**PRACTICE TASK**: **My Many Triangles** Return to Task Table

Adapted from Van de Walle, J.A., Karp, K. S., & Bay-Williams, J. M. (2010). *Elementary and Middle School Mathematics: Teaching Developmentally* 7th Ed. Boston: Pearson Education, Inc., p. 413-414.

**TASK CONTENT:** Students will classify triangles by their angles and length of sides.

## STANDARDS FOR MATHEMATICAL CONTENT

**MGSE4.G.1** Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

**MGSE4.G.2** Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

## STANDARDS FOR MATHEMATICAL PRACTICE TO BE EMPHASIZED

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

## BACKGROUND KNOWLEDGE

Students should be able to identify triangles by the lengths of their sides (isosceles, equilateral, and scalene) as well as by the measure of their angles (right, obtuse, and acute) by using a right angle as a benchmark.

## ESSENTIAL QUESTION

- How can angle and side measures help us to create and classify triangles?

## MATERIALS

- "My Many Triangles" student recording sheet
- "My Many Triangles, Triangles to Cut and Sort" student sheet
- White construction paper (one sheet per student or per pair of students)

- Colored construction paper cut into strips $\frac{1}{4}$" wide (each student will need approximately 10 strips of paper)

## GROUPING

Individual/Partner Task

## NUMBER TALKS

Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. Catherine Fosnot has developed problem "strings" which may be included in Number Talks to further develop mental math skills. See *Mini-lessons for Operations with Fractions, Decimals, and Percents* by Kara Louise Imm, Catherine Twomey Fosnot and Willem Uittenbogaard. (*Mini-lessons for Operations with Fractions, Decimals, and Percents*, 2007, Kara Louise Imm, Catherine Twomey Fosnot and Willem Uittenbogaard)

## TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

This task requires students to sort triangles according to common attributes and then create triangles according to two properties. This performance task may be used as formative assessment following the "Thoughts About Triangles" task.

**Part 1**
**Task Directions**

Cut out the triangles below. Sort the triangles into groups where every triangle fits in a group and every triangle belongs to only 1 group. Then sort the triangles in a different way. Record how you sorted the triangles and the number of the triangles in each group. Be able to share how you sorted the triangles.

The type of each triangle on the "My Many Triangles, Triangles to Cut and Sort" student sheet are shown below.

#1, #11 – obtuse scalene
#2, #7 – right scalene
#4, #13 – acute scalene
#5, #10 – right isosceles
#8, #12 – acute equilateral
#3, #9 – acute isosceles
#6, #14 – obtuse isosceles

**Part 2**
**Task Directions**

Use the strips of construction paper to create the triangles described in each box below. Use the row label and the column label to identify the properties required for each triangle. For example,

the box labeled "A" needs to be acute and isosceles because the row label is "Acute" and the column label is "Isosceles."

| | Equilateral | Isosceles | Scalene |
|---|---|---|---|
| Acute | | A | |
| Right | | | |
| Obtuse | | | |

Two triangles are not possible; for those, explain why each triangle is not possible on the lines below. Glue each triangle onto the construction paper and label it.

Allow students to struggle a little bit with this part of the task. Students may need to try out a few possibilities before finding that lengths of sides and measures of angles are two ways to sort these triangles so that each triangle belongs to exactly one group when sorted.

| Sorted according to side lengths | | Sorted according to angle measures |
|---|---|---|
| Equilateral triangles: 8, 12 | | Acute triangles: 3, 4, 8, 9, 12, |
| Isosceles triangles: 2, 3, 5, 6, 9, 14 | **or** | Right triangles: 2, 5, 7, 10 |
| Scalene triangles: 1, 4, 7, 10, 11, 13 | | Obtuse triangles: 1, 6, 11, 14 |

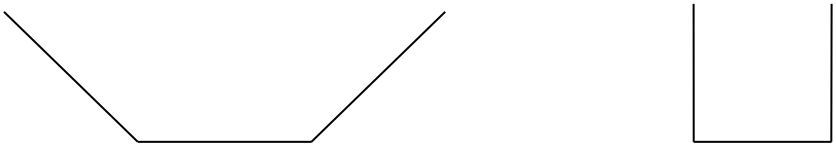
Students will need to be able measure the sides and use 90 degrees as a benchmark for determining the angle classification in order to create the required triangles (using a right angle as a benchmark and/or tracing angles to see if they are congruent).

Of the nine triangles, two are not possible.

- An equilateral right triangle is not possible because an equilateral triangle also has equal angle measures (equiangular). The sum of the angles in a triangle is equivalent to 180°, and $90° \times 3 = 270°$ which is more than 180°.
- An equilateral obtuse triangle is not possible because an equilateral triangle has equal angle measures (equiangular).

**Comments**

Students may need some assistance using the chart to identify the triangles they need to create. Be sure students understand they need to attempt to make nine different types of triangles, two of which are not possible to create. Encourage students to try to make an equilateral obtuse angle and an equilateral right triangle so that they can see that it is not possible to create a three-sided closed figure with two obtuse angles or two right angles. (See below.)



## FORMATIVE ASSESSMENT QUESTIONS

Part 1

- How do you know this is a(n) _____ (isosceles, right, equilateral, etc.) triangle?
- Are there any triangles that don't belong in a group?
- Are there any triangles that belong to more than one group?
- Can you think of another way to sort the triangles?
- What are some properties of this triangle? Can you use one of those properties to think of a way to group all of your triangles?

