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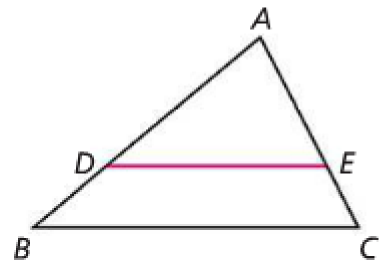
6. Understanding Theorems 4.1 and 4.2 by reading through their words can be difficult. It may help to replace some of the words with actual segment names. Rewrite each theorem using the nested triangles shown here as a reference. Make each theorem as specific as possible. If a theorem mentions a segment length or a proportion, substitute the name of that segment or proportion in place of the words.



7. Standardized Test Prep In $\triangle ABC$, D lies on $\overline{AB}$ and E lies on $\overline{AC}$. Suppose $\overleftrightarrow{DE} \parallel \overleftrightarrow{BC}$. Which proportion is NOT correct?

A. $\frac{AD}{AB} = \frac{AE}{AC}$

B. $\frac{AD}{DB} = \frac{AE}{EC}$

C. $\frac{AD}{DB} = \frac{DE}{BC}$

D. $\frac{AD}{AB} = \frac{DE}{BC}$

8. Write About It The Parallel Side-Splitter Theorem says that a segment parallel to a side of a triangle with endpoints on the other two sides "splits the other two sides proportionally."

Tammy Jo has three sayings that help her remember this:

Whole is to part as whole is to part.

Part is to part as part is to part.

Part is to whole as part is to whole.

What do these sayings mean?

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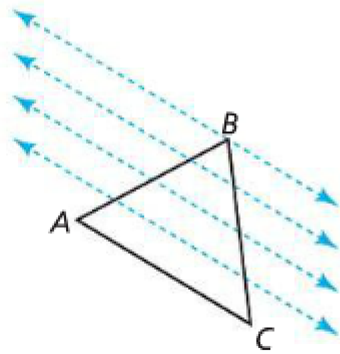
4. **Standardized Test Prep** In $\triangle STR$, U lies on $\overline{SR}$, V lies on $\overline{RT}$, and $\overline{VU} \parallel \overline{TS}$. Suppose that $TS = 540$, $VU = 180$, $US = 667$, and $RT = 600$. What is RV?

A. 200 **B.** 240 **C.** 270 **D.** 333

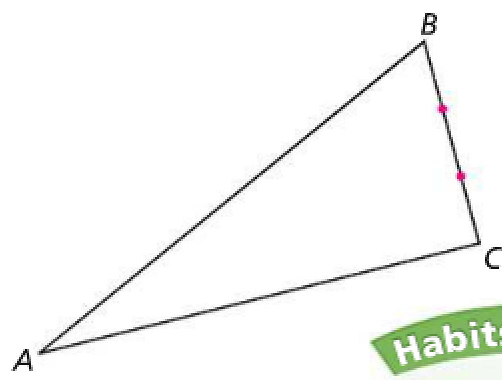
5. The dashed lines in the figure are all parallel to $\overline{AC}$ and equally spaced. What can you conclude about how they intersect $\overline{AB}$ and $\overline{BC}$?



6. Make two copies of the diagram below. Use the fact that the points shown in red trisect $\overline{BC}$ to do the following.

a. Trisect $\overline{AB}$.

b. Trisect $\overline{AC}$.



Habits of Mind

Make connections. How does the definition of *bisect* help you define *trisect*?

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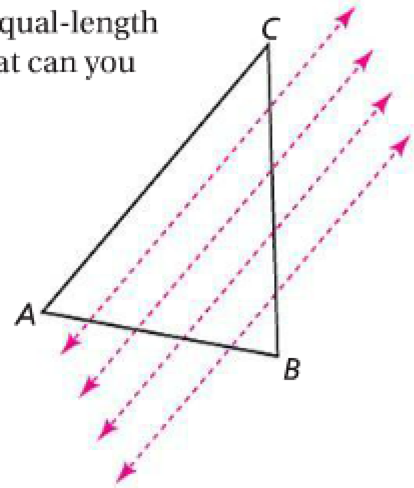
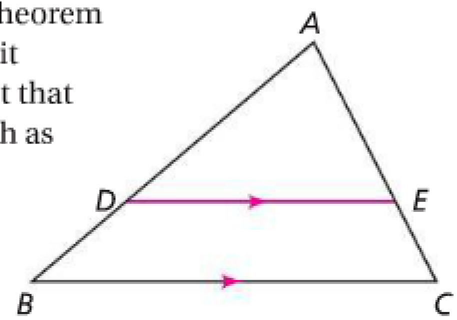
7. Both $\overline{AB}$ and $\overline{BC}$ are cut into five equal-length segments by the dashed lines. What can you conclude?



The first part of the Parallel Side-Splitter Theorem tells you that two sides of a triangle are split proportionally. By now, you should suspect that there are several proportions possible, such as $\frac{AB}{AD} = \frac{AC}{AE}$ and $\frac{DB}{AD} = \frac{EC}{AE}$ in the triangle at the right.

