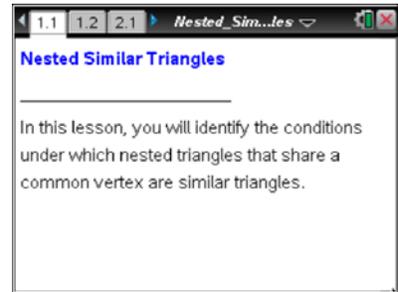# Nested Similar Triangles

Student Activity

Name _____

Class _____

Open the TI-Nspire document *Nested_Similar_Triangles.tns.*

In this activity, you will examine nested triangles that share a vertex. You will determine what must be true about the nested triangles in order for them to be similar.

1. Drag point *E* to any position on $\overline{AB}$. Then slowly drag point *F* until congruent angle marks appear for $\triangle AEF$ and $\triangle B$, and press [enter].

   a. Explain why $\triangle AFE$ and $\triangle C$ are also congruent.

   b. When these pairs of angles are congruent, what is the relationship between the two ratios?

   c. Write a proportion using $\overline{AE}$, $\overline{AB}$, $\overline{AF}$, and $\overline{AC}$.

2. When $\triangle AEF$ is congruent to $\triangle B$, is $\overline{EF}$ parallel to $\overline{BC}$? Why or why not?

3. The nested triangles are similar.

   a. Finish the similarity statement for these triangles. (Note: the order of the vertices matters.)

   $\triangle ABC \sim$ _____

   b. What evidence shows that the two triangles are similar?

   c. How does $\overline{EF} : \overline{BC}$ compare to the other ratios found in the similar triangles? Justify your answer.

4. Drag point *E* to a new position on $\overline{AB}$ and slowly drag point *F* until the congruent angle marks appear. Do any of your answers to questions 1–3 change? Explain.

5. a. If two triangles share a common angle, are they always similar? Why or why not?

    b. If you have nested triangles with $\triangle A$ in common, what conditions are necessary for the triangles to be similar? Write your statement(s) in if-then form.

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6. Drag the open circle at point *F* to any position on $\overline{AC}$. Then slowly drag the open circle at point *E* until congruent angle marks show. Then press $\boxed{\text{enter}}$.

    a. When the congruence marks appear for angles, what do you observe about the ratios of sides?

    b. When the congruence marks appear, are the triangles similar? Why or why not?

    c. If the triangles are similar, then finish the similarity statement for these triangles. (Note: the order of the vertices matters.) $\triangle ABC \sim$ _____

7. Consider the statements below.

    a. Ann said, "If two nested triangles are similar, then the sides opposite the common angle must be parallel." Is she right? Explain.

    b. Kyle said, "If you can use $\overline{AE}$, $\overline{AB}$, $\overline{AF}$, and $\overline{AC}$ to make a proportion, then the nested triangles with $\triangle A$ in common are always similar." Is he right? Explain.