Lesson: Quadrilateral Quandary

Unit: Geometry Exploration

1. Benchmark/Standard:

7.G Draw, construct, and describe geometrical figures and describe the relationships between them.

7.G.2 Draw (freehand, with ruler and protractor, using technology) geometric shapes with given conditions

1. Behavioral/Objective

By the end of this lesson, students will be able to:

* + 1. Identify properties of each type of quadrilateral.
    2. Identify specific quadrilaterals given particular parameters.
    3. Rank quadrilaterals in a hierarchy fashion based on their properties.

It is important for students to be able to identify the properties and rank the quadrilaterals so they can later understand the concept of perimeter and area, which will be covered in the following lesson. Since perimeter and area are dependent on the type of quadrilateral, it is important to recognize the identity or create particular quadrilaterals.

1. Anticipatory Set
   1. Generate Interest: The mystery will be stated at the start of the class. The situation involves seven quadrilaterals all found in a mansion on the night of a murder. Each shape claims that they are innocent, but the one that was in the kitchen is definitely guilty. The students were hired as detectives to determine which quadrilateral is the true criminal. The quadrilaterals will each be given to them in Geometer’s Sketchpad, (all quadrilaterals will be shown originally as squares and will be found in seven separate rooms), and students will be able to manipulate the shapes in many ways to determine which quadrilateral is the shape’s true identity. A demonstration of how to open Geometer’s Sketchpad will be given by overriding all of the students’ computer screens and showing them the step-by-step process on how to access the file and how to manipulate the shapes.
   2. Access Prior Knowledge: Students will discuss as a class what quadrilaterals they already know. These shapes will be drawn on the board by various students in the class and labeled with their names.
   3. Practice something: Students will begin to play around with Geometer’s Sketchpad and explore the various shapes.
2. Objective/Purpose:

