

Quadrilateral Quandary

Properties of Quadrilaterals

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Grade Level	10th Grade	**Time Frame**	2-3 class period(s)
Subject	Mathematics	**Duration**	120 minutes
Course	Geometry		

Essential Question

How can various figures be described precisely?

Summary

Students will determine basic properties of quadrilaterals through activities and games.

Snapshot

Engage

A Quick Draw activity engages students in thinking about how to describe various geometric figures.

Explore

Students play Guess What? A variation of Guess Who? in order to explore properties of quadrilaterals.

Explain

Students explain which properties will be true for all examples of different kinds of quadrilaterals.

Extend

Students create a decision tree for use during the Guess What? game.

Evaluate

Students play the game using the decision trees they created and write a reflection about the outcome of the game and the success of their decision tree.

Standards

ACT College and Career Readiness Standards - Mathematics (6-12)

G705: Solve multistep geometry problems that involve integrating concepts, planning, and/or visualization

Oklahoma Academic Standards for Mathematics (Grades 9, 10, 11, 12)

G.2D.1.4: Apply the properties of special quadrilaterals (square, rectangle, trapezoid, isosceles trapezoid, rhombus, kite, parallelogram) and use them to solve real-world and mathematical problems involving angle measures and segment lengths using algebraic reasoning and proofs.

Attachments

- Decision Tree Examples—Quadrilateral Quandary.docx
- Decision Tree Examples—Quadrilateral Quandary.pdf
- Guess What Quadrilateral Board—Quadrilateral Quandary - Spanish.docx
- Guess What Quadrilateral Board—Quadrilateral Quandary - Spanish.pdf
- Guess What Quadrilateral Board—Quadrilateral Quandary.docx
- Guess What Quadrilateral Board—Quadrilateral Quandary.pdf
- Guess What Quadrilaterals Recording Sheet—Quadrilateral Quandary - Spanish.docx
- Guess What Quadrilaterals Recording Sheet—Quadrilateral Quandary - Spanish.pdf
- Guess What Quadrilaterals Recording Sheet—Quadrilateral Quandary.docx
- Guess What Quadrilaterals Recording Sheet—Quadrilateral Quandary.pdf
- Quadrilateral Quick Draw.jpg

Materials

- Quick Draw image
- Guess What? boards for quadrilaterals (enough for one for every three students and two extras)
- Smartboard, document camera, or overhead projector
- Sandwich bag
- Two-sided counters or other small objects to act as placeholders (about five per student)
- Decision Tree Examples (one copy)

15 minutes

Engage

Teacher's Note

To prepare for this lesson, be sure to print out the above materials and cut one of the "Guess What?" boards into pieces, placing the pieces in a sandwich bag for use during the Explore activity.

Display the attached **Quick Draw** image on the document camera, Smart board, or an overhead projector. Use the Quick Draw strategy to engage students' prior knowledge about geometric shapes.

After you have asked students what they saw in the image and how they drew the image, ask students what geometric shapes they see in the image. Students may reply that they see a square, trapezoid, rhombus, and parallelogram. Follow up and ask students how they know that shape is what they say it is. For example, ask students how they know it is a rhombus vs. a parallelogram (or vice versa) or how they know it is a square and not a rectangle. Also, press students to identify and name all the shapes they see.

35 minutes

Explore

Place students in teams of three or four; have no more than 10 teams. Pass each team one copy of the **Guess What Quadrilateral Board** and 15 two-sided counters or other placeholders. Explain the following rules of the game:

- One student will choose a shape from the sandwich bag, without looking, to begin each round. The student will hand the shape to the teacher.
- Groups will take turns asking one yes or no question to determine which shape was chosen. They may not reference the name of the shape in these questions. Each group will be given 3 minutes to discuss what question to ask. Other groups should be considering possible questions at this time as well.
- Once the group has asked their question, the teacher will record the question asked on the board, and then supply the answer to the question (yes, or no) for the shape chosen.
- The group that asked the question will have 30 seconds to guess what shape was chosen by using the name of the shape. If they guess correctly, they earn a point and a new round begins. If not, the next group gets to ask another question and make a guess at the shape until a group is able to identify the correct shape.

Play several rounds of Guess What? with the students. As teams ask questions, ask the team why they chose the question they did. The purpose of this exercises is to have students reflect on their thinking about these shapes. Also, continue to add to the list of questions generated by students when new questions arise.

After several rounds, pass out the **Guess What Recording Sheet**. Have students complete this sheet in pairs by referencing the list of questions generated during the game.

Teacher's Note

The recording sheet can be given for homework if students are given opportunities to photograph the list of questions generated or copy the list into their notes. The lesson can continue, starting with the Explain portion, the next day.

15 minutes

Explain

After students have completed this work, call on one pair to share the list of questions they gave for square. Ask other pairs to verify that they have the same list of questions. If not, discuss the differences in the lists of questions until the class comes to a consensus about what the list of questions should be. Repeat for the other types of quadrilaterals.

45 minutes

Extend

Show students the two **Decision Tree Examples** attached to this lesson on the Smart board or document camera so they understand the purpose and design of a decision tree.

Tell students their task is to create a decision tree that will help them decide what kind of quadrilateral was chosen while playing the Guess What? game. Inform students that they will use the decision tree to play a few rounds of the game.

After students have created their decision trees, place students into groups of three (or four, if needed). Assign one student in each group to be player A, one student to be player B, and one or two students to be referees.

Have each player choose one shape from the Guess What? board and share that shape with the referee(s) but not with the other player.

The two players then play one round of the game. During this round, the job of the referee(s) is to check to make sure each player is following their own decision tree. Referees should not allow players to change the questions asked or the order in which they are asked.

When the round is over, have players rotate their roles (players and referees). Continue playing until each student has been a player twice. This should take three or four rounds, depending on the sizes of the groups.

10 minutes

Evaluate

Have students complete an Exit Ticket using the prompt *What were the strengths and weaknesses of your decision tree?*

You may also elect to collect students Guess What Recording Sheets.

Resources

- K20 Center. (n.d.). Bell ringers and exit tickets. Strategies. https://learn.k20center.ou.edu/strategy/125
- K20 Center. (n.d.). Quick draw. Strategies. https://learn.k20center.ou.edu/strategy/51
- Wheatley, G. H. (2007). Quick draw: Developing spatial sense in mathematics (2nd ed.). Tallahassee, FL: Mathematics Learning.