

Similar Triangles, Proportions and Indirect Measurement

Grade 10 – Geometry math · Worksheet · Standards: G-SRT.B.4, G-SRT.B.5

Name: _____ Date: _____ Class: _____

These problems cover G-SRT.B.4 and G-SRT.B.5: proving triangles similar with AA, SAS and SSS, the Side-Splitter Theorem and its converse, geometric means in right triangles, the Pythagorean Theorem by similarity, and indirect measurement.

Early problems find missing sides. Later problems use mirrors and stakes to measure what cannot be reached, and two-column proofs.

Standards: G-SRT.B.4, G-SRT.B.5 · **Level:** Grade 10 Geometry

Problem 1 Find a missing side (easy)

$\triangle ABC \sim \triangle DEF$. $AB = 6$, $DE = 15$ and $BC = 8$. Find the scale factor from $\triangle ABC$ to $\triangle DEF$ and the length of EF .

Problem 2 AA similarity check (easy)

One triangle has angles of 38° and 74° . Another has angles of 74° and 68° . Are the triangles similar? Explain.

Problem 3 SAS similarity (easy)

Triangle 1 has two sides of 6 and 9 with a 50° angle between them. Triangle 2 has two sides of 8 and 12 with a 50° angle between them. Are the triangles similar?

Problem 4 SSS similarity (easy)

Triangle 1 has sides 7, 9 and 12. Triangle 2 has sides 10.5, 13.5 and 18. Are the triangles similar? Find the scale factor.

Problem 5 Use the side-splitter theorem (easy)

$DE \parallel BC$ in $\triangle ABC$. $AD = 4$, $DB = 6$ and $AE = 5$. Find EC .

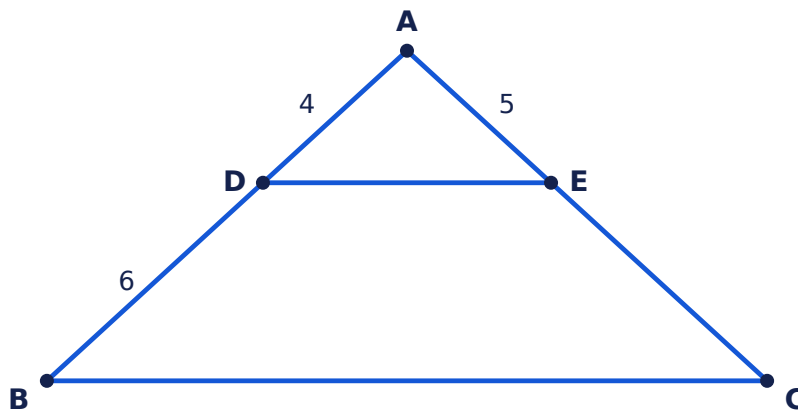


Figure for Problem 5.

Problem 6 Side-splitter with algebra (medium)

$DE \parallel BC$ in $\triangle ABC$. $AD = 2x$, $DB = 12$, $AE = x + 3$ and $EC = 9$. Find x , AD and AE .

Problem 7 Is the line parallel (medium)

In $\triangle ABC$, D is on AB and E is on AC . Decide whether $DE \parallel BC$.

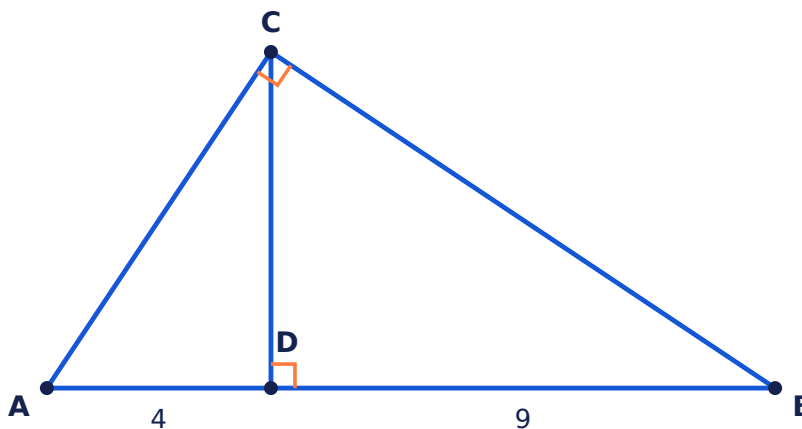
- $AD = 6$, $DB = 9$, $AE = 8$, $EC = 12$
- $AD = 5$, $DB = 7$, $AE = 6$, $EC = 8$

Problem 8 Length of the parallel segment (medium)

$DE \parallel BC$ in $\triangle ABC$, with $AD = 6$, $DB = 9$ and $BC = 25$. Find DE .

