PRACTICETASK: Tangling with Triangles

Adapted from Ohio Department of Education

Students will draw and use straws to make the three types of angles, within triangles.

STANDARDS FOR MATHEMATICAL CONTENT

MCC5.G.3 Understanding that attributes belonging to a category of two-dimensional figure also belong to all subcategories.

STANDARDS FOR MATHEMATICAL PRACTICE

SMP 1. Make sense of problems and persevere in solving them.
SMP 2. Reason abstractly and quantitatively.
SMP 6. Attend to precision.
SMP 7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students should be able to identify and draw all three types of triangles.

MISCONCEPTIONS

Students may have misconceptions that the orientation of an angle or the length of the sides of an angle determines the measure of the angles (NRC, 2001).

ESSENTIAL QUESTIONS

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

MATERIALS

- status of the class sheet (pre-assessment)
- dry spaghetti noodles
- 7 triangle pictures
- index cards
- ruler
- 3 straws per student
- chart paper
- angles (optional)

GROUPING

Whole/Individual/Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Angles are difficult, complicated figures for students to understand because they must be understood as a rotation from one place to the next, as a geometric shape, and a combination of both when measuring (NRC, 2001). Be prepared to help students identify individual angles in a triangle and deal with misconceptions about those angles.

TASK

Pre-Assessment

- Distribute three straws of equal length to each student.
- Ask each student to make a right angle with the straws. Next ask them to make an acute angle with the straws. Finally, direct them to make an obtuse angle.
- You can use the Status of the class sheet to document if students understand right, obtuse, and acute.

Part One

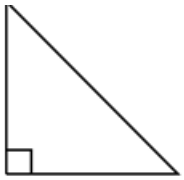
Prepare for the post-assessment by making an assortment of seven large triangles (acute, obtuse, and right). Number the triangles from 1-7 and display them around the room.

- Distribute *Triangle Measurements*, Attachment A, to each student. Explain the procedures of the activity. Small groups of students rotate around the room and view seven displayed triangles. Identify a non-verbal cue to signal rotation to the next triangle.
- Place the students into seven small groups. Assign each group to a triangle. Students analyze the angles of the triangles and identify the type of triangle.
- Instruct the students to write the type of triangle on the sheet and then raise their hands when ready to move to the next triangle.
- Rotate groups through the seven triangles and collect the sheets.

Instructional Procedure

1. Complete the pre-assessment.
2. Distribute Attachment B, *Triangle Angle Exploration* to each student.
3. Draw the following triangles on the board.

A. 

B. 

4. Ask students if they can classify the triangles on the board. Explain the use of the angle markings to indicate angles of equal or different measures. For example, Triangle A has two angles of equal measure (the two angles each with one curve) and one angle that is different (the top angle with no marking). Triangle B has a ninety degree measure (the square in the corner).
5. Ask students to individually classify the triangles of Attachment B, *Triangle Angle Exploration* into groups using characteristics of the angles. Do not suggest names for the categories prior to classifying. Ask students to explain their reasoning about classifying the triangles. Keep the conversation focused on the size of the angles (acute, right, obtuse) or angle relationship (equiangular) during this part of the lesson. Part Two of the lesson focuses on classifying triangles by sides within a triangle (scalene, isosceles, and equilateral). After 5 minutes, place students into groups of 3 or 4 to discuss how and why they classified the triangles the way that they did.
6. Ask students to suggest names for the categories. Use the names students suggest first and then give the mathematical name. For example, students might make a category for triangles whose angles are all equal and suggest "all equal angles" as the name. Write that name on the board and then write the mathematical name, equiangular.
7. Have students work in their groups to suggest triangles that can be moved into other categories. For example, the equiangular triangles are also acute triangles. Allow students a few minutes to examine the existing placements, then discuss different placements as a class.
8. Have each student use a straightedge to draw a triangle to represent an acute, obtuse, right, and equiangular triangle. Have each student share their triangles with their group to compare.
9. Create class definitions of acute, right, obtuse, and equiangular triangles. Record the generated definitions on chart paper and save them for Part Three of the lesson.
10. Collect the drawings the students created as they exit the room. Look for misconceptions and progress toward understanding types of triangles.

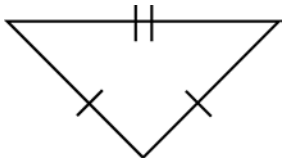
Part Two

- Using page 2 of *Triangle Measurements*, Attachment A, have students create each type of triangle by gluing uncooked spaghetti strands onto the paper.
- Students should mark congruent sides and angles if they draw the triangles.

