

Midsegments of Triangles

ID: 9408

Time required
40 minutes

Activity Overview

In this activity, students will explore the properties of the midsegment, a segment that connects the midpoints of two sides of a triangle. First, students will construct and investigate one midsegment and the relationship of the new small triangle to the original triangle. Then, all three midsegments will be constructed and this figure will be explored.

Topic: Ratio, Proportion & Similarity

- *Construct a line segment joining the midpoints of two sides of a triangle and conjecture a relationship between the segment and the third side.*
- *Prove and apply the Triangle Midsegment Theorem and its converse.*

Teacher Preparation and Notes

- *The midsegment of a triangle is a line segment connecting the midpoints of any two sides of the triangle. It is parallel to and half as long as the third side of the triangle.*
- *Notes for using the TI-Nspire™ Navigator™ System are included throughout the activity. The use of the Navigator System is not necessary for completion of this activity.*
- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter “9408” in the quick search box.***

Associated Materials

- *MidsegmentsOfTriangles_Student.doc*
- *MidsegmentsOfTriangles.tns*

Suggested Related Activities

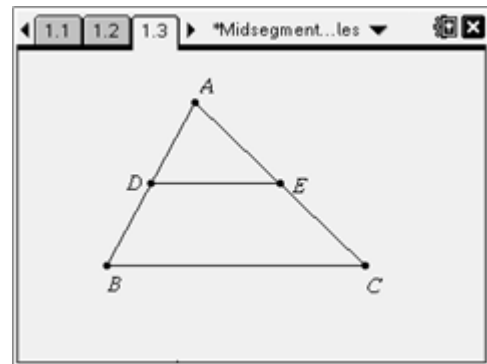
To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Triangle Midsegment Theorem Theorem (TI-84 Plus family) — 7275*
- *Triangle Midsegment Exploration (TI-Nspire technology) — 11390*
- *Midsegments (TI-Nspire technology) — 9422*

Problem 1 – One Midsegment

On page 1.3, students will use the **Midpoint** tool from the Construction menu to construct the midpoints of two sides of the triangle, labeling the points D and E , as shown.

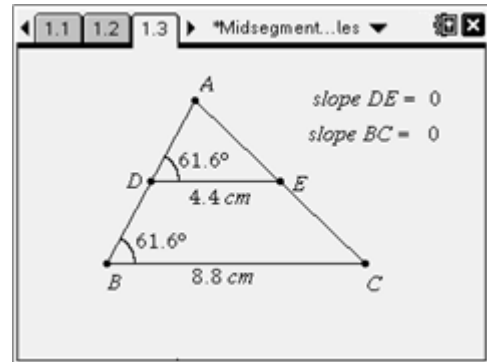
Then they will use the **Segment** tool from the Points & Lines menu to connect points D and E .



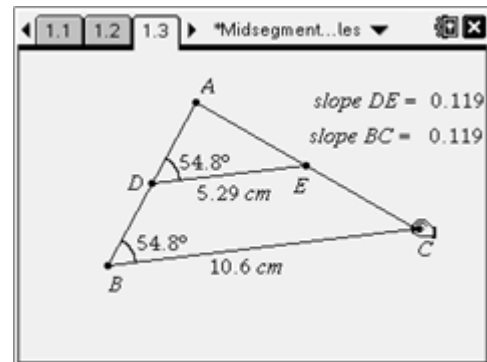
Next, students should use the **Length**, **Slope**, and **Angle** tools from the Measurement menu to explore the properties of the midsegment, as shown to the right.

Have them record these measurements on their worksheets.

Note: Before measuring the slope of side BC , students will first need to overlay on it a segment using the **Segment** tool.



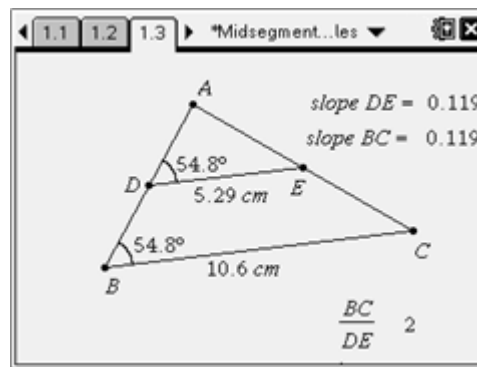
Students should make conjectures about relationships in the figure. Be sure that they drag the vertices of $\triangle ABC$ around the screen to confirm their conjectures.



TI-Nspire Navigator Opportunity: Screen Capture

See Note 1 at the end of this lesson.

