G.SRT.B.5: Similarity 4

1 In the diagram below of right triangle $ABC$, an altitude is drawn to the hypotenuse $AB$.

Which proportion would always represent a correct relationship of the segments?

1) $\frac{c}{z} = \frac{z}{y}$
2) $\frac{c}{a} = \frac{a}{y}$
3) $\frac{x}{z} = \frac{z}{y}$
4) $\frac{y}{b} = \frac{b}{x}$

2 The accompanying diagram shows a 24-foot ladder leaning against a building. A steel brace extends from the ladder to the point where the building meets the ground. The brace forms a right angle with the ladder.

If the steel brace is connected to the ladder at a point that is 10 feet from the foot of the ladder, which equation can be used to find the length, $x$, of the steel brace?

1) $\frac{10}{x} = \frac{x}{14}$
2) $\frac{10}{x} = \frac{x}{24}$
3) $10^2 + x^2 = 14^2$
4) $10^2 + x^2 = 24^2$
3. The accompanying diagram shows part of the architectural plans for a structural support of a building. PLAN is a rectangle and $\overline{AS} \perp \overline{LN}$.

Which equation can be used to find the length of $\overline{AS}$?

1) $\frac{LS}{AS} = \frac{AS}{SN}$
2) $\frac{AN}{LN} = \frac{AS}{LS}$
3) $\frac{AS}{SN} = \frac{AS}{LS}$
4) $\frac{AS}{LS} = \frac{LS}{SN}$

4. In the diagram below of right triangle $ABC$, altitude $BD$ is drawn to hypotenuse $AC$, $AC = 16$, and $CD = 7$.

What is the length of $\overline{BD}$?

1) $3\sqrt{7}$
2) $4\sqrt{7}$
3) $7\sqrt{3}$
4) 12

5. In the diagram below of right triangle $ABC$, altitude $\overline{CD}$ is drawn to hypotenuse $AB$.

If $AD = 3$ and $DB = 12$, what is the length of altitude $\overline{CD}$?

1) 6
2) $6\sqrt{5}$
3) 3
4) $3\sqrt{5}$
6 In the diagram below, $QM$ is an altitude of right triangle $PQR$, $PM = 8$, and $RM = 18$.

What is the length of $QM$?

1) 20  
2) 16  
3) 12  
4) 10

7 In the diagram below of right triangle $ABC$, altitude $BD$ is drawn to hypotenuse $AC$.

If $BD = 4$, $AD = x - 6$, and $CD = x$, what is the length of $CD$?

1) 5  
2) 2  
3) 8  
4) 11

8 In $\triangle RST$ shown below, altitude $SU$ is drawn to $RT$ at $U$.

If $SU = h$, $UT = 12$, and $RT = 42$, which value of $h$ will make $\triangle RST$ a right triangle with $\angle RST$ as a right angle?

1) $6\sqrt{3}$  
2) $6\sqrt{10}$  
3) $6\sqrt{14}$  
4) $6\sqrt{35}$

9 In the diagram below, $CD$ is the altitude drawn to the hypotenuse $AB$ of right triangle $ABC$.

Which lengths would not produce an altitude that measures $6\sqrt{2}$?

1) $AD = 2$ and $DB = 36$  
2) $AD = 3$ and $AB = 24$  
3) $AD = 6$ and $DB = 12$  
4) $AD = 8$ and $AB = 17$
10 In $\triangle PQR$, $\angle PRQ$ is a right angle and $RT$ is drawn perpendicular to hypotenuse $PQ$. If $PT = x$, $RT = 6$, and $TQ = 4x$, what is the length of $PQ$? 
1) 9 
2) 12 
3) 3 
4) 15

11 In the diagram below of right triangle $ACB$, altitude $CD$ intersects $AB$ at $D$. If $AD = 3$ and $DB = 4$, find the length of $CD$ in simplest radical form.

12 In right triangle $ABC$ below, $CD$ is the altitude to hypotenuse $AB$. If $CD = 6$ and the ratio of $AD$ to $AB$ is $1:5$, determine and state the length of $BD$. [Only an algebraic solution can receive full credit.]

13 The drawing for a right triangular roof truss, represented by $\triangle ABC$, is shown in the accompanying diagram. If $\angle ABC$ is a right angle, altitude $BD = 4$ meters, and $DC$ is 6 meters longer than $AD$, find the length of base $AC$ in meters.

14 In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$. Explain why $\triangle ABC \sim \triangle ACD$. 

[Diagrams for questions 10, 11, 12, and 13 are provided.]
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Answer Section

1 ANS: 3  REF: 081410ge
2 ANS: 1  REF: 010619b
3 ANS: 1  REF: 010920b
4 ANS: 1
   \[ x^2 = 7(16 - 7) \]
   \[ x^2 = 63 \]
   \[ x = \sqrt{9} \sqrt{7} \]
   \[ x = 3\sqrt{7} \]
   REF: 061128ge
5 ANS: 1
   \[ x^2 = 3 \times 12 \]
   \[ x = 6 \]
   REF: 011308ge
6 ANS: 3
   \[ x^2 = 8 \times 18 \]
   \[ x^2 = 144 \]
   \[ x = 12 \]
   REF: 061506ge
7 ANS: 3
   \[ x(x - 6) = 4^2 \]
   \[ x^2 - 6x - 16 = 0 \]
   \[ (x - 8)(x + 2) = 0 \]
   \[ x = 8 \]
   REF: 081807geo
8 ANS: 2
   \[ h^2 = 30 \cdot 12 \]
   \[ h^2 = 360 \]
   \[ h = 6\sqrt{10} \]
   REF: 061613geo
9 ANS: 2
\[ \sqrt{3 \cdot 21} = \sqrt{63} = 3\sqrt{7} \]

REF: 011622geo

10 ANS: 4
\[ x \cdot 4x = 6^2. \quad PQ = 4x + x = 5x = 5(3) = 15 \]
\[ 4x^2 = 36 \]
\[ x = 3 \]

REF: 011227ge

11 ANS:
\[ 2\sqrt{3}. \quad x^2 = 3 \cdot 4 \]
\[ x = \sqrt{12} = 2\sqrt{3} \]

REF: fall0829ge

12 ANS:
\[ 4x \cdot x = 6^2 \]
\[ 4x^2 = 36 \]
\[ x^2 = 9 \]
\[ x = 3 \]
\[ BD = 4(3) = 12 \]

REF: 011437ge

13 ANS:
\[ x(x + 6) = 4^2 \]

10. Let \( \overline{AD} = x. \quad x^2 + 6x - 16 = 0 \]. Since \( DC = 8, \quad AC = 10 \).
\[ (x + 8)(x - 2) = 0 \]
\[ x = 2 \]

REF: 080932b

14 ANS:
If an altitude is drawn to the hypotenuse of a triangle, it divides the triangle into two right triangles similar to each other and the original triangle.

REF: 061729geo