

## Grade 6 Classifying triangles

6.SS.4	
Construct and compare triangles, including <ul style="list-style-type: none"><li>• scalene</li><li>• isosceles</li><li>• equilateral</li><li>• right</li><li>• obtuse</li><li>• acute</li></ul> in different orientations.	<ol style="list-style-type: none"><li>1. Sort a set of triangles according to the length of the sides.</li><li>2. Sort a set of triangles according to the measures of the interior angles.</li><li>3. Identify the characteristics of a set of triangles according to their sides and/or their interior angles.</li><li>4. Sort a set of triangles and explain the sorting rule.</li><li>5. Draw a triangle (e.g., scalene).</li><li>6. Replicate a triangle in a different orientation and show that the two are congruent.</li></ol>

### Clarification of the outcome:

- ◆ This outcome concerns jargon - technical language (specialized language in some area of human knowledge). Learning triangle jargon is, to use a street phrase, not the stuff of rocket science. Nor is jargon critical mathematical knowledge. However, knowing jargon can be useful when describing and explaining more complicated matters. For example, using the words 'equilateral triangle' can save space and time because you do not need to say 'a triangle for which all of the sides and angles are equal'. This then is the attitude underlying the development of outcome #4 - jargon is useful but not critical knowledge.

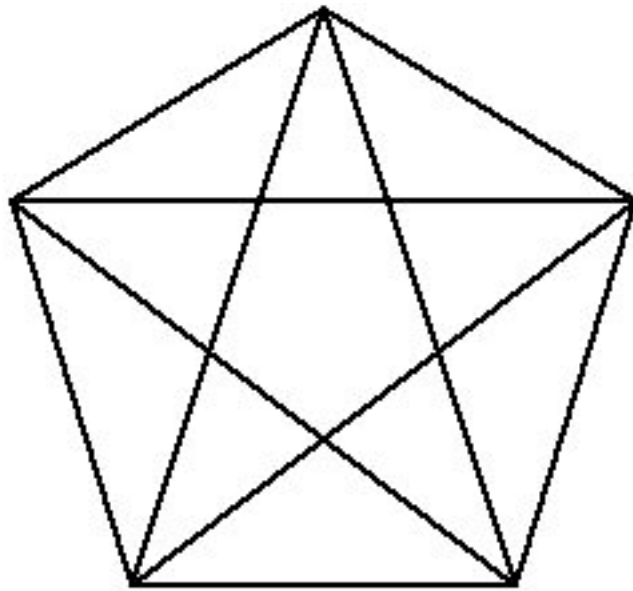
### Required close-to-at-hand prior knowledge:

- ❖ Understand angle measurement and types of angles (6.SS.1).
- ❖ Understand what a triangle is.

## SET SCENE stage

### The problem task to present to students:

Provide students with a triangle identification puzzle consisting of overlapping/intertwined triangles (see example). Ask them to find all the triangles in the puzzle.



### Comments

A puzzle approach can be useful for engaging students. Teaching jargon is not exciting stuff. Therefore a puzzle may encourage students to be reasonably engaged in learning about types of triangles.

## DEVELOP stage

### Activity 1: Revisits SET SCENE

- ◆ Ask selected students to tell how many triangles they found in the puzzle. Do not indicate right or wrong - accept their solutions. Tell them that they will return to the problem later on in the lesson.
- ◆ Ask students to provide a list of special mathematical words (jargon) that they know (e.g. square, area, sum). Ask them to describe what each word means. Discuss the advantage of being able to use one word (e. g. area) instead of having to use a lot of words when talking about something.

### Activity 2: Addresses achievement indicator 1, 2, and 3.

- ◆ Have students examine two collections of triangles, one collection consisting only of equilateral triangles with the word 'EQUILATERAL' pasted above the collection. The other collection does not contain any equilateral triangles and has the words 'NOT EQUILATERAL' pasted above the collection. Based on what students notice, have them define an equilateral triangle. Ensure they include sides and interior angles in the definition. [Equilateral triangle: three sides the same length and the three interior angles equal.]
- ◆ Have students examine two collections of triangles, one collection consisting only of isosceles triangles with the word 'ISOSCELES' pasted above the collection. The other collection does not contain any isosceles triangles and has the words 'NOT ISOSCELES' pasted above the collection. Based on what they notice, have students define an isosceles triangle. Ensure they include sides and interior angles in the definition. [Isosceles triangle: two sides the same length and two angles equal.]
- ◆ Have students examine two collections of triangles, one collection consisting only of scalene triangles with the word 'SCALENE' pasted above the collection. The other collection does not contain any scalene triangles and has the words 'NOT SCALENE' pasted above the collection. Based on what they notice, have students define a scalene triangle. Ensure they include sides and interior angles in the definition. [Scalene triangle: no sides the same length and no angles equal.]

### Comments

Ensure the triangles in the collection have different orientations (positioned a different way). [Refer to the example here of two equilateral triangles.]

For each type of triangle, discuss why the orientation of a triangle does not affect what it is.



**Activity 3: Addresses achievement indicators 1, 2, and 3, and practice.**

- ◆ Provide students with a collection of triangles (drawings). Ask them to sort the triangles into three categories: equilateral, isosceles, and scalene. Select a triangle from each category. Ask students to explain why the triangle was placed in that category. Ensure they talk about side lengths and interior angles.