Exercises 8 and 9 show how to prove that these proportions are two different ways of writing the same information.



8. Take It Further First, you can prove a related fact using algebra. Suppose that r, s, t, and u are any four nonzero numbers. If $\frac{r}{s} = \frac{t}{u}$, explain why it is also true that $\frac{r-s}{s} = \frac{t-u}{u}$.

Hint: $\frac{r-s}{s} = \frac{r}{s} - \frac{s}{s}$

9. Take It Further Use Exercise 8 as a guide. Explain how the proportion $\frac{AB}{AD} = \frac{AC}{AE}$ leads directly to $\frac{DB}{AD} = \frac{EC}{AE}$.

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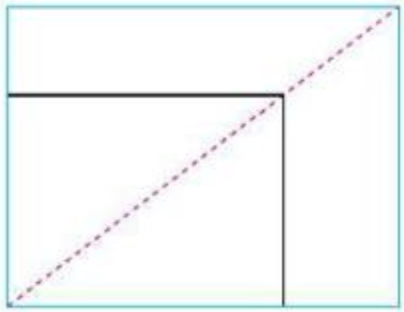
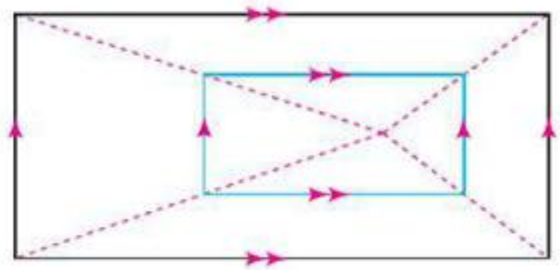
4. Use the side-splitter theorems. Explain why the two rectangles in each figure below are scaled copies of each other.

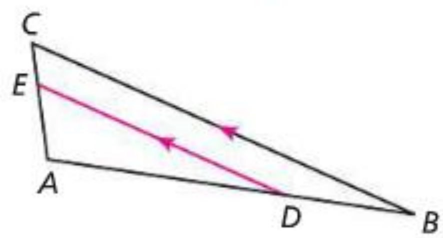
a.



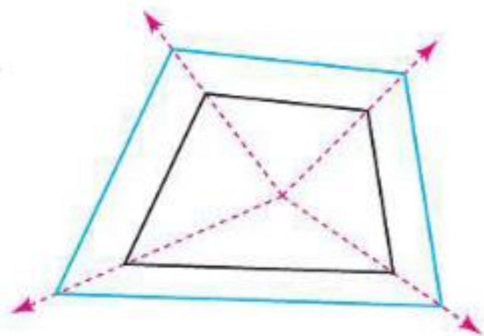
b.



5. In the triangle shown here, $\overline{DE} \parallel \overline{BC}$. Explain why $\triangle ABC$ is a scaled copy of $\triangle ADE$.



6. You draw the sides of the outer polygon parallel to the sides of the inner polygon as shown at the right. Explain why the polygons are scaled copies.



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7. **Standardized Test Prep** Suppose $\triangle ABC$ is a scaled copy of $\triangle BED$. Which of the following lists the congruent corresponding angles of these two triangles?

A. $\angle A \cong \angle DBE$, $\angle ABC \cong \angle BDE$, $\angle C \cong \angle DEB$

B. $\angle A \cong \angle DBE$, $\angle ABC \cong \angle BED$, $\angle C \cong \angle BDE$

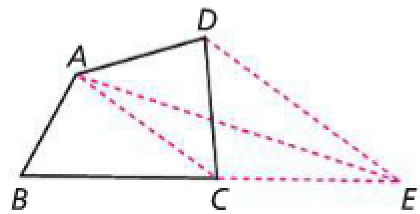
C. $\angle A \cong \angle DBE$, $\angle ABC \cong \angle BED$, $\angle B \cong \angle BDE$

D. $\angle A \cong \angle DBE$, $\angle ABC \cong \angle BDE$, $\angle C \cong \angle DEB$

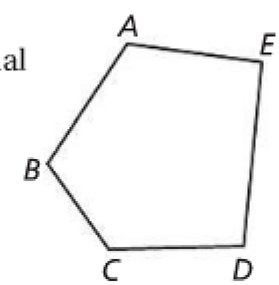
8. **Take It Further** Here is a way to construct $\triangle ABE$ to have the same area as quadrilateral $ABCD$, without taking any measurements.

First, draw diagonal $\overline{AC}$. Then draw a line through point D parallel to $\overline{AC}$. Extend $\overline{BC}$ to meet the parallel at point E.

This completes the construction. The area of $\triangle ABE$ is equal to the area of quadrilateral $ABCD$. Explain why.



9. **Take It Further** Extend the method used in Exercise 8. Construct a triangle with area equal to that of pentagon $ABCDE$ shown here.



10. **Take It Further** $\overline{AB}$ and $\overline{BC}$ represent the border between land owned by Wendy and land owned by Juan. How can you replace these segments with a single segment such that the amount of land owned by each person does not change? Justify your answer.