Next, students should select the **Text** tool (Actions menu) and display the ratio $\frac{BC}{DE}$ on the screen. Then they can use the **Calculate** tool (Actions menu) to evaluate the ratio of the lengths of \overline{BC} and \overline{DE} . Dragging a vertex of $\triangle ABC$, students can record their observations on their worksheets.

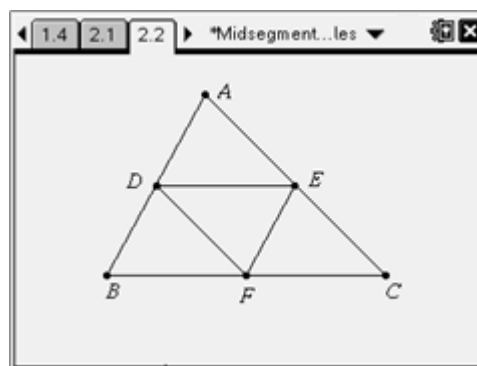


Note: To use the **Calculate** tool, press $\frac{\square}{\square}$ (or **enter**) once on the expression to evaluate, and then once on the value for each variable as you are prompted.

Ask: *What is the relationship between $\triangle ADE$ and $\triangle ABC$? Can you prove it?*

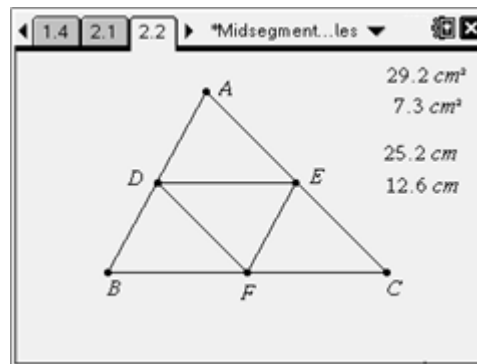
Problem 2 – Three Midsegments

On page 2.2, $\triangle ABC$ is shown and the midpoints of two of its sides have been constructed. Students should first create the third midpoint and label it point F .



Then they can construct $\triangle DEF$ using the **Triangle** tool from the Shapes menu.

Students can now use the **Length** and **Area** tools from the Measurement menu to measure the perimeter and area of $\triangle DEF$ and $\triangle ABC$.



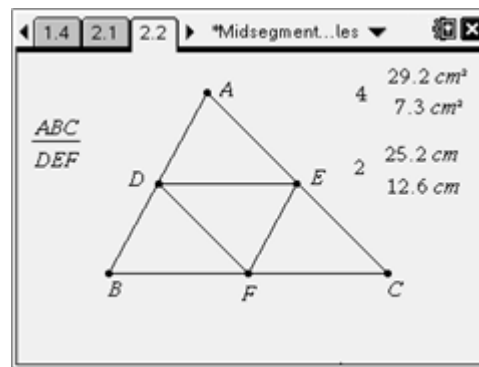
Have them record these measurements on their worksheets.

TI-Nspire Navigator Opportunity: Quick Poll

See Note 2 at the end of this lesson.

Next, student should use the **Text** and **Calculate** tools to find the ratio of the perimeters and areas using the formula $\frac{ABC}{DEF}$. They can then drag a vertex of $\triangle ABC$ and record their observations.

Ask: *What is the relationship between $\triangle DEF$ and $\triangle ABC$? Can you prove it? What is the relationship between $\triangle DEF$ and $\triangle ADE$? Can you prove it?*



Apply the Math – Solutions

1. $BC = 12.4$ inches, $EF = 5.7$ inches
2. Perimeter of $\triangle DEF = 18$ cm
3. Area of $\triangle ABC = \text{Area of } \triangle ADE = \text{Area of } \triangle BDF = 2.15 \text{ CM}^2$
4. $m\angle A = m\angle CEF = m\angle BDF = m\angle EFD = 64^\circ$
 $m\angle B = m\angle EFC = m\angle ADE = m\angle DEF = 89^\circ$
 $m\angle C = m\angle AED = m\angle EDF = m\angle DFB = 27^\circ$

TI-Nspire Navigator Opportunities

Note 1

Problem 1, Screen Capture

This would be a good place to do a screen capture to verify students are able to construct the midpoints and segments, and use the **Length**, **Slope**, and **Angle** tools. In Problem 2, screen capture can be used to verify students are correctly calculating the area and perimeter.

Note 2

Whole Document, Quick Poll

Throughout the activity, you may choose to use Quick Poll to assess student understanding. The worksheet questions can be used as a guide for possible questions to ask.