? (Yes.) The students may have thought that the sides have to be the same length. They do not.

Say:

Sort your figures by the number of sides. (The students should have 4 triangles (8, 9, 10, 15); 5 figures with 4 sides (1, 2, 3, 4, 11); 2 figures with 5 sides (5, 12); 2 figures with 6 sides (6, 13); and 2 figures with 8 sides (7, 14))

⇒ Give the students the names of the figures.

Say:

Let's look at our 3-sided figures. Find the name for 3-sided figures. (triangle) **How many angles do triangles have?** (3) **Which has a right angle?** (#9) **How do you know it is a right angle?** (It has a square corner.) **Do triangles have any parallel lines?** (No.) **What is special about triangle 8.** (All the sides are the same length.) **What is special about triangle 15?** (Two of the sides are the same length.)

Say:

Put the triangles on the side for now. Let's look at the figures with 5 sides. Find the name for 5-sided figures. (pentagon) **How many angles do pentagons have?** (5) **What is different about the 2 pentagons?** (#5 has sides that are the same length; #12 has some right angles and some parallel sides.) **Do pentagons have parallel sides?** (They could, but they don't have to.) You want to get the idea across that pentagons can look very different, but they all have 5 sides and 5 angles.

Say:

Put the pentagons on the side. Let's look at figures with 6 sides. Find the name for 6-sided figures. (hexagon) **How many angles do hexagons have?** (6) **How are the 2 hexagons different?** (#6 has sides that are the same length and has some parallel lines; #13 has a right angle with no parallel sides.) Again, you want them to see that hexagons can look very different.

Say:

Put the hexagons on the side. Let's look at the figures with 8 sides. Find the name for 8-sided figures. (octagon) **How many angles do octagons have?** (8) **How are the two octagons different?** (#8 has sides that are all the same length and some parallel sides; #14 has no parallel sides and the sides are not the same length.)

Say:

Put the octagons to the side. What figures are we left with? (Response: 4-sided figures) Some 4-sided figures have more than one name. All four sided figures are called *quadrilaterals*. They can look very different, just as pentagons and hexagons can; but they all have 4 sides and 4 angles. In some quadrilaterals, the opposite sides are parallel. Find the 4-sided figures that have opposite sides parallel. (#2, #3 and #4) These figures are quadrilaterals, but also have other names. Two of the three figures have 4 right angles. Put those in front of you. (#2 and #3) How are the figures alike? (They both have 4 sides and 4 angles; the opposite sides are parallel; and all of the angles are right angles.) Four-sided figures that have opposite sides parallel and 4 right angles are called *rectangles*. Both of these are rectangles. How are the 2 figures different? (#3 has sides that are all the same length.) This figure has another name, it is called a *square*. We have found that a rectangle can be called a rectangle and a quadrilateral. What are the other names for a square? (rectangle and quadrilateral.)

Say:

Put all of the three 4-sided figures with opposite sides parallel in front of you. (#2, #3, and #4) Two of these figures have sides that are the same length. Place them in front of you. (# 3 and # 4) How are they alike? (They have 4 sides and 4 angles; all sides are the same length; and opposite sides are parallel.) Four-sided figures that have opposite sides parallel and have all sides the same length are called *rhombuses*, so these two figures also have the name of rhombus. How are they different? (#3 has right angles.) We have already named that one. It is a square, so a square can also be called a rhombus.

⇒ Place the square in front of you.

Say:

What are all the names for a square? (Square, rectangle, rhombus, parallelogram, and quadrilateral.)

⇒ Give Student Sheet 49 to the students. Allow the students 3–5 minutes. Then talk about each one.

These are some responses:

1) 3, triangle

2) 4; They should tell you square; rectangle (because it has opposite sides parallel and 4 right angles); rhombus (because opposite sides are parallel and all sides are the same length); and quadrilateral (because it has 4 sides.)

3) 5, pentagon

4) 8, octagon

5) 6, hexagon

6) 4, rhombus and quadrilateral

⇒ Now give Student Sheet 50. You want to make sure that they realize that you should also count the squares because they are also rectangles, just special ones.

1) 5 rectangles

2) 3 rectangles

Number 3 will take a little time.

3) B and C are triangles. They both have 3 sides; the sides are straight; and the sides are connected. A is not a triangle, because the sides are not connected. D is not a triangle because it does not have straight lines.

⇒ Give the cut up pieces of Student Sheet 51 to the students. Place the cylinder, cube, cone, pyramid, and sphere in front you. It is really important that you have some sort of 3-dimensional objects. The mathematics teacher should be able to lend you some.

Say:

Look at the objects in front of me. How are they different from the polygons we were working with? (They are not flat, they have a height, and they are made up of flat figures.) You have the pictures and names of these objects. When I hold up an object, find the picture and the name.

⇒ Hold up the cube. You can use a box, but all of the faces have to be squares.