**Activity 4: Addresses achievement indicator 2.**

- ◆ Have students examine two collections of triangles, one collection consisting only of right triangles with the word 'RIGHT', pasted above the collection. The other collection does not contain any right triangles and has the words 'NOT RIGHT' pasted above the collection. Based on what they notice, have students define a right triangle. [Right triangle: one angle is  $90^\circ$ .]
- ◆ Have students examine two collections of triangles, one collection consisting only of obtuse triangles with the word 'OBTUSE', pasted above the collection. The other collection does not contain any obtuse triangles and has the words 'NOT OBTUSE' pasted above the collection. Based on what they notice, have students define an obtuse triangle. [Obtuse triangle: one angle is greater than  $90^\circ$ .]
- ◆ Have students examine two collections of triangles, the collection. The other collection does not contain any acute triangles and has the words 'NOT ACUTE' pasted above the collection. Based on what they notice, have students define an acute triangle. [Acute triangle: all angles less than  $90^\circ$ .]

**Comments**

Ensure the triangles in the collection have different orientations.

For each type of triangle, discuss why the orientation of a triangle does not affect what it is.

**Activity 5: Addresses achievement indicator 2 and practice.**

- ◆ Provide students with a collection of triangles (drawings), where the triangles have different orientations. Ask them to sort the triangles into three categories: right, obtuse, and acute. Select a triangle from each category. Ask students to explain why the triangle was placed in that category. Ensure they talk about interior angles.

**Activity 6: Addresses achievement indicator 6 and practice.**

- ◆ Show students two congruent isosceles triangles that have different orientations. Ask them to give the name for each triangle. Ask students if the two triangles are congruent (the same size and shape). Ask them to explain why the two triangles are congruent.
- ◆ Repeat for scalene, right, obtuse, and acute triangles.

**Activity 7: Addresses achievement indicators 1, 2, 3, 4, 5, and practice.**

- ◆ Ask students if it is possible to draw a right isosceles triangle. [This task is possible. The other two angles are  $45^\circ$  each] Ask them to draw the triangle. Ask them to explain why it is both right and isosceles.
- ◆ Ask students if it is possible to draw an acute right triangle. Discuss why this task is not possible.
- ◆ Ask students if it is possible to draw an acute equilateral triangle. [This task is possible.] Ask them to draw the triangle. Ask them to explain why it is both acute and equilateral.
- ◆ Ask students if it is possible to draw an acute isosceles triangle. [This task is possible.] Ask them to draw the triangle. Ask them to explain why it is both acute and isosceles.
- ◆ Ask students if it is possible to draw an obtuse right triangle. Discuss why this task is not possible.
- ◆ Ask students if it is possible to draw a scalene right triangle. [This task is possible.] Show them a scalene right triangle (E.G. a triangle having sides 3, 4, and 5 is both right and scalene). Ask them to explain why it is both scalene and right.
- ◆ Ask students if it is possible to draw an obtuse isosceles triangle. [This task is possible. The "top" angle can be greater than  $90$  while the two equal angles are less than  $90$ .] Ask them to draw the triangle. Ask them to explain why it is both obtuse and isosceles.

**Activity 8: Revisits SET SCENE and practice.**

- ◆ Ask students to revisit the SET SCENE puzzle but this time count how many triangles there are for each category of triangle (isosceles, acute, right, etc.). Discuss the results.
- ◆ Organize students into groups. Have each group create a triangle puzzle, involving the various categories of triangles, and solve it. Ask the groups to share their puzzles and solutions.

**Activity 9: Assessment of teaching.**

- 🕒 Have students draw an equilateral, isosceles, scalene, right, acute, and obtuse triangle. Have them label each triangle and explain why the label is correct (in other words, explain what isosceles means, for example).

*If all is well with the assessment of teaching, engage students in PRACTICE (the conclusion to the lesson plan).*

*An example of a partial well-designed worksheet follows.*

*The worksheet contains a sampling of question types. More questions of each type are needed.*

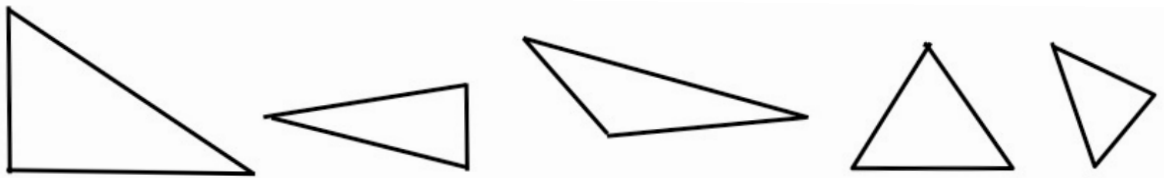
The MAINTAIN stage follows the sample worksheet.

### Question 1.

- a) Draw an equilateral triangle. Explain why it is equilateral.
- b) Draw an isosceles triangle. Explain why it is isosceles.
- c) Draw a scalene triangle. Explain why it is scalene.
- d) Draw a right triangle. Explain why it is right.
- e) Draw an obtuse triangle. Explain why it is obtuse.
- f) Draw an acute triangle. Explain why it is acute.

### Question 2.

Label each triangle as: scalene, equilateral, isosceles, acute, obtuse, right.  
A triangle can have more than one label attached to it.



### Question 3.

- a) Draw an isosceles right triangle. Explain why it is isosceles and right.
- b) Can you draw an equilateral right triangle? Why or why not?
- c) Draw an acute scalene triangle. Explain why it is scalene and acute.

### Question 4.

Does the orientation of a triangle affect which category it belongs to? Explain.

## **MAINTAIN stage**

### **Mini-task example**

Every so often:

- Present students with a triangle. Ask them to indicate what type of triangle it is and explain why.

### **Rich-task example**

Using a drawing program (computer software) or a geoboard, have students construct an equilateral, isosceles, scalene, right, acute, and obtuse triangle so that each triangle has a perimeter of 12 cm.

### **Comments**

In order to construct a triangle (of any type) the sum of the lengths of any two sides must always be greater than the length of the remaining side.

This is a rich-task because it integrates triangle jargon with perimeter.