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1. Input:
   1. Task Analysis
      1. The learner should be able to identify the following shapes by looking at them: rhombus, square, rectangle, parallelogram, trapezoid, kite, quadrilateral. Students must know the definitions of the terms: parallel, congruency, perpendicular.
      2. Procedure
         1. Students will log-on to their computers.
         2. Since log-in takes a bit of time, I will introduce the topic to the students at this time. The mystery will be announced and the question of who did it will be posed to the class.
         3. I will walk them through Geometer’s Sketchpad and how the software is used, where to find the file needed to complete today’s activity, and how to alter the shapes given in the activities to determine properties.
         4. Students will have a chance to explore the shape maker activity. They will be working primarily on their own, but are able to ask assistance from their neighbor or from one of the circulating teachers.
            1. Students who are in the first group will be given the properties at the start of the activity. Using these properties, students will play around with the shapes and see which contain the given properties and which do not.
            2. Students in the second group will be given the activity and asked to determine the identity by first figuring out which properties are contained by each quadrilateral and eliminating ones that do not meet the correct requirements.
            3. Students in the third group will work to determine which quadrilateral is each and identify the properties each express. Since these students have a strong understanding of the material they will finish the activity before the first two groups. As an extension, these students will begin to design their own shape makers activity and then allow other students in group 3 to try and identify the quadrilateral they created.
         5. Students will record the properties they found present in each of the shapes given to them on their worksheets.
         6. As a class we will come together to discuss which properties were discovered and what quadrilaterals abide by these properties. The properties will be consolidated by having students come up to the board and add one property they identified for a shape. Since there are seven different rooms, there are a lot of properties to notice and thus some students will have to write up two properties. All responses will remain on the whiteboard regardless of whether or not they are correct.
         7. As a class, we will analyze the collection of properties and see if any should be moved or altered. After solidifying all of the properties, students will choose which quadrilateral was in each of the rooms in the mansion, ultimately declaring which was in the kitchen and thus guilty.
         8. Class worksheets will be collected by the teacher at the end of the hour and will be the students’ exit ticket for the day.
         9. Students will work at home on another mystery problem involving missing passports for all the different quadrilaterals to test their understanding of quadrilaterals.
   2. Thinking Levels: Bloom’s Taxonomy
      1. Knowledge: Able to identify each of the shapes when given a picture and able to draw them given the name.
      2. Comprehension: Interpret what is happening when each shape is adjusted. Notice which parts of the quadrilateral change and how they are altered. Also, identify the things that remain the same.
      3. Application: Determine where these shapes are used in everyday life and how their properties aide in using them.
      4. Analysis: Analyze which properties exist in most of the quadrilaterals and which are specific to a particular one.
      5. Synthesis: Arrange the quadrilaterals based on their properties and how they relate to one another.
      6. Evaluation: Determine which shape is which and give strong evidence of support for this viewpoint.
   3. Learning Styles and/or Accommodations
      1. Remediation: Give the properties of each shape and have the students try to figure out which is which by matching the shape maker to the given properties and name. This does provide more direct actions for the student and eliminates some of the exploration. Yet, some students need these steps in order to work more comfortably, thus need the remediation. This would be for the lower functioning students in the classroom.
      2. Extensions: Provide students an opportunity to create their own shape makers. Have them swap their files they create with others who are done with the current lesson. Students may also begin to explore shapes beyond quadrilaterals including the different types of triangles and 5-10 sided shapes.
      3. Differentiated Curriculum: Students are given shapes and their properties and are able to simply match the two together. They will be given a shape maker activity that requires them to build shapes based off of properties. This will give them an opposite approach to the activity for students who are able to do the exploration activity, but will still teach them about the properties of quadrilaterals in an exploratory way.
   4. Method and Materials
      1. Introduction of mystery and quadrilaterals, demonstration of how to use Geometer’s Sketchpad, work through one of the shapes as a group
      2. Materials:
         1. Geometers Sketchpad
         2. Computer
         3. Worksheet
         4. Pencil
         5. Whiteboard and Markers
2. Modeling
   1. I will give an example of how to work with Geometer’s Sketchpad on my computer, which I will link with the students’ computers. This demonstration will consist of maneuvering through Geometer’s Sketchpad including accessing the file, how to manipulate the quadrilaterals provided, and the thought process for identifying the properties of a given quadrilateral.
3. Checking for Understanding
   1. Example Questions:
      1. How do you recognize the different quadrilaterals?
      2. What properties did you identify for each of the shapes?
      3. Which room contained the square, rectangle, rhombus, etc?
      4. How did you rank/order these quadrilaterals based on their properties?
      5. Where do you see these quadrilaterals in everyday life?
   2. Stop and Check:
      1. 5 fingers check for understanding, (1 – no idea what we are doing, 5 – understand the material completely): This will be used when navigating the site to show that they understand where to go for the information.
      2. Thumbs up/thumbs down: based on whether they chose the particular quadrilateral to be found in the room being pointed at.
   3. Discussion of Discoveries:
      1. Students will partake in the discussion on what properties were discovered to exist in each room and which quadrilateral associates with these properties. I will write the properties mentioned by students on the board whether or not they are correct. Together we will examine the list for each quadrilateral and remove incorrect properties.
4. Guided Practice
   1. Model to students how to use Geometer’s Sketchpad and how to identify properties associated with shapes given in the activity (10 minutes the first day).
   2. Students will use Geometers Sketchpad to experiment with various shapes and their properties (2 days total)
   3. Day one: identifying quadrilaterals and their properties.
   4. Day two: ranking quadrilaterals in a hierarchy based on the determined properties
   5. Teacher circulates the classroom and assists the students as needed by using guided questioning.
5. Independent Practice
   1. Students will complete an identification worksheet for homework that involves an identity thief who took the names off of each quadrilateral’s passport. Each passport contains properties specific to that shape and will require students to evaluate which quadrilateral belongs with each passport. This worksheet will require students to recall all the properties of each quadrilateral. Students must use logical reasoning and analyze their hierarchy flow chart.
6. Closure:
   1. Students:
      1. Complete the exploration activity worksheet for Quadrilateral Quandary making sure to include all properties and the rooms each quadrilateral was found in.
      2. Hierarchy flow chart created based on quadrilateral properties.
   2. Teacher:
      1. Reflect on the lesson with the class during the discussion of the generated properties list
      2. Evaluate the effectiveness of the lesson based on the students’ success with the exploration worksheet, their ability to communicate the properties during the discussion, and the correctness of their hierarchy chart.