Say:

What object am I holding? Place the picture of it in front of you. What is its name? (cube) What plane figures do you see in it? (squares) How many squares make up the cube? (6)

⇒ Hold up the cylinder. You can use a can.

Say:

What object am I holding? Place the picture of it in front of you. What is its name? (cylinder) Do you see any flat figures in it? (circles)

⇒ Hold up the cone. You can use an ice cream cone or a party hat.

Say:

What object am I holding? Place the picture of it in front of you. What is its name? (Cone) Do you see any flat figure in it? (A circle)

⇒ Hold up the pyramid. It is hard to find a pyramid. This one you may have to borrow from a mathematics teacher.

Say:

What object am I holding? Place the picture of it in front of you. What is its name? (pyramid) Do you see any flat figures in it? (triangles, and possibly a square) This answer can vary. A pyramid has to have faces that are triangles, but it can have a base that is a triangle, a square, a pentagon, etc.

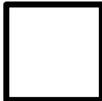
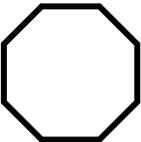
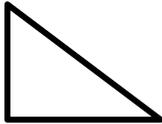
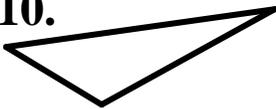
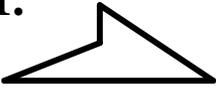
⇒ Hold up the sphere. You can use a ball.

Say:

What object am I holding? Place the picture of it in front of you. What is its name? (sphere) Do you see any flat figures in it? (No.)

⇒ Have one student summarize today's lesson.

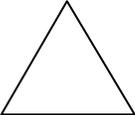
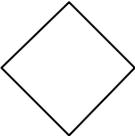
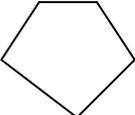
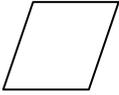
Student Sheet 48 (Geometry: Lesson 2)

Triangle	Quadrilateral	Rectangle
Rhombus	Square	Pentagon
Hexagon	Octagon	
1. 	2. 	3. 
4. 	5. 	6. 
7. 	8. 	9. 
10. 	11. 	12. 
13. 	14. 	15. 

Student Sheet 49 (Geometry: Lesson 2)

How many sides does each figure have? Name each shape with all of the names that describe it. The names are in the box below.

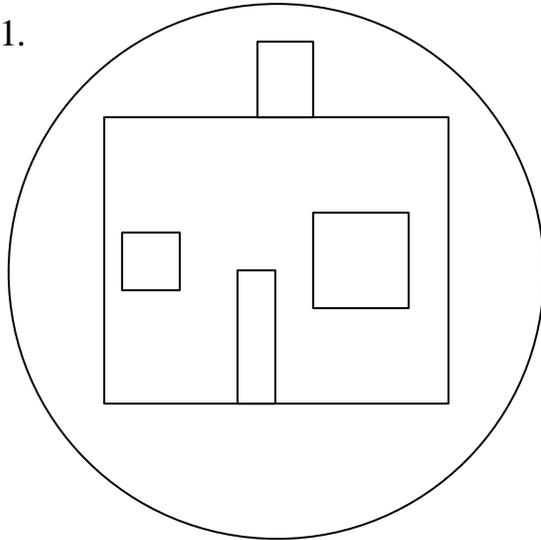
Triangle Rectangle Pentagon Circle Octagon
Hexagon Quadrilateral Rhombus Square

	Number of Sides	Name(s)
1. 	_____	_____
2. 	_____	_____
3. 	_____	_____
4. 	_____	_____
5. 	_____	_____
6. 	_____	_____

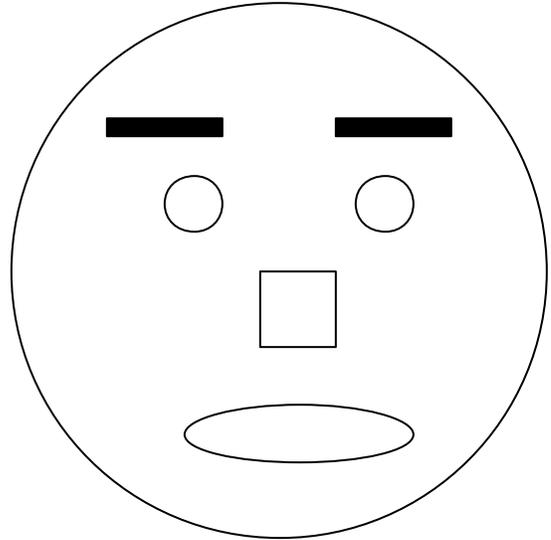
Student Sheet 50 (Geometry: Lesson 2)

How many rectangles are in the following figures?

1.



2.

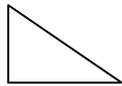


3. Which of the following are triangles? Explain in writing why you think each is or is not a triangle.

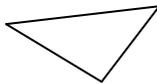
A.



B.



C.



D.



Student Sheet 51 (Geometry: Lesson 2)

Cylinder	Cone	Cube
Pyramid	Sphere	