Problem 9 Altitude to the hypotenuse (medium)

In right triangle ABC with the right angle at C , the altitude CD splits the hypotenuse into $AD = 4$ and $DB = 9$. Find CD .



Problem 10 Hypotenuse split into 9 and 16 (medium)

The altitude to the hypotenuse of a right triangle splits the hypotenuse into pieces of 9 and 16. Find the altitude and both legs.

Problem 11 Geometric mean (medium)

Find the geometric mean of (a) 6 and 24, (b) 5 and 20, and (c) 8 and 12 (to the nearest hundredth).

Problem 12 Decimal pieces of the hypotenuse (medium)

A right triangle has hypotenuse 10 divided by the altitude into pieces 3.6 and 6.4. Find the altitude and the two legs.

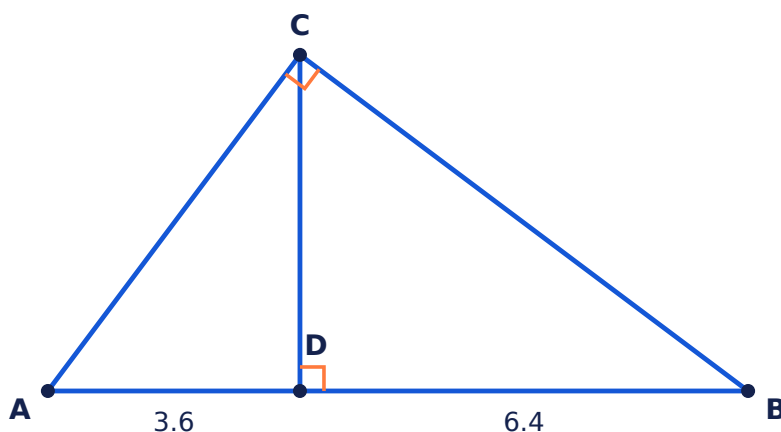


Figure for Problem 12.

Problem 13 Pythagorean theorem by similarity (medium)

In a right triangle the legs are a and b , the hypotenuse is c , and the altitude to the hypotenuse creates pieces p (next to a) and q (next to b). Use the relationships $a^2 = pc$ and $b^2 = qc$ to prove $a^2 + b^2 = c^2$, then check with $a = 15$, $b = 20$, $c = 25$.

Problem 14 Mirror measurement (hard)

A student with eye height 1.6 meters stands 2.4 meters from a mirror lying flat on the ground. The mirror is 18 meters from the base of a building. She sees the top of the building in the mirror. Find the height of the building.

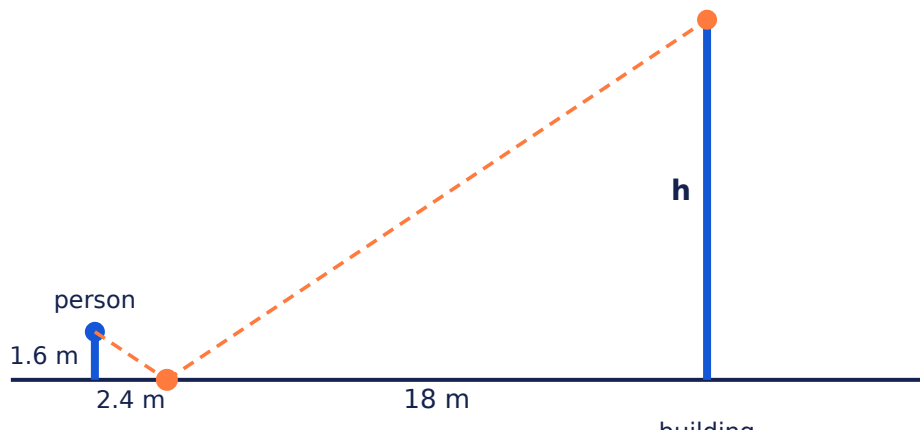


Figure for Problem 14.

