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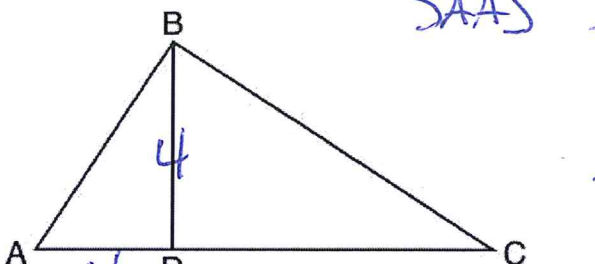
Date _____
Geometry

Similar Triangles with Quadratics

1. In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$. If $BD = 4$, $AD = x - 6$, and $CD = x$, what is the length of $\overline{CD}$?



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

$\frac{x-6}{4} = \frac{4}{x}$

$x(x-6) = 16$

$x^2 - 6x = 16$

$-16 \quad -16$

$x^2 - 6x - 16 = 0$

$(x-8)(x+2) = 0$

$x-8=0 \quad | \quad x+2=0$

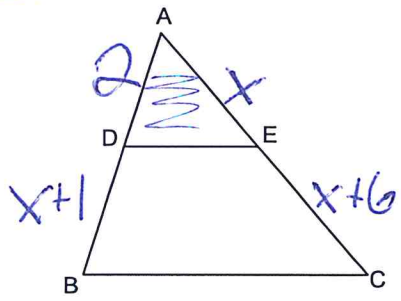
$+8 \quad +8 \quad -2 \quad -2$

$x = 8 \quad x = -2$ reject

1,16
2,8
4,4

$CD = 8$

2. In triangle ABC, $\overline{DE} \parallel \overline{BC}$. If $\overline{AD} = 2$, $\overline{DB} = x + 1$, $\overline{AE} = x$, and $\overline{EC} = x + 6$, find $\overline{AE}$



$\frac{\text{top}}{\text{top}} = \frac{\text{bottom}}{\text{bottom}}$

$\frac{2}{x} = \frac{x+1}{x+6}$

$x(x+1) = 2(x+6)$

$x^2 + 1x = 2x + 12$

$-2x - 12 \quad -2x - 12$

$x^2 - 1x - 12 = 0$

$(x-4)(x+3) = 0$

$x-4=0 \quad | \quad x+3=0$

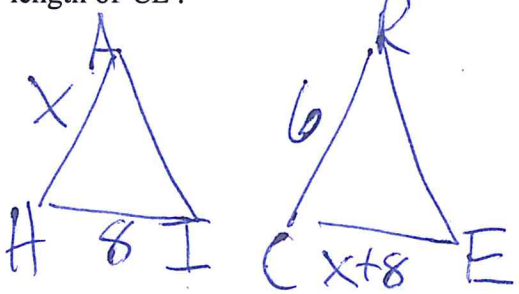
$+4 \quad +4 \quad -3 \quad -3$

$x = 4 \quad x = -3$ reject

1,12
2,6
3,4

$AE = 4$

3. $\Delta HAI \sim \Delta CRE$. If $\overline{HA} = x$, $\overline{CR} = 6$, $\overline{HI} = 8$, and $\overline{CE} = x + 8$, determine and state the length of $\overline{CE}$.



$\frac{x}{6} = \frac{8}{x+8}$

$x(x+8) = 48$

$x^2 + 8x = 48$

$-48 \quad -48$

$x^2 + 8x - 48 = 0$

$(x+12)(x-4) = 0$

$x+12=0 \quad | \quad x-4=0$

$-12 \quad -12 \quad +4 \quad +4$

$x = -12$ reject $\quad x = 4$

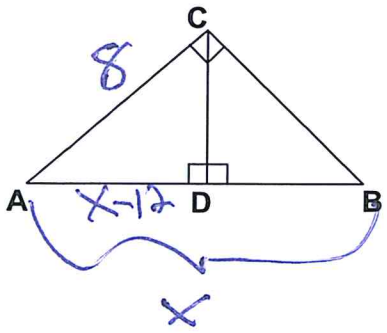
1,48
2,24
3,16
4,12
6,8

$CE = x + 8$

$CE = 4 + 8$

$CE = 12$

4. Altitude $\overline{CD}$ is drawn to right triangle ABC. If $\overline{AC} = 8$, $\overline{AB} = x$, and $\overline{AD} = x - 12$. Find the measure of $\overline{AD}$.



$\frac{x}{8} = \frac{8}{x-12}$

$x(x-12) = 64$

$x^2 - 12x = 64$

$-64 \quad -64$

$x^2 - 12x - 64 = 0$

$(x-16)(x+4) = 0$

$x-16=0 \quad x+4=0$

$+16 \quad +16 \quad -4 \quad -4$

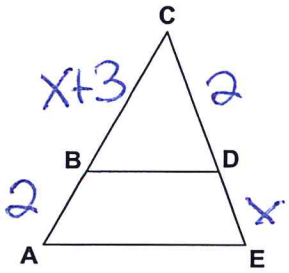
$x = 16 \quad x = -4$ reject

$\overline{AD} = x - 12$

$\overline{AD} = 16 - 12 = 4$

1,64
2,32
4,16
8,8

5. In the diagram, $\overline{BD} \parallel \overline{AE}$, $\overline{CB} = x+3$, $\overline{BA} = 2$, $\overline{CD} = 2$, and $\overline{DE} = x$. Find $\overline{DE}$.



