# Making “Bigger” Shapes with Smaller Shapes

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| This lesson calls for students to compose congruent hexagons using smaller pattern block pieces. They will explain which arrangements of pattern block pieces compose a congruent hexagon, and count the number of smaller pieces that compose the “bigger” shape. |

Common Core Standard:

**Analyze, compare, create, and compose shapes.**

**NC.K.G.6** Compose simple shapes to form larger shapes.

Additional/Supporting Standard(s):

**Describe and compare measureable attributes.**

**NC.K.MD.2** Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference.

Count to tell the number of objects.

**NC.K.CC.4** Understand the relationship between numbers and quantities.

* When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (one-to-one correspondence).
* Recognize that the last number named tells the number of objects counted regardless of their arrangement (cardinality).
* State the number of objects in a group, of up to 5 objects, without counting the objects (perceptual subitizing)

Standards for Mathematical Practice:

* 1. Make sense of problems and persevere in solving them
1. Model with mathematics
2. Use appropriate tools strategically
3. Attend to precision

Student Outcomes:

* I can compose a congruent hexagon using smaller pattern block pieces.
* I can explain which different arrangements of smaller pattern block pieces compose a congruent hexagon.
* I can count, in the correct sequence, the number of smaller pieces that compose a “bigger” shape
* I understand that the last number I count is the cardinal number (The last number identifies the quantity of the collection and includes all the numbers that come before it.)
* I can compose the different congruent hexagons I made by gluing paper pattern blocks onto a separate sheet of paper.

Materials:

* Bags of pattern blocks per student including 2 hexagons, 16 triangles, 6 rhombus, 4 trapezoids
* A large collection of paper pattern blocks for recording the different congruent hexagons composed
* Glue sticks
* Blank sheets of paper
* Crayons to match the colors of the pattern blocks
* Trapezoidal grid paper

Advance Preparation:

* Use the collection of pattern blocks to create as many congruent hexagonal shapes as possible
* Prepare the bags of pattern blocks for each student including 2 hexagons, 16 triangles, 6 rhombus (rhombi is the plural of rhombus), 4 trapezoids
* Prepare paper pattern blocks or provide a copy of the triangular grid paper included in this lesson. (This is a wonderful opportunity for a parent volunteer to cut them using a die-cut or cutting with scissors from the attached blackline masters.)
* Gather glue sticks and blank paper.
* Prepare paper strips with the mathematical vocabulary words you will use and want students to learn, such as triangle, rhombus, trapezoid, hexagon, congruent, equal to, same shape as, pattern blocks

Directions:

1. Distribute the pattern blocks to each student and ask them to find their work space.
2. Allow time for students to explore how the pattern blocks “fit” together.
3. Move among the students asking questions about their shapes, the names of pieces they used to create the shape, and how they would describe it to a friend.
4. When students have had adequate time for exploration (The amount of time required will vary based upon their previous experiences with pattern blocks.)
5. Reconvene the class as a whole group. Show a shape and ask students if they know the name of the shape. Repeat this with the shapes you will use in the task: hexagons, trapezoids, rhombi, and triangles. As you present a shape, show the corresponding paper strip with the word printed on it. (This helps students connect the spoken and written mathematical vocabulary. After the lesson you may want to post these vocabulary strips on your word wall.)
6. Ask the students to describe different ways to make a shape congruent with the hexagon. You may need to model this for students and explain the meaning of congruent. (Two objects are congruent if they have the same dimensions and shape. Two figures are congruent if they are identical in form; coinciding exactly when superimposed.)
7. Assign pairs of students to work together using one bag of pattern blocks between them.
8. Once students have found all of the possible ways to make a shape congruent with a hexagon, reconvene the class as a whole group.
9. Ask the groups to leave their creations and reconvene as a whole class. Invite students to use your set of pattern blocks to create and describe the different compositions of congruent hexagons.
10. Reference any other math vocabulary that connects with this lesson and engage and invite students in reading them with you.

Questions to Pose:

Before:

* Tell me what you know about pattern blocks. (This helps you understand the students’ prior knowledge about pattern blocks. It will also give you an understanding of the mathematical vocabulary.)
* Tell me the names of each shape as you hold it up or present it on the smart board. (You might also want to make large paper shapes to make it easier for students to see them.) This information will be useful in asking questions of students as they work as individuals and pairs.
* What kinds of things do you want to do with the pattern blocks?

During:

* Tell me what you have learned about pattern blocks. (You may want to document what students share with you so that you can plan the next question(s) and/or lesson.)
* What discoveries have you made about pattern blocks? (You might expect students to tell you that two triangles make a rhombus, one triangle and one rhombus are equal to a trapezoid, six triangles are equal to one hexagon, etc.) At this time you might introduce the word and meaning of congruency. (Two objects are congruent if they have the same dimensions and shape. Two figures are congruent if they are identical in form; coinciding exactly when superimposed.)
* Which of the shapes do you know the “math” word that describes it?

After:

* Tell me what you have learned when worked with the pattern blocks. (You may want to document what students share with you so that you can plan the next question(s) and/or lesson.)
* What discoveries have you made about pattern blocks? (You might expect students to tell you that two triangles make a rhombus, one triangle and one rhombus are equal to a trapezoid, six triangles are equal to one hexagon, etc.) At this time you might introduce the word and meaning of congruency. (Two objects are congruent if they have the same dimensions and shape. Two figures are congruent if they are identical in form; coinciding exactly when superimposed.)
* Which of the shapes do you know the “math” word that describes it? (You may want to document what students share with you so that you can plan the next question(s) and/or lesson.)
* Tell me things you learned while making shapes congruent with the hexagon? (You may want to document what students share with you so that you can plan the next question(s) and/or lesson.)
* Describe for me the shapes that are equal to other shapes. (You may want to document what students share with you so that you can plan the next question(s) and/or lesson.)

Possible Misconceptions/Suggestions:

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| **Possible Misconceptions** | **Suggestions** |
| Students may not know the proper mathematical word to label the pattern blocks. | Use appropriate mathematical vocabulary when talking about each shape. Associate the written words with the spoken words. Invite students to use a few of the words in their activities. |
| Students may have difficulty manipulating the shapes. | Create outlines of the shapes on paper and laminate or place them in page protectors. Give these to students as a “pattern” for composing congruent shapes. |
| Students are not likely to know the meaning of congruent. | Use this word in the context of creating congruent shapes as 2 triangles to form a rhombus, 3 rhombi to form a hexagon. Have different students to repeat after you the appropriate use of the word and to describe what it means. (Two objects are congruent if they have the same dimensions and shape. Two figures are congruent if they are identical in form; coinciding exactly when superimposed.) |

**Special Notes:**

This activity merits repeating multiple times so that students will truly understand the shapes that are congruent and can name and describe those that are.

**Large Triangle to Reproduce for Demonstration**

**Large Trapezoid to Reproduce for Demonstration**

##### Large Rhombus to Reproduce for Demonstration

##### Large Hexagon to Reproduce for Demonstration