## Quadrilateral Riddles and Fun

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| In this lesson, students identify and explain the attributes of a quadrilateral and use defining attributes (number of sides, angles) to name quadrilaterals. |

**NC Mathematics Standard(s):**

**Reason with shapes and their attributes.**

**NC.3.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.

**Standards for Mathematical Practice:**

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.
4. Model with mathematics.
5. Use appropriate tools strategically.

**Student Outcomes:**

* I can identify and explain the attributes of a quadrilateral.
* I can use defining attributes (number of sides, angles) to name quadrilaterals.
* I can recognize and draw rhombuses, rectangles, and squares as being examples of quadrilaterals.
* I can draw quadrilaterals other than rhombuses, rectangles, and squares.

**Materials:**

* Geoboards
* Geobands
* The Greedy Triangle by Marilyn Burns
* Folder or other material to use to cover
* Vocabulary word bank

**Advance Preparation:**

* Teacher should refer to the “Parent, Teacher, and Other Adult” page in The Greedy Triangle for math content information before teaching this lesson.
* Students should be familiar with defining attributes such as number of sides, number of angles, equal, and vertices (corners) through introductory lessons that build understanding of this vocabulary.
* A vocabulary Word Bank needs to be accessible to the students that they can use when describing their polygons. Examples for the word bank include but are not limited to: *equal sides angles vertices square rectangle rhombus quadrilateral trapezoid*

**Directions:**

1. Review vocabulary on the Word Bank by having students work in small groups to come up with a definition that can be explained in ten words or less for one of the words in the bank. Teacher can assign words or let groups choose the word they would like to define. Allow groups to share out with the definition they created. This should be a quick review.
2. Distribute geoboards and geobands. It is easier to distribute these materials if the geobands are already placed on top of each geoboard or if the geobands are in the container that is shared with a small group. (It is important that students know the rules for using geoboards so that the lesson will not be interrupted by someone shooting the rubber bands. If the teacher addresses this and the students are familiar with using them distractions are minimized. Also, for those students who cannot follow the rules, the teacher can have a paper copy of a geoboard and a pencil for them to use in place of the geoboard. If students know this is an option they are more likely to follow the rules so they can keep their geoboard like the rest of the class.)
3. Ask students to make two different quadrilaterals on their geoboard. Have them record the quadrilaterals on their geopaper. If this is the first time they are recording on geoboard paper the teacher may need to circulate and make sure they are accurate in their transcribing.
4. Now ask students to use the vocabulary we just reviewed to explain how the shapes are alike and how they are different.
5. As students work, the teacher would monitor and question students to help them think of other ideas. If students are struggling, the teacher may want to share a few similarities or differences that students have constructed. This would be a good time to take anecdotal notes on how comfortable the students are with using with the vocabulary. The attached recording sheets are provided as tools for assessment. One is a calendar grid where the students’ names are written in the squares and notes are added to each square. The other is a traditional recording sheet where check marks or other notations are used to document a student’s progress.
6. When students begin to finish, have them share with a partner or small group and then add to their similarities and differences any new ideas they learned from their group. Have students use a highlighter to highlight any words from the word bank they used in their work. If they used a new math word that needs to be added to the word bank they can highlight it with a new color and add it to the Word Bank.
7. Teachers can then collect these for assessment and they could be displayed.
8. Part 2 of this task may need to be completed on a different day. Begin Part 2 by having students make a quadrilateral on their geoboard. Students would use a folder to cover the shape so that others could not see it.
9. Students are then asked to write 4 clues to describe the quadrilateral they created. Again they can use the Word Bank to help with their clues.
10. As students write clues the teacher will monitor and encourage students to use very clear mathematical vocabulary. This is another good time to assess student’s understanding of the shapes they are creating.
11. When they finish writing the four clues they find a partner that is finished and play “Quadrilateral Riddle” by reading their clues to their partner and the partner guesses which polygon they created. Continue to play by finding additional partners when they finish. These can be collected and put in a “Quadrilateral Riddle” book for continued review throughout the year.

**Questions to Pose:**

Before:

* What do we know about these words?
* What are the rules for using a geoboard?
* What do you know about quadrilaterals?

During:

* What else do you know about this shape?
* Which words in the word bank would help you compare the shapes you made?
* Are there other math words you are using to help compare the shapes? What are they?

After:

* Do we know more about the words in the word bank now they we did when we started with our definitions? If so what?
* Write in your math journal or on a blank sheet of paper what you learned today about shapes you or someone in your group made on your geoboard.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Avoid having students memorize the properties of the shapes. | Students need to have many experiences that allow them to explore, compare, and move shapes around.. |
| Students may think that a trapezoid always looks like the red pattern block. | Show different trapezoids. The use of a geoboard is a good way to have students explore the various shapes. |
| Students should be required to use mathematical vocabulary. | Supplying the word bank will help with this as well as encouraging discussion among students. |

**Special Notes:**

It is important that students know the rules for using geoboards so that the lesson will not be interrupted by someone shooting the rubber bands. If the teacher addresses this and the students are familiar with using them distractions are minimized. Also, for those students who can not follow the rules, the teacher can have a paper copy of a geoboard and a pencil for them to use in place of the geoboard. If students know this is an option they are more likely to follow the rules so they can keep their geoboard like the rest of the class.

**Solutions:** N/A