**Supplementary Activities**

**Unit 3 Investigation 6**

 **Midsegments of Triangles**

**Open the file:** <http://tube.geogebra.org/material/simple/id/2800029>.

The **midsegment** of a triangle is a segment that connects the midpoints of two of the triangle's sides.   Slide the slider in the applet. Then change the locations of the triangle's vertices *before* sliding the slider again.  Repeat the experiment several times, paying close attention to the phenomena you're observing.

1. What two **facts** does this applet illustrate about the midsegment of any triangle with respect to the triangle's third side?
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Now open the file:** <http://tube.geogebra.org/material/simple/id/1498083>

In this applet, points *D* and *E* are midpoints of two sides of ∆*ABC*. One midsegment of Triangle *ABC* is shown in green. Move the vertices *A*, *B*, and *C* of ∆*ABC* around. As you do, observe the two comments off to the right side. Then, answer these questions.

1. What do you notice about the slopes of segments $\overbar{DE}$ and $\overbar{AB}$? What does this imply about these two segments?
2. What does the ratio of *DE* to *AB* tell us about the midsegment of any triangle?
3. State your conjecture about the midsegment of any triangle:
4. Write a coordinate proof for your conjecture. Let the vertices of ∆*ABC* be *A* (0, 0), *B*(2*a*, 0), and *C*(2*b*, 2*c*). Let *D* be the midpoint of $\overbar{AC}$ and *E* be the midpoint of $\overbar{BC}$.

**Midsegments of Trapezoids**

**Open the file:** <http://tube.geogebra.org/material/simple/id/2946781>

Note that the **midsegment** of the trapezoid is defined as the segment joining the midpoints of the two legs. (That is the pair of opposite sides that are not necessarily parallel. The word “median” is sometimes used in place of “midsegment.”)

1. Use the applet to discover two properties of the midsegment of a trapezoid. List them here:
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What similarities do you observe between the midsegment of a trapezoid and the midsegment of a triangle?
5. State a conjecture about the midsegment of a trapezoid.
6. Write a coordinate proof for your conjecture. Let the vertices of trapezoid *ABCD* be
*A* (0, 0), *B*(2*a*, 0), *C*(2*b*, 2*c*), and *D*(2*d*, 2*e*) Let *E* be the midpoint of $\overbar{AD}$ and *F* be the midpoint of $\overbar{BC}$.

**Midpoints of Quadrilateral Sides**

Open the file: <http://tube.geogebra.org/material/simple/id/2560045>

Quadrilateral *ABCD* is a shown (Vertices are BIG.)  .

Quadrilateral *EFGH* is another quadrilateral whose vertices are the midpoints of the sides of quadrilateral *ABCD.*

Move each one of the BIG vertices of quadrilateral *ABCD* around. As you do, pay attention to the quadrilateral *EFGH*.

After interacting with this applet for a few minutes, please answer the questions that appear below:

1. How would you classify quadrilateral *EFGH,* regardless of where *A, B, C,* and *D* lie?
2. Use the tools of GeoGebra to support your conjecture. State your evidence here.
3. Write a formal, 2-column proof to prove your conjecture. (Hint: Think of the Triangle-Midsegment Theorem)
4. Write a coordinate geometry proof to prove your conjecture.