## Area Comparison and Justification – Formative Assessment

| **Frameworks Cluster** | Reasoning with Area and Surface Area |
|---|---|
| **Standards** | **NC.6.G.1** *Create geometric models to solve real-world and mathematical problems to:* <br> ● *Find the area of triangles by composing into rectangles and decomposing into right triangles.* <br> ● *Find the area of special quadrilaterals and polygons by decomposing into triangles or rectangles.* <br> **SMP 1** *Make sense of problems and persevere in solving them.* <br> **SMP 2** *Construct viable arguments and critique the reasoning of others.* <br> **SMP 4** *Model with mathematics.* <br> **SMP 5** *Attend to precision.* <br> **SMP 6** *Use appropriate tools strategically.* |
| **Materials/Links** | ● Recording sheet (can be given to each individual student or can be displayed for the students to answer on their own) <br> ● Have grid paper available as a tool for students to use |
| **Learning Goal** | Students can justify the relationships between areas of rectangles, parallelograms, and triangles with the same dimensions. |

## Task Overview:

This formative assessment task provides the teacher an opportunity to determine student understandings about area after investigating the relationships between the area of rectangles, parallelograms, and triangles.

## Prior to Lesson:

● Students should have reviewed how to find the area of rectangles and learned how to find the area of triangles and parallelograms, through the lessons *Parts and Pieces, Area of Rectangles and Parallelograms, Area of Triangles,* and *Creating a Triangular Flag* (or other similar tasks).
● Make one copy of the recording sheet for each student (if desired).
● Be sure students have access to graph paper as a tool (without it being directly given to them for the activity).

## Teaching Notes:

This formative assessment task can be used after doing the *Parts and Pieces, Area of Rectangles and Parallelograms, and Area of Triangles* lessons.

**Directions:**
● Pose the question to your students. You may use the recording sheet for students to show their thinking, however, you could also project the question and have them do their work on a separate sheet of paper.
● Students should have access to similar tools that they have used in previous lessons to investigate the area of triangles and parallelograms. These may include graph paper, scissors, and geoboards.
● To follow up this formative assessment, consider leading a whole-group discussion of various methods students used to compare the areas and make connections between the strategies. Consider using the Class Discussion Planner (https://tinyurl.com/discussion-planner) to guide your discussion.

Lesson plan template adapted from *Taking Action: Implementing Effective Mathematics Teaching Practices*, NCTM, 2017

## Student sheet on next page.

Name _____

Date_____

# Area Comparison Justification

**Student Recording Sheet**

**Danielle says that the following three shapes have the same area:**
A rectangle with a base of 3 and a height of 4
A parallelogram with a base of 4 and a height of 3
A triangle with a base of 3 and a height of 4

**Is she correct?**
**Justify your answer, whether you agree or disagree with her.**

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**Work Area:**

## Possible Strategies/Anticipated Responses:

- The area of the rectangle is 12, the area of the parallelogram is 12, the area of the triangle is 6, so she is incorrect; however, based on the relationships that have been found between the shapes (the area of a triangle is ½ the area of a rectangle or parallelogram with the same base and height), the student does not necessarily have to determine the area to answer this problem.
- Students who answer the question by finding the area of each shape may forget that the area of a triangle is <u>half</u> of the area of the rectangle or parallelogram that has the same dimensions, leading them to believe that all three shapes have the same area.
- If students are correctly finding the area of the rectangle and parallelogram but not the triangle, consider having students take a rectangle that is 5 units by 8 units and cut it in half. Ask the student what the area of the rectangle is and what the relationship is between the original rectangle and the new triangle. In doing this, incorporate discussion about the triangle that is created from the rectangle and its dimensions. Depending on the students' needs, a reinforcement day may be necessary to clarify the concepts and provide more practice before moving on to the rest of the cluster.
- Students may not initially notice that the areas of the rectangle and parallelogram are the same from just the given dimensions, as the bases and heights are interchanged. Given that the base and height of any shape meet at a right angle, it is possible for the dimensions of the rectangle and parallelogram to be swapped because the commutative property of multiplication allows factors to be multiplied in any order. If this misconception occurs, use a physical model of a shape to demonstrate that rotations do not impact the dimensions of a figure.
- Students should have the opportunity to (and be encouraged to) approach this problem in multiple ways, which could include:
  - Using grid paper to sketch the shapes and then cut and manipulate them.
  - Using grid paper to sketch the shapes and then model how the shape can be decomposed and then re-composed into a new shape to determine the area.
  - Use the relationships between rectangles, triangles, and parallelograms to explain that since triangles are half of the area of the rectangle or parallelogram with the same base and height, a triangle with the same dimensions must have a different area than the given rectangle and parallelogram, regardless of the numbers given.