

LessonTitle:

Geo 3.3

Triangle Conjectures: Mid-segments of Triangles and Triangle Inequalities

Utah State Core Standard and Indicators Geometry Standards 3 Process Standards 1-5

Summary

In this lesson, students cut one triangle into two triangles, attempting to create two equal areas (they must use the midpoint of one side and create a mid-segment). Then they use cut-out paper triangles, fold to get the mid points, draw to create the mid-segments, measure sides and mid-segments, then make conjectures about the relationships between the mid-segments and sides and relationships found among the smaller triangles created by the mid-segments and the original triangle.

Enduring Understanding

We can observe characteristics of shapes, make conjectures, and discover specific geometric relationships. This process is valuable in itself (the process of making conjectures, proving them and then using the conjectures in problems).

Essential Questions

What is a conjecture? Why do we make them? How do they help us?

Skill Focus

- Collecting, observing, drawing conclusions
- Triangle mid-segment properties
- Triangle inequalities

Vocabulary Focus

Assessment

Materials: Computers with Geometer’s Sketchpad,

Launch

Explore

What are the relationships which occur when the midpoints of triangles are connected? Develop conjectures about mid-segment relationships and then use arguments to support the conjectures.

Summarize

Apply

Directions:

After students have sliced the triangle and found the secret to dividing the triangle into two equal parts, have them move on to the other triangle conjectures.

Note: You can choose to do the activity below or use the Mid-segments of Triangles activity found in [Navigating through Geometry](#), pages 25-27. If you use the Navigating Through Geometry, you will need to access dynamic geometry software such as Geometer’s Sketchpad.

After students have made conjectures about triangle mid-segments, have them do the Triangle Inequalities activity found in [Exploring Geometry with Geometer’s Sketchpad](#) p. 67

Directions for Mid-segments conjectures:

This activity will lay the foundation for exploring and making conjectures regarding triangle centers. Students create the triangles and mid-segments, then make conjectures based on visual observations and validate by measuring.

After completing the activity sheet, provide students with a few minutes to formalize their conjectures and prepare to share their conjectures and support with the entire class.

Possible Conjectures:

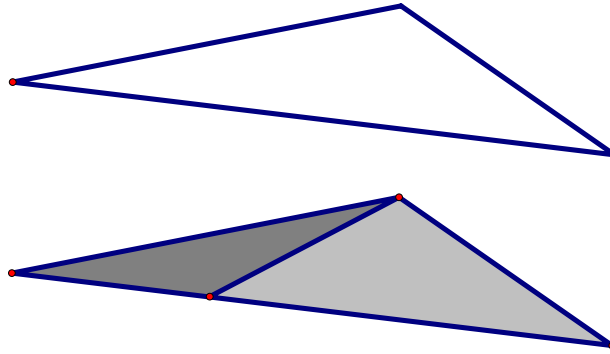
- All four triangles formed by the mid-segments are congruent and are similar to the original
- The length of the mid-segment is $\frac{1}{2}$ the length of the corresponding base.
- The mid-segment is parallel to the corresponding base.

Have students use Geometer's Sketchpad to test and prove their conjectures.

Students might also investigate the shape formed by the mid-segments of quadrilaterals.

Slicing a Triangle

Use Geometer's Sketchpad to construct a triangle. Cut the triangle into exactly two triangles.



- Use Sketchpad to measure the triangle areas. Can you create two smaller triangles with exactly the same areas? What is your conjecture (idea to be proved)?
- Does your conjecture work for all different triangles? Explain.
- Will the two triangles ever be congruent? Explain.
- Write what you have learned about triangles.
- Write what you have learned about conjectures.

Triangle Mid-segment Conjectures

Your challenge in this activity is to 1) observe triangle properties, 2) make conjectures about the relationships you observe, 3) prove your conjectures to be true and 4) present your conjectures and arguments to the class.

1) Set up the investigation:

- Cut out the sets of triangles. Give each student in the group one or two pairs of congruent triangles.
- Match up each pair of two vertices of the triangles and make a small crease on each side to present the midpoints.
- Label the midpoints with a point. Draw in the mid-segments by connecting the midpoints.
- Find the lengths of the sides of the triangle and the length of the mid-segments.
- Measure the angles and label them.

2) Compare the lengths of the sides of all three sides and the corresponding mid-segments using the chart below. What do you observe? What are your conjectures?

Triangle	Side 1	Mid-seg 1	Side 2	Mid-seg 2	Side 3	Mid-seg 4
A						
B						
C						
D						
E						

3) Each person in your group should cut one of their congruent triangles into the smaller triangles formed by the mid-segments. Move the triangles around and make observations. What are your observations and conjectures?

4) Prepare to present your conjectures to your classmates.