Instructional Procedure

1. Distribute Attachment C, *Triangle Side Exploration,* to students. Ask students if they know what the triangle below represents. Explain the use of the slash marks to indicate sides of the same and different lengths. For example, explain to students that the following triangle has two congruent sides (the sides with one slash mark) and one side

that is a different length (the side with two slash marks).



2. Have students work in small groups to discover the commonalities of the triangles in Group1 on Attachment C, *Triangle Side Exploration.* Also have groups discuss how the triangles in Group 1 are different from the triangles in the other groups. Allow groups to work for about five minutes and then ask groups to share their thoughts. (The triangles in Group 1 all have two sides that are equal.) Ask students to create a class name for the group and then introduce the formal name of isosceles.

3. Repeat step 1 with the triangles in Group 2 and Group 3. The Group 2 triangles have three equal sides (equilateral triangles). The triangles in Group 3 (scalene triangles) have no sides that are the same. Again, ask students to create a class name for Group 2 and Group 3 and then share the mathematical label.

4. As a class, create definitions for each of the groups of triangles on Attachment C, *Triangle Side Exploration.* Record the class-selected title, the mathematical title, and the class- created definitions on chart paper and save them for Part Three of the lesson.

5. Ask students to write a response to the following prompt and collect their responses to check for understanding:

Describe the possible ways a triangle can be labeled if the measurements of the sides of a triangle are known.

Part Three

- Use page 3 of *Triangle Measurements,* Attachment A. Ask the students to draw the triangles requested.
- Students should mark congruent sides and angles.

Instructional Procedures

Create a set of note cards by writing the class-created definitions of the seven triangles on individual note cards. Separate the note cards into two piles, by angle measurements (acute, right, obtuse, and equiangular) and by side length (scalene, isosceles, and equilateral). Prepare these before class.

1. Divide students into small groups of three to five students.
2. Have each group choose two note cards, one from each stack of note cards.

3. Explain that each group is in charge of finding an accurate mathematical definition and the type of triangle created when both note cards are combined. For example, a group may have an acute scalene triangle, or a right obtuse triangle. Provide mathematical dictionaries or Internet resources for student access.
4. On the chart paper, each group should provide the following:
    - the mathematical term for the triangle;
    - the class-created definition;
    - an accurate mathematical definition pulled from a textbook or other reliable source; and
    - three different examples of the type of triangle.

1. Give the groups 15-25 minutes to find the information and write the required information on chart paper. Assist groups with their examples as necessary.
2. Distribute Attachment D, *Study Guide*. Explain to the students that this is going to be their study guide for their post-assessment. The study guide is for students to record the mathematical terms and definitions for each type of triangle. Remind students to include examples of each type of triangle on their study guides.
3. Have each group make a presentation. Stress to each group the importance of staying under five minutes.
4. Ask students to go over Attachment D, *Study Guide,* in pairs when all groups are finished. Explain that each pair needs to make sure that both people filled out the study guide correctly.

FORMATIVE ASSESSMENT QUESITONS

- Name at least one positive thing about today's lesson and one thing you will change.
- 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? Justify your answer.
- 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.

DIFFERENTIATION

Extension

- Have students research triangles. For example: How have triangles been used in architecture, science, engineering?
- Encourage students demonstrating understanding of classifying triangles to explore the relationship between angles and sides of a triangle in the real world. Provide research

opportunities to allow students to explore why triangles are used and how different professional jobs use them.

Intervention

- Have students who are having difficulty categorize triangles with a student who is more familiar.
- Complete the Study Guide ahead of time for the students who have difficulty writing. Leave out key words to be filled in by those students.
- Allow students to use spaghetti noodles or angles to recreate the triangles. This will allow the student to physically compare angle measures and lengths of sides.

TECHNOLOGY CONNECTION

- http://www.basic-mathematics.com/types-of-triangles.html Gives basic definitions for the types of triangles. Note: this web site contains advertising.
- http://www.k-5mathteachingresources.com/Geometry-Interactive-Whiteboard-Resources.htmlThis resource has a triangle sort activity in which can be used for additional practice or remediation purposes.
- http://www.crickweb.co.uk/ks2numeracy-shape-and-weight.html#trianglesPlay the game Triangle Sort for additional practice or for remediation purposes.