Problem 15 River width (hard)

A tree T stands directly across a river from point A on the near bank. A surveyor walks 40 meters along the bank to B , then marks D on AB so that $BD = 12$ meters. At D she walks away from the river along a line perpendicular to the bank until C , where C , B and the tree are in line. $DC = 9$ meters. Find the river's width TA .

Problem 16 Scale model of a lot (hard)

A triangular lot has sides of 120, 150 and 200 feet. A model is built with the shortest side 8 inches long. Find the other two sides and the perimeter of the model to the nearest tenth of an inch.

Problem 17 Three parallel streets (hard)

Three parallel streets are cut by two straight avenues. On the first avenue the streets mark segments of 120 meters and 180 meters. On the second avenue the first segment is 95 meters. Find the second segment.

Problem 18 Altitude in a 12-16-20 triangle (hard)

A right triangle has legs 12 and 16 and hypotenuse 20. Find the altitude to the hypotenuse and the two pieces of the hypotenuse, then verify $h^2 = pq$.

Problem 19 Prove similarity from a parallel line (hard)

Given: $DE \parallel BC$ in $\triangle ABC$. Prove: $\triangle ADE \sim \triangle ABC$.

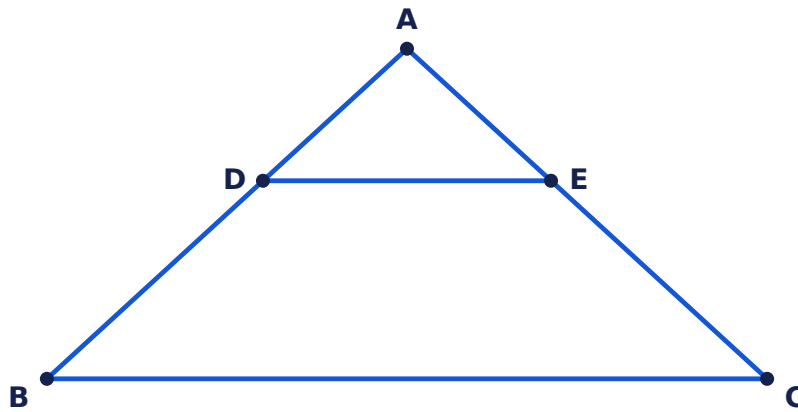


Figure for Problem 19.

Problem 20 Prove $AC^2 = AD \cdot AB$ (hard)

Right triangle ABC has its right angle at C , and CD is the altitude to AB . Prove that $\triangle ACD \sim \triangle ABC$, and use it to show that $AC^2 = AD \cdot AB$.

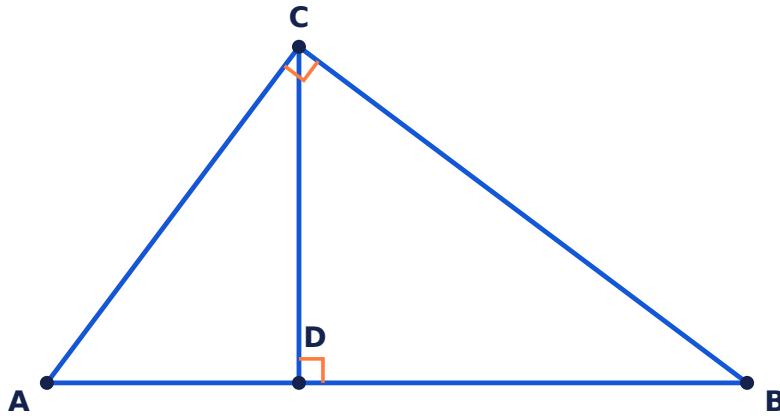


Figure for Problem 20.