

Geometry CC - Unit 7
 LESSON 11: HLLS/SAAS Day 1
 M2 L 21

Proportions in a Right Triangle

The altitude drawn to the hypotenuse of a right triangle forms two triangles that are similar to each other and to the original triangle.

Since these triangles are similar, we can establish proportions relating the corresponding sides. Two valuable theorems can be formed using these proportions.

$\triangle ACB \sim \triangle ADC \sim \triangle CDB$

Theorem 1: The altitude to the hypotenuse of a right triangle is the mean proportional between the segments that divide the hypotenuse. (SAAS)

$\frac{AD}{CD} = \frac{CD}{DB}$

SAAS
 $\frac{a}{a} = \frac{a}{s}$
 Seg 1 = Alt
 Alt = Seg 2

Theorem 2: The measure of each leg of the original triangle is the mean proportional between the hypotenuse and the segment of the hypotenuse that is adjacent to that leg. (HLLS)

$\frac{AB}{CB} = \frac{CB}{DB}$
 or
 $\frac{AB}{CA} = \frac{CA}{AD}$

HLLS
 $\frac{h}{l} = \frac{l}{s}$ or $\frac{h}{l} = \frac{l}{h}$

Hyp = leg
 leg Seg closest to leg

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Let's focus on SAAS: $\left(\frac{\text{segment 1}}{\text{altitude}} = \frac{\text{altitude}}{\text{segment 2}}\right)$

ait seg seg

$$\frac{S}{A} = \frac{A}{S}$$

$$\frac{2}{10} = \frac{10}{50}$$

$$100 = 100 \checkmark$$

ait seg seg

$$\frac{2}{10} = \frac{10}{50}$$

$$100 = 100 \checkmark$$

$$\frac{1}{4} \times \frac{4}{16}$$

$$16 = 16$$

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1. Find the value of x to the nearest tenth, if necessary.

a) $\frac{x}{4} = \frac{4}{7}$
 $x \approx 2.3$

b) $\frac{6}{9} = \frac{9}{x}$
 $6x = 81$
 $x = 13.5$

c) $\frac{5}{x} = \frac{x}{7}$
 $\sqrt{35} = \sqrt{x^2}$
 $x \approx 5.9$

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d) $\frac{x}{5} = \frac{5}{8}$
 $25 = 8x$
 $x \approx 3.1$

e) $\frac{7}{10} = \frac{10}{x}$
 $7x = 100$
 $x \approx 14.3$

f) $\frac{6}{x} = \frac{x}{8}$
 $\sqrt{48} = \sqrt{x^2}$
 $x \approx 6.9$

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Let's focus on HLLS: $\left(\frac{\text{hypotenuse}}{\text{leg}} = \frac{\text{leg}}{\text{segment}}\right)$

Theorem 2: The measure of each leg of the original triangle is the mean proportional between the hypotenuse and the segment of the hypotenuse that is adjacent to that leg. (HLLS)

$\frac{AB}{CB} = \frac{CB}{DB}$
 or
 $\frac{AB}{CA} = \frac{CA}{AD}$

HLLS
 $\frac{h}{l} = \frac{l}{s}$ or $\frac{h}{l} = \frac{l}{h}$

In each case, find the value of x to the nearest tenth, if necessary.

a) $\frac{H}{L} = \frac{L}{S}$
 $\frac{12}{4} = \frac{4}{x}$
 $\sqrt{48} = \sqrt{x^2}$
 $x \approx 6.9$

b) $\frac{17}{x} = \frac{x}{6}$
 $\sqrt{x} = \sqrt{102}$
 $x \approx 10.1$

c) $\frac{4+x}{8} = \frac{8}{4}$
 $4(4+x) = 64$
 $4+x = 16$
 $x = 12$

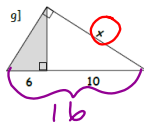
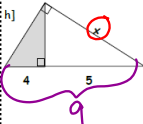
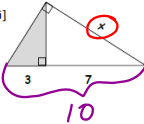
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d) $\frac{14}{x} = \frac{x}{5}$
 $\sqrt{70} = \sqrt{x^2}$
 $x \approx 8.4$

e) $\frac{19}{x} = \frac{x}{7}$
 $\sqrt{x} = \sqrt{133}$
 $x \approx 11.5$

f) $\frac{4+x}{6} = \frac{6}{4}$
 $\frac{36}{4} = \frac{4(4+x)}{4}$
 $9 = 4+x$
 $5 = x$

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<p>g) </p> $\frac{16}{x} = \frac{x}{10}$ $\sqrt{x} = \sqrt{160}$ $x \approx 12.6$	<p>h) </p> $\frac{9}{x} = \frac{x}{5}$ $\sqrt{x} = \sqrt{45}$ $x \approx 6.7$	<p>i) </p> $\frac{10}{x} = \frac{x}{7}$ $\sqrt{x} = \sqrt{70}$ $x \approx 8.4$
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