ALBERT

Name _____ Date _____

Triangle Proportionality and Similarity Proofs Worksheet

Geometry · Common Core HSG-SRT.B.4

> Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

Practice

Builds the skill step by step.

1. In △ABC, DE ∥ BC with D on AB and E on AC. AD = 3, DB = 6 and AE = 4. What is EC?

2. In △ABC, DE ∥ BC. AD = 5, DB = 10 and EC = 12. What is AE?

3. A line divides two sides of a triangle proportionally. What must be true about it?

   A. It is perpendicular to the third side.

   B. It bisects the third side.

   C. It passes through a vertex.

   D. It is parallel to the third side.

4. In △ABC, DE ∥ BC. AD = 4, AB = 12 and AE = 5. What is AC?

5. In △ABC, D is the midpoint of AB and DE ∥ BC with E on AC. AE = 7. What is EC?

6. A right triangle has legs 9 and 12. How long is the hypotenuse?

7. In $\triangle ABC$, $DE \parallel BC$. $AD = x$, $DB = 6$, $AE = 4$ and $EC = 8$. What is x?

8. The Pythagorean Theorem can be proved with similar triangles. What segment is drawn to make them?

   A. the altitude from the right angle to the hypotenuse

   B. a median to a leg

   C. a line parallel to the hypotenuse

   D. the angle bisector of an acute angle

9. In $\triangle ABC$, D is on AB and E is on AC. $AD = 4$, $DB = 6$, $AE = 6$ and $EC = 9$. Is $DE \parallel BC$?

   A. You can't tell.

   B. Yes, because $4 \div 6 = 6 \div 9$.

   C. No, because the segments have different lengths.

   D. No, because $4 \neq 6$.

10. A right triangle has legs 5 and 12. How long is the hypotenuse?

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On Level

Grade-level practice.

1. In △ABC, DE ∥ BC. AD = x + 1, DB = x + 5, AE = 4 and EC = 8. What is x?

2. In △ABC, DE ∥ BC. AD = 6, DB = 4 and DE = 9. What is BC?

3. Three parallel lines cut two transversals. On the first transversal the segments are 4 and 6. On the second, the first segment is 6. How long is the second segment?

4. In △ABC, AD = 3, DB = 5, AE = 4 and EC = 6, with D on AB and E on AC. Is DE ∥ BC?

   A. You can't tell.

   B. Yes, because both ratios are less than 1.

   C. No, because 3 ÷ 5 ≠ 4 ÷ 6.

   D. Yes, because D and E are between the vertices.

5. Outline how to prove the Pythagorean Theorem with similar triangles in right △ABC with right angle C and altitude CD to hypotenuse AB.

6. A right triangle has a hypotenuse of 25 and one leg of 7. How long is the other leg?

7. The altitude to the hypotenuse of a right triangle splits the hypotenuse into segments of 9 and 16. How long is the leg next to the segment of 9?

8. In $\triangle ABC$, $DE \parallel BC$. $AD \div DB = \frac{2}{3}$ and $AC = 20$. What is AE?

9. In $\triangle ABC$, $DE \parallel BC$. $AE = 6$, $EC = 3$ and $BC = 12$. What is DE?

10. A right triangle has legs 8 and 15. How long is the hypotenuse?

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Challenge

Multi-step and word problems that stretch it.

1. Three parallel lines cut two transversals. On one transversal the segments are 2x and 3x + 1. On the other they are 4 and 7. What is x?

2. In △ABC, DE ∥ BC. AD = 4 and AB = 10. The area of △ABC is 50 square units. What is the area of △ADE?

3. In △ABC, DE ∥ BC. AD = 8, DB = x, AE = x and EC = 2. What is x?

4. Prove the triangle proportionality theorem: in △ABC, if DE ∥ BC, then AD ÷ DB = AE ÷ EC.

5. The altitude to the hypotenuse of a right triangle splits it into segments of 3 and 12. How long is the altitude?

6. In $\triangle ABC$, D is on AB and E is on AC with $AD \div AB = AE \div AC$. Which statement must be true?

   A. $DE \perp BC$

   B. D is the midpoint of AB

   C. $DE \parallel BC$

   D. $DE = BC$

7. A right triangle has legs 1 and $\sqrt{3}$. How long is the hypotenuse?

8. D and E are the midpoints of AB and AC, and DE = 7.5. What is BC?

9. The altitude to the hypotenuse of a right triangle is 12, and it splits the hypotenuse into two segments. One segment is 9. How long is the other?

10. A right triangle has a hypotenuse of 13 and a leg of 5. How long is the altitude to the hypotenuse?