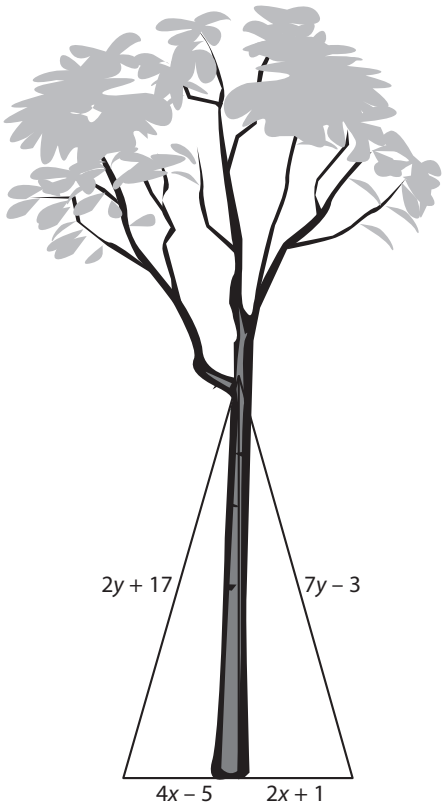
NAME:

UNIT 1 • SIMILARITY, CONGRUENCE, AND PROOFS
Lesson 7: Proving Similarity

Lesson 1.7.2: Working with Ratio Segments

Warm-Up 1.7.2

Landscapers will often stake a sapling to strengthen the tree's root system. A typical method of staking a tree is to tie wires to both sides of the tree and then stake the wires to the ground. If done properly, the two stakes will be the same distance from the tree.



1. Assuming the distance from the tree trunk to each stake is equal, what is the value of x?

2. How far is each stake from the tree?

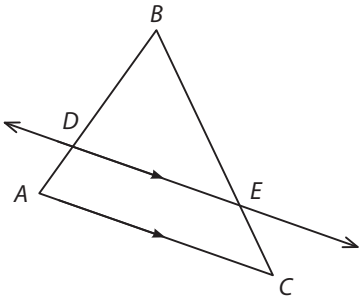
3. Assuming the distance from the tree trunk to each stake is equal, what is the value of y?

4. What is the length of the wire from each stake to the tie on the tree?

Theorem

Triangle Proportionality Theorem

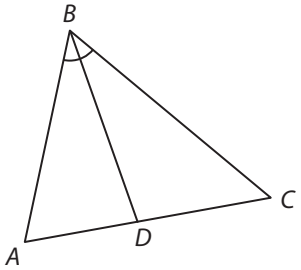
If a line parallel to one side of a triangle intersects the other two sides of the triangle, then the parallel line divides these two sides proportionally.



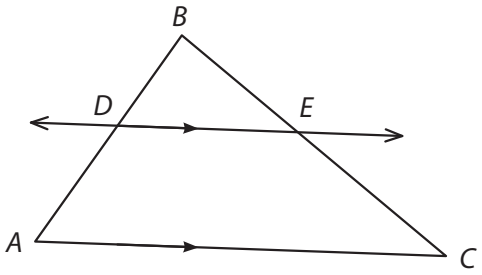
Theorem

Triangle Angle Bisector Theorem

If one angle of a triangle is bisected, or cut in half, then the angle bisector of the triangle divides the opposite side of the triangle into two segments that are proportional to the other two sides of the triangle.



It is also true that if a line divides two sides of a triangle proportionally, then the line is parallel to the third side.



It is possible to determine the lengths of the sides of triangles because of the **Segment Addition Postulate**.

This postulate states that if B is between A and C, then $AB + BC = AC$.

The **Reflexive Property of Congruent Segments** means that a segment is congruent to itself, so $\overline{AB} \cong \overline{AB}$.

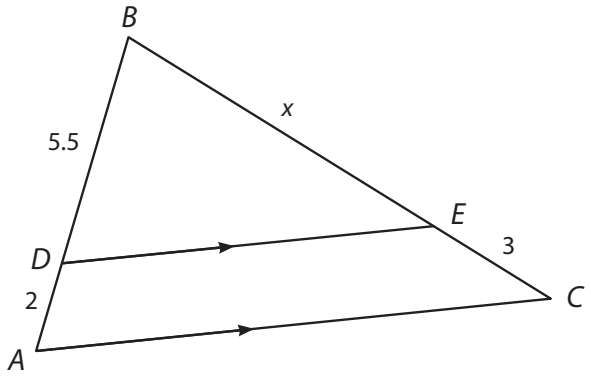
According to the **Symmetric Property of Congruent Segments**, if $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$.

The **Transitive Property of Congruent Segments** allows that if $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$.

Examples:

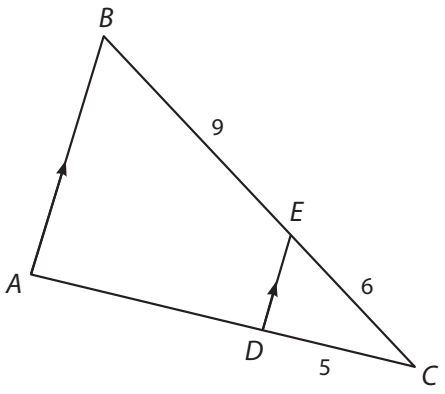
Example 1

Find the length of $\overline{BE}$.



