**Constructing Triangles**

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| In this lesson, students learn the attributes of triangles by constructing them from various side lengths.  |

**NC Mathematics Standard(s):**

**Reason with shapes and their attributes**

**NC.G.1 Reason with two-dimensional shapes and their attributes.**

**• Investigate, describe, and reason about composing triangles and quadrilaterals and decomposing quadrilaterals.**

**• Recognize and draw examples and non-examples of types of quadrilaterals including rhombuses, rectangles, squares, parallelograms, and trapezoids.**

**Additional/Supporting Standards:**

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them

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

**Student Outcomes:**

* I can identify the attributes of a triangle as having three sides, three vertices, and three angles.
* I can provide examples and non-examples of a triangle.
* I can

**Math Language:**

**What words or phrases do I expect students to talk about during this lesson?**

**polygon, side, triangle, angle, vertex, vertices, right angle, acute angle, obtuse angle, attribute,**

**Materials:**

* straws, stir stick, or pipe cleaners
* clay or small pieces of pipe cleaners to use as connectors
* Student Activity Sheet
* straw bags (1 per group of 4)

**Advance Preparation**:

* Cut straws into the following lengths: 2 in, 3 in, 4 in, 5 in, 6 in, 8 in. (If possible, make all straws of same length a uniform color.0
* Package an assortment of straws into Ziploc bags, making sure to include at least 3 of each size.

**Launch:**

1. What is a triangle? (10 min)
* Begin by having students sort their straws into groups based on size. Allow time for them to measure the straws and establish the length of the straws in each group.
* Ask if anyone can describe a triangle, then draw it on the board.
* Discuss how shapes have characteristics that we call attributes. Point out from the drawing that triangles have 3 sides, which is an attribute. Next, point out the place where two sides meet and explain that we call this a vertex. More than one vertex are called vertices.
* Explain that they will be making triangles with their straws to discover other attributes.

**Explore:**

1. Constructing Triangles (20 min)
* Demonstrate how to connect the straws with a small ball of clay. Straws can also be connected by threading a piece of pipe cleaner into the ends of 2 straws and bending it to form the vertex.
* Create a triangle from the straws and share that this is one kind of triangle that they could build. Explain that they will be building triangles with different lengths of straws to observe changes in the shapes of the triangles.
* Draw your triangle on the board and demonstrate how to label the side lengths.
* Distribute Activity Sheet and explain that they will work in partners to construct triangles based on the directions in the sheet. Tell students that they will not have enough straws to “keep” all of the triangles that they make, so they will need to draw and label them on the activity sheet.

**Discuss:**

1. Attributes of a Triangle (20 min)
* Ask students what they notice about all of their triangles. If From this discussions, create a list of commonalities. Students most likely will identify 3 sides and 3 corners, or vertices. If no one brings it up, introduce the vocabulary word angle. Ask if they know what an angle is, then define it as the area formed when two sides meet.
* Demonstrate an angle by connecting 2 straws and open and close to show the angle that is formed. Point out the angle size as the straws open and close.
* Explain that these attributes define a triangle: 3 sides, 3 vertices, and 3 angles. Record it on a chart.
* Discuss question 1. Have students share their solutions for triangles with 3 sides the same. Triangles can be drawn on board, or recorded on a chart. As students share, have them talk about what they notice about the sides, vertices, and angles. Are there similarities between these triangles? What would happen if we made another triangle with side length of 10? 20? 100?
* Share solutions for question 2. Are there similarities between these triangles? Have students compare and contrast these triangles with the ones from question 1.
* Share solution for question 3. Try to get several representations of this triangle in different positions. What do you notice about this triangle? Point out the right angle in this triangle. Explain that this angle, unlike many of the other triangles has an angle that looks like the corner of a rectangle. It is called a right angle. Have them look at the other two angles. Are they greater or less than the right angle? How do you know?
* Share solutions for straws that wouldn’t make a triangle. If the sides don’t connect, is it a triangle? If students struggle with this question, refer back to your triangle attributes chart.

**Evaluation of Student Understanding**

Informal Evaluation: Teacher observation of students building triangles and discussing attributes.

Formal Evaluation/Exit Ticket: Students draw an example of a triangle, and label the characteristics, then draw a non-example and explain why it is not considered a triangle.

**Meeting the Needs of the Range of Learners**

**Intervention:** Students may need more opportunities to construct triangles. This activity can be place in a center for additional practice.

**Extension:** Have student build a variety of triangles that have 3 different side lengths. As they investigate, they will draw and label their constructions into two categories: triangles and non-triangles. Have them study the side lengths and generalize a rule for triangles that work and ones that don’t work. Prompt them to look at the sum of the two shorter sides to determine if the length of the third side is longer than the sum of the two shorter sides, the sides will not close to make a triangle.

**Possible Misconceptions/Suggestions:**

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| --- | --- |
| **Possible Misconceptions** | **Suggestions** |
| All triangles have the same shapeAny 3-sided shape, open or closed is a triangle |  |

**Possible Solutions:**

|  |  |
| --- | --- |
| 3 sides equal |  |
| 2 sides equal |  |
| 3, 4, 5 inches |  |
| Won’t form a triangle |   |

**Activity Sheet**

**For each triangle that you make, draw and label the side lengths in the chart below.**

1. **Make triangles with all the same length.**
2. **How many triangles can you make with 2 sides the same length, and a third side a different length?**
3. **Make a triangle with side lengths of 3 in, 4 in, and 5 in.**
4. **Are there any straw lengths that will not make a triangle? Why do you think they won’t form a triangle?**

**Constructing Triangles Chart**

|  |  |
| --- | --- |
| **3 sides equal** |  |
| **2 sides equal** |  |
| **Sides of 3, 4, and 5 inches** |  |
| **Will not form triangles** |  |