$\frac{\text{top}}{\text{top}} = \frac{\text{bottom}}{\text{bottom}}$

$\frac{x+3}{2} = \frac{2}{x}$

$x(x+3) = 4$

$x^2 + 3x = 4$

$-4 \quad -4$

$x^2 + 3x - 4 = 0$

$(x+4)(x-1) = 0$

$x+4=0 \quad x-1=0$

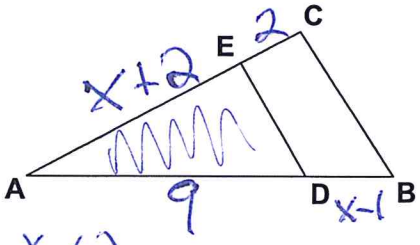
$-4 \quad -4 \quad +1 \quad +1$

$x = -4 \quad x = 1$

$\overline{DE} = 1$

1,4
2,2

6. In the diagram, $\overline{ED} \parallel \overline{BC}$, $\overline{AE} = x+2$, $\overline{DB} = x-1$, $\overline{AD} = 9$ and $\overline{EC} = 2$, find the measure of $\overline{AE}$.



	x	$+2$
x	x^2	$2x$
-1	$-1x$	-2

$x^2 + x - 2$

$\frac{\text{top}}{\text{top}} = \frac{\text{bottom}}{\text{bottom}}$

$\frac{x+2}{9} = \frac{2}{x-1}$

$(x+2)(x-1) = 18$

$x^2 + x - 2 = 18$

$-18 \quad -18$

$x^2 + x - 20 = 0$

$(x+5)(x-4) = 0$

$x+5=0 \quad x-4=0$

$-5 \quad -5 \quad +4 \quad +4$

$x = -5 \quad x = 4$

reject

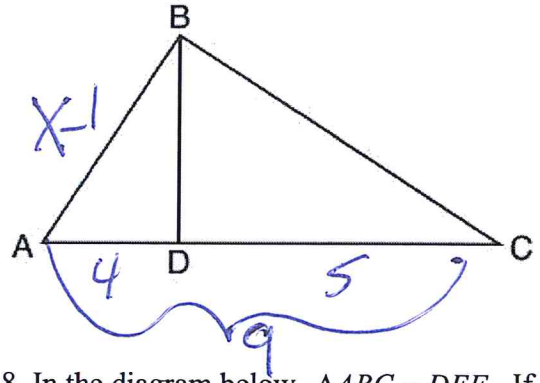
$\overline{AE} = x + 2$

$\overline{AE} = 4 + 2$

$\overline{AE} = 6$

1,20
2,10
4,5

7. In the diagram, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$. If $\overline{AB} = x-1$, $\overline{DC} = 5$ and $\overline{AD} = 4$, find $\overline{AB}$.



$\frac{H}{L} = \frac{L}{S}$

$\frac{9}{x-1} = \frac{x-1}{4}$

$(x-1)(x-1) = 36$

$x^2 - 2x + 1 = 36$

$-36 \quad -36$

$x^2 - 2x - 35 = 0$

$(x-7)(x+5) = 0$

$x-7=0 \quad x+5=0$

$+7 \quad +7 \quad -5 \quad -5$

$x = 7 \quad x = -5$ reject

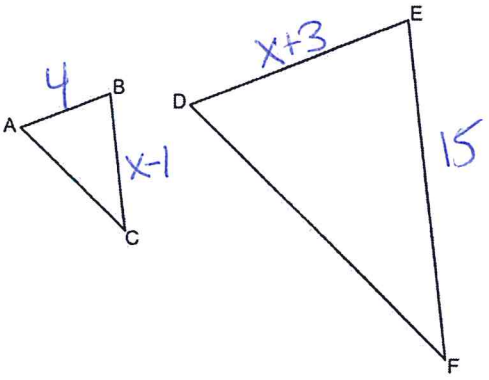
$\overline{AB} = x-1$

$AB = 7-1$

$\overline{AB} = 6$

$x^2 + 2x - 3$

8. In the diagram below, $\Delta ABC \sim DEF$. If $\overline{AB} = 4$, $\overline{BC} = x-1$, $\overline{DE} = x+3$, and $\overline{EF} = 15$, determine and state the length of $\overline{DE}$.



$\frac{4}{x+3} = \frac{x-1}{15}$

1,63
3,21
7,9

$(x+3)(x-1) = 60$

$x^2 + 2x - 3 = 60$

$-60 \quad -60$

$x^2 + 2x - 63 = 0$

$(x+9)(x-7) = 0$

$x+9=0 \quad x-7=0$

$-9 \quad -9 \quad +7 \quad +7$

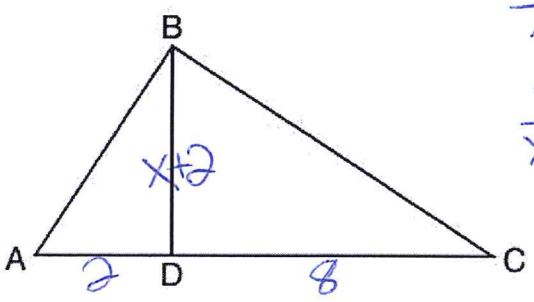
$x = -9$ reject $\quad x = 7$

$\overline{DE} = x+3$

$DE = 7+3$

$DE = 10$

9. In the diagram, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$. If $\overline{BD} = x+2$, $\overline{DC} = 8$ and $\overline{AD} = 2$, find ~~$\overline{AB}$~~ $\overline{BD}$.



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

$\frac{2}{x+2} = \frac{x+2}{8}$

$x^2 + 4x + 4 = 16$

$-16 \quad -16$

$x^2 + 4x - 12 = 0$

$(x+6)(x-2) = 0$

$x+6=0 \quad x-2=0$

$-6 \quad -6 \quad +2 \quad +2$

$x = -6$ reject $\quad x = 2$

$x^2 + 4x + 4$

$\overline{BD} = x+2$

$BD = 2+2$

$BD = 4$