Triangle Measurements

Attachment A

Name _____ Date _____

Directions: Look at each triangle displayed in the room. Draw and label the triangle in the correscponding box. Classify each of the triangles as acute, right, obtuse, or equilateral and explain your choices.

Draw the triangle	Classify the triangle and explain your decision
Triangle 1	
Triangle 2	
Triangle 3	
Triangle 4	
Triangle 5	
Triangle 6	
Triangle 7	

Triangle Measurements-page 2

Attachment A

Directions: Create or draw the following triangles to represent angle measurements and side lengths.

Isosceles triangle
Scalene triangle
Equilateral triangle

Triangle Measurements-Page 3

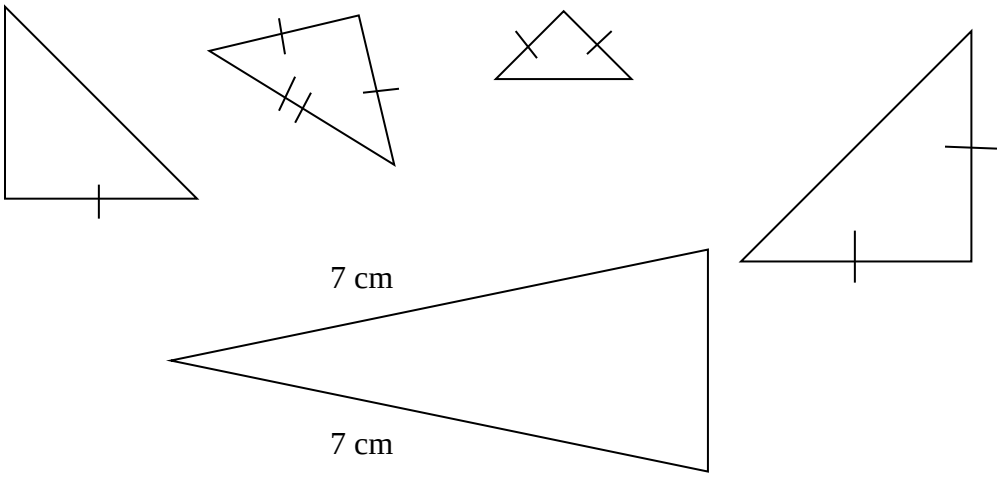
Attachment A

Directions: Draw the following triangles to represent angle measurements and side length.

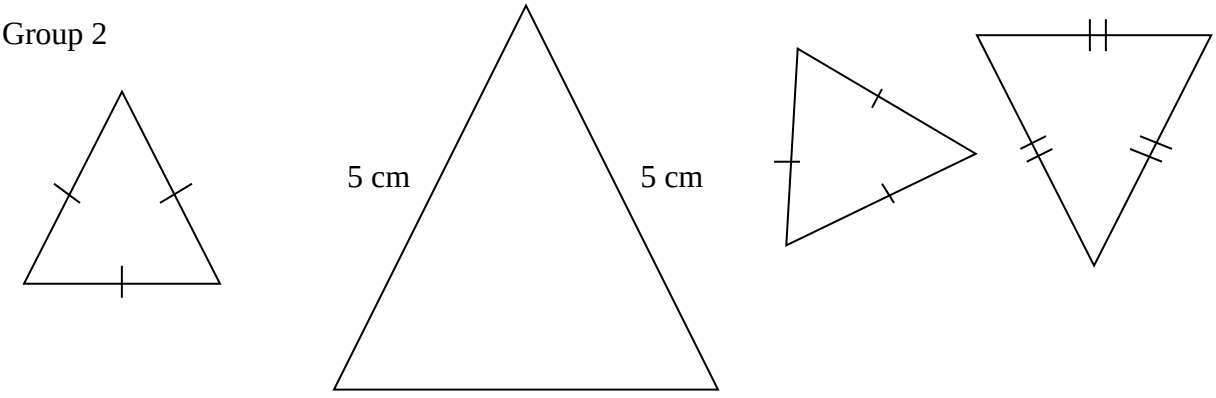
1. Draw an acute, isosceles triangle:
2. Draw a right, isosceles triangle:
3. Draw an obtuse, scalene triangle:
4. Draw an equilateral triangle:

Triangle Angle Exploration
Triangle Side Exploration-Attachment C

Group 1



Group 2



Group 3