Part 2

- Can you create an equilateral right triangle? An equilateral obtuse triangle? How do you know?
- Is there a scalene equilateral triangle? How do you know?
- How do you know this is a _____ (i.e. scalene obtuse) triangle?
- How can you prove to us that this is a _____ (i.e. scalene obtuse) triangle?
- If it is a _____ (i.e. scalene obtuse) triangle, what is true about the length of its sides? The measures of its angles? Prove that the triangle you created has those attributes.
- Which students were successful at making the seven triangles with the strips of paper?
- Which students were able to measure segments and angles accurately?

## DIFFERENTIATION

**Extension**

- Challenge students to write directions for a triangle that they choose so that someone else could follow their directions and create the same triangle. Allow a partner to try these directions to see how successful they were at describing how to create their triangle.

**Intervention**

- Allow students to use a picture glossary or the triangles from Part 1 of this task to help them create the triangles for Part 2.

Intervention Table

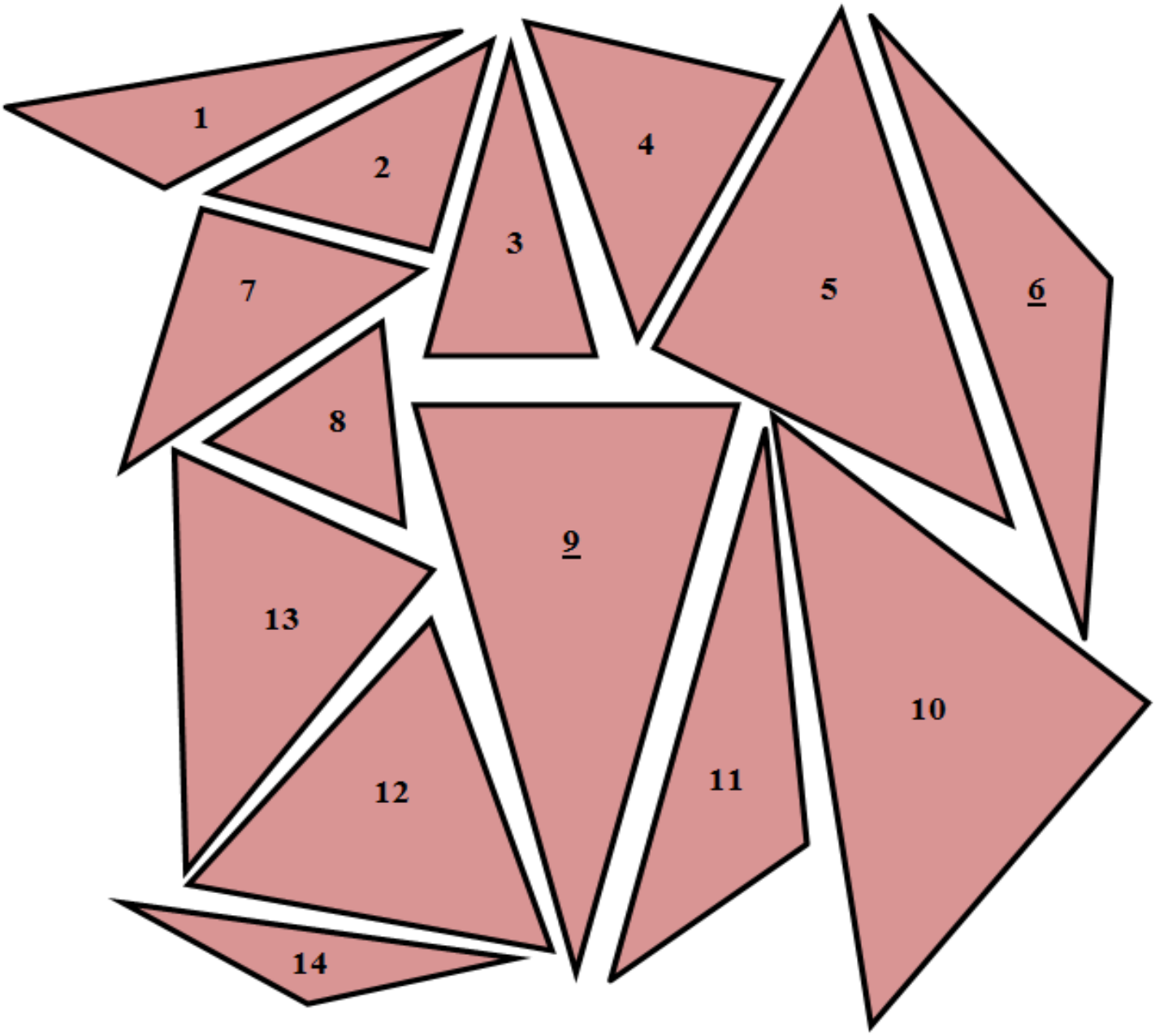
## TECHNOLOGY

- http://www.crickweb.co.uk/ks2numeracy-shape-and-weight.html#triangles Triangle Sort: This online activity sorts triangles by properties. It can be used for additional practice or for remediation purposes.
- http://www.basic-mathematics.com/types-of-triangles.html Types of Triangles: This online tutorial gives basic definitions of types of triangles. It can be used for remediation purposes.

# My Many Triangles

## Triangles to Cut and Sort

Cut out the triangles below. Sort the triangles into groups where every triangle fits in a group and every triangle belongs to only 1 group. Then sort the triangles in a different way. Record how you sorted the triangles and the number of the triangles in each group. Be able to share how you sorted the triangles.



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| Obtuse | | | |