**Activity 4.4.1 Parallel Lines in Triangles**

**Warm Up:**

1. In ∆*ABC* segment $\overbar{DE}$ is the midsegment joining sides $\overbar{AB}$ and $\overbar{AC}$.

 a. What do you know about segments $\overbar{DE}$ and $\overbar{BC}$?

 b. What is the ratio of $\frac{AD}{DB}$ and $\frac{AE}{EC}$?

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In this investigation you will discover a relationship associated with splitting the sides of a triangle. It is a generalization of the theorem you used in the warm up

**Part I -** Open up GeoGebra and draw a triangle. Label its vertices *A*, *B*, and *C*.

1. Follow these steps to draw a line that is parallel to side $\overbar{BC}$ of your triangle.



1. Use the “Point on Object “ tool to place a point *D* anywhere on side $\overbar{AB}$.
2. Use the “Parallel Line” tool to construct a line through *D* parallel to $\overbar{BC}$.



1. Use the “Intersect” tool to locate *E*, the point where the parallel line intersects side $\overbar{AC}$.

1. Line $\overleftrightarrow{DE}$ now “splits” two sides of the triangle, $\overbar{AC }$and $\overbar{AC}$. Measure each segment of the sides that have been split. Use the “Distance or Length” tool
2. Your sketch should look something like the one below. Record your side lengths below:



*BE* = \_\_\_\_\_\_\_\_\_\_

*EC* = \_\_\_\_\_\_\_\_\_\_

*AD* = \_\_\_\_\_\_\_\_\_\_

*DC* = \_\_\_\_\_\_\_\_\_\_

1. Find the ratio of segments on each side of the triangle (to the nearest 0.1):

$\frac{BE}{EC}$ = \_\_\_\_\_\_\_\_\_ and $\frac{AD}{DC}$= \_\_\_\_\_\_\_\_\_

What do you notice?

1. Move the line you constructed parallel to $\overbar{AB}$ so that your side lengths change. Record your new side lengths below:

*BE* = \_\_\_\_\_\_\_\_\_\_

*EC* = \_\_\_\_\_\_\_\_\_\_

*AD* = \_\_\_\_\_\_\_\_\_\_

*DC* = \_\_\_\_\_\_\_\_\_\_

1. Find the new ratios:

$\frac{BE}{EC}$ = \_\_\_\_\_\_\_\_\_ and $\frac{AD}{DC}$= \_\_\_\_\_\_\_\_\_
2. Compare your results with other students in the class. How are the results similar? How are they different?
3. You have just discovered the “side splitting” relationship. In your own words write a conjectiure that describes your discovery.

**Part II – Using the side splitting conjecture**

1. In the triangle below $\overleftrightarrow{EF }$is parallel to $\overbar{AB}$. Find *EC*



1. In the triangle below could $\overleftrightarrow{ED}$ be parallel to $\overbar{AB}$? Explain your reasoning.
(Assume the given lengths are accurate to the nearest 0.01.)

