Name: ______________________________________ Date: __________________________

MORE SIMILARITY REASONING
N-GEN MATH® GEOMETRY

*Reasoning with **similar triangles** can be challenging for students, especially because it is not always obvious when two triangles have the **same shape** but a **different size**. In this lesson, we will extend our reasoning with similar triangles to establish **relationships amongst** their **side lengths**. First a review of a **fraction property**.*

The Cross-Product Property of Fractions

If the cross-products of two fractions are equal, then the fractions are equal. Conversely, if two fractions are equal, then their cross-products are equal.

***Exercise* #1:** In each case below, test the equivalency of two fractions by seeing if the **product of the means** is equal to the **product of the extremes**.

(a) $\frac{3}{6}=\frac{1}{3}$ (b) $\frac{3}{6}=\frac{6}{12}$ (c) $\frac{6}{4}=\frac{15}{10}$ (d) $\frac{4}{6}=\frac{9}{12}$

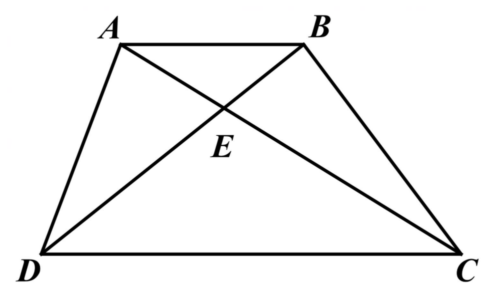
*Whenever we change a **true proportion** into a **product**, we use the following line of reasoning:*

means

$\frac{a}{b}=\frac{c}{d} \Rightarrow b\cdot c=a\cdot d$ **The Product of the Means is Equal to the Product of the Extremes**

extremes

***Exercise* #2:** In the diagram shown, $ABCD$ is a trapezoid with $\overline{AB}\parallel\overline{CD}$. Diagonals $\overline{AC}$ and $\overline{BD}$ intersect at point E. We want to show that $AE\cdot DE=CE\cdot BE$.



(a) Mark all congruent angles based on the parallel lines.

(b) What two triangles can be proven similar using the A.A. Criteria? State them and draw them below in similar orientations.

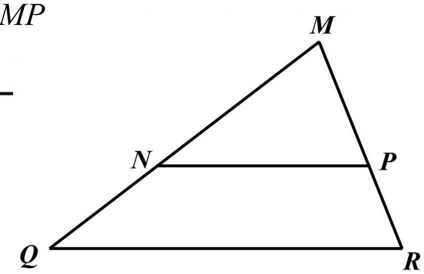
(c) One you have proven the triangles from (b) are similar using the A.A. Criteria, you can then finish the proof. Fill in the reasons for each of the following statements.

$\frac{BE}{DE}=\frac{AE}{CE}$ Reason: ____

$AE\cdot DE=CE\cdot BE$ Reason: ____

These types of proofs are very similar to ***CPCTC proofs*** *from previous units. The difference is that in these types we first must* ***prove*** *two* ***triangles*** *are* ***similar****, then use them to set up a* ***proportion****, and then turn that proportion into a* ***product****. These proofs will be very common in the rest of this unit and in our unit on circle geometry.*

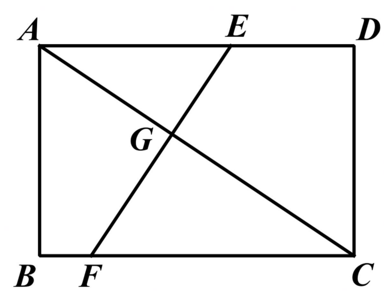
***Exercise* #3:** Given: $\overline{MNQ}$, $\overline{MPR}$, and $\overline{NP} \parallel \overline{QR}$ Prove: $MN \cdot MR = MQ \cdot MP$



Statement	Reason

***Exercise* #4:** Given: $ABCD$ is a rectangle. Points E and F lie on $\overline{AD}$ and $\overline{BC}$ such that $\overline{EF} \perp \overline{AC}$. Prove that:

$$AC \cdot FG = CD \cdot CF$$



(a) Use the product above to determine which two triangles will need to be proven similar. Outline a strategy based on the givens.

(b) Do the proof.

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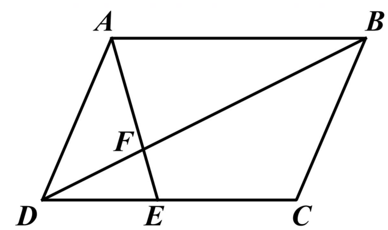
More Similarity Reasoning
N-Gen Math® Geometry Homework

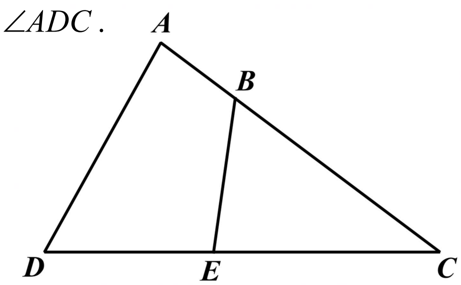
Reasoning

1. Given: $ABCD$ is a parallelogram with point E located on $\overline{CD}$ such that $\overline{AE}$ intersects $\overline{BD}$ at point F.

   Prove: $EF \cdot BF = AF \cdot DF$



2. In ΔACD, points B and E are located on $\overline{AC}$ and $\overline{CD}$ such that $\angle EBC \cong \angle ADC$.

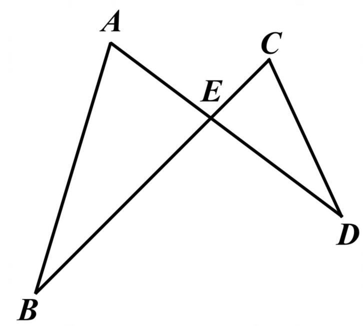


   (a) Based on the givens and shared angles, write a similarity statement. Draw the individual triangles separately and in the same orientation.

   (b) Prove: $EC \cdot AD = AC \cdot EB$

3. Given: $\overline{BC}$ and $\overline{AD}$ intersect at E and $\angle B \cong \angle D$.

Prove: $BE \cdot EC = DE \cdot EA$



4. Given: $QRST$ is a rhombus whose diagonals intersect at W. Point U is located on $\overline{QR}$ such that $\overline{WU} \perp \overline{QR}$.

Prove: $QW \cdot UR = WT \cdot UW$