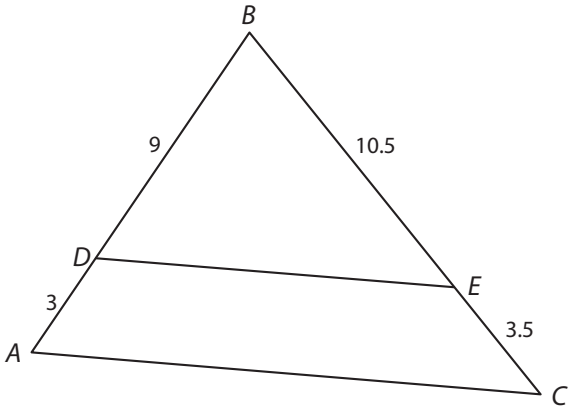
Example 2

Using two different methods, find the length of $\overline{CA}$.



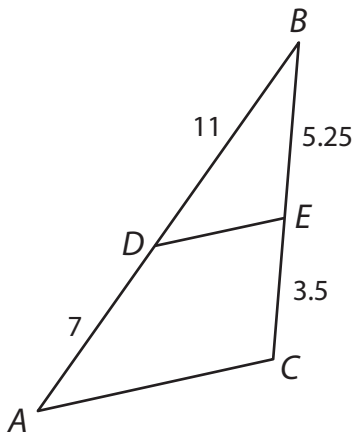
Example 3

Prove that $\overline{DE} \| \overline{AC}$.



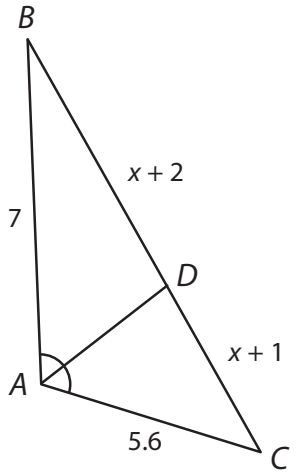
Example 4

Is $\overline{DE} \| \overline{AC}$?



Example 5

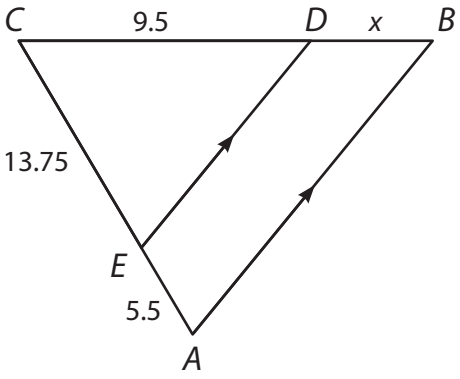
Find the lengths of $\overline{BD}$ and $\overline{DC}$.



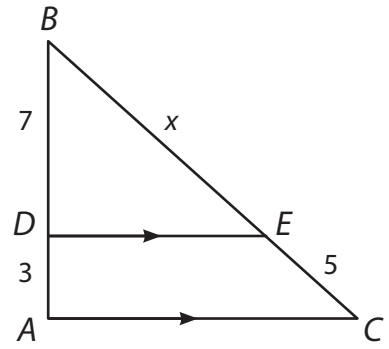
Practice 1.7.2: Working with Ratio Segments

Use the Triangle Proportionality Theorem and the Triangle Angle Bisector Theorem to find the unknown lengths of the given segments.

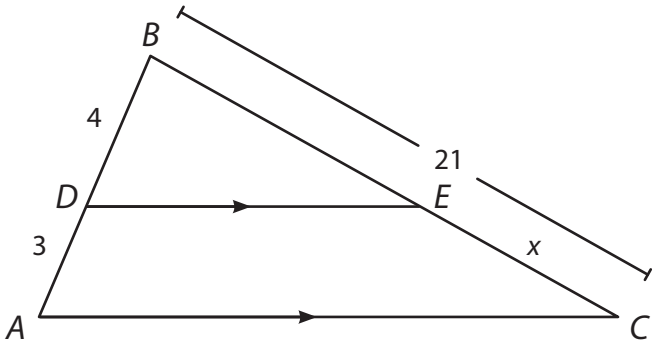
1. $\overline{BD}$



2. $\overline{BE}$

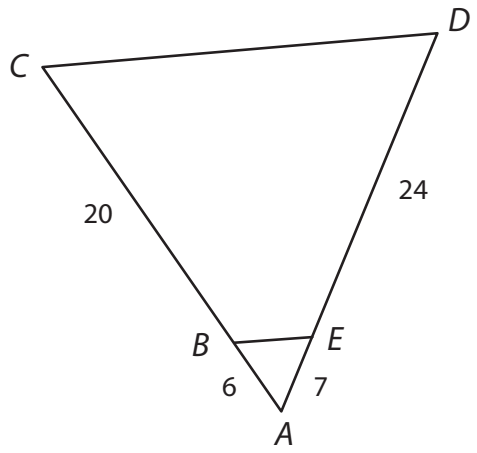


3. $\overline{EC}$



Use the Triangle Proportionality Theorem to determine if the given segments are parallel. Explain your reasoning.

7. Is $\overline{BE} \| \overline{CD}$?



Problem-Based Task 1.7.2: Suddenly Sinking

In August 2012, a sinkhole in Louisiana swallowed part of the Earth's surface. This sudden erosion of land forced many people to evacuate as engineers worked to determine the effects of the sinkhole. Officials began their assessment of the area by first determining the size of the sinkhole. Surveyors worked to locate points near the sinkhole to calculate its diameter. The initial measurements are shown below. As days passed, the diameter of the sinkhole increased by 15%. What was the diameter of the sinkhole after the increase?