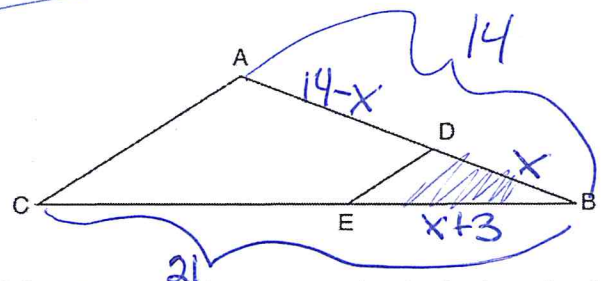
Name Schlansky
Mr. Schlansky

Date _____
Geometry

Similar Triangles with Algebra

1. In the diagram of $\triangle ABC$ below, points D and E are on sides $\overline{AB}$ and $\overline{CB}$ respectively, such that $\overline{DE} \parallel \overline{AC}$.



$\overline{EB} = x+3$
$\overline{DB} = x$

If EB is 3 more than DB, $AB = 14$, and $CB = 21$, what is the length of $\overline{AD}$?

1) 6
2) 8
3) 9
4) 12

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

$\frac{x}{x+3} = \frac{14}{21}$

$21x = 14(x+3)$

$21x = 14x + 42$
$-14x \quad -14x$
$\frac{7x}{7} = \frac{42}{7}$
$x = 6$

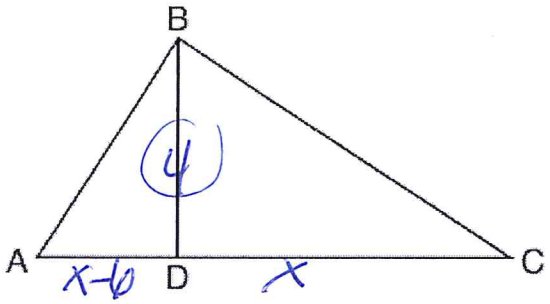
$\overline{AD} = 14 - 6 = 8$

2. In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.

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

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

$x(x-6) = 16$
$x^2 - 6x = 16$
$-16 \quad -16$



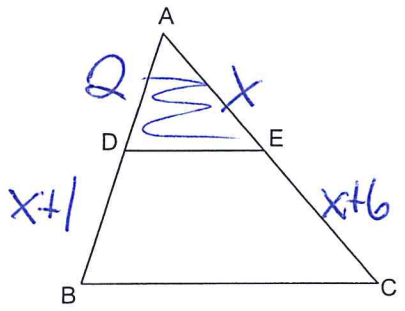
If $BD = 4$, $AD = x - 6$, and $CD = x$, what is the length of $\overline{CD}$?

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

$x^2 - 6x - 16 = 0$
$(x-8)(x+2) = 0$
$x = 8 \quad | \quad x = -2$

$\overline{CD} = 8$

3. 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 $\overline{AE}$



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

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

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

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

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

$0 = x^2 - x - 12$

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

$x=4 \quad x=-3$

$\overline{AE} = 4$

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 $\overline{AD}$.

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

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

$x(x-12) = 64$

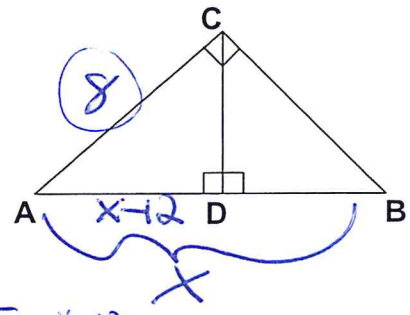
$x^2 - 12x = 64$

$-64 \quad -64$

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

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

$x=16 \quad x=-4$



$\overline{AD} = 16 - 12$

$\overline{AD} = 4$

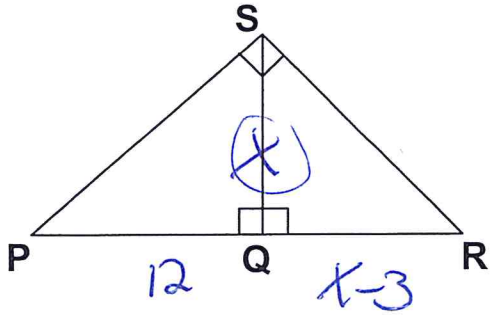
5. Altitude $\overline{SQ}$ is drawn to right triangle PSR. If $\overline{PQ} = 12$ and $\overline{QR}$ is 3 less than $\overline{SQ}$, find the length of $\overline{QR}$.

$\overline{QR} = x - 3$

$\overline{SQ} = x$

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

$\frac{12}{x} = \frac{x}{x-3}$



$x^2 = 12x - 36$

$-12x+36 \quad -12x+36$

$x^2 - 12x + 36 = 0$

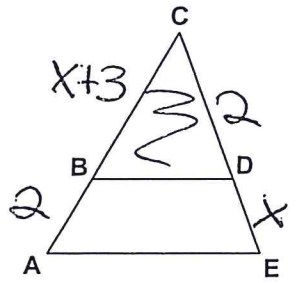
$(x-6)(x-6) = 0$

$x=6 \quad x=6$

$QR = 6 - 3$

$QR = 3$

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



top/top = bottom/bottom

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

$X^2+3X=4$

$-4 \quad -4$

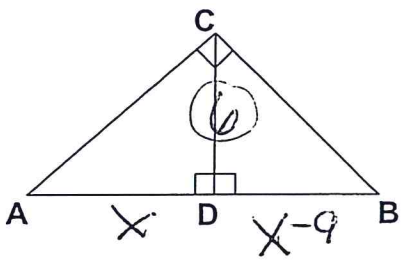
$X^2+3X-4=0$

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

$X=-4 \quad X=1$

$\overline{DE}=1$

7. Altitude $\overline{CD}$ is drawn to right triangle ABC. The measure of $\overline{DB}$ is 9 less than $\overline{DA}$. If the altitude is 6, find the measure of $\overline{AD}$.



DB: X-9

DA: X

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

$\frac{X}{6} = \frac{6}{X-9}$

$X(X-9)=36$

$X^2-9X=36$

$-36 \quad -36$

$X^2-9X-36=0$

$(X-12)(X+3)=0$

$X-12=0 \quad X+3=0$

$+12 \quad +12 \quad -3 \quad -3$

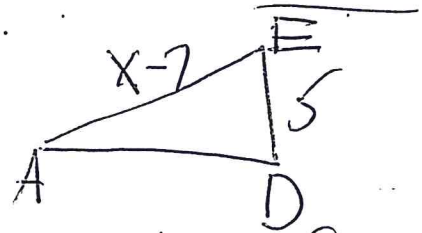
$X=12 \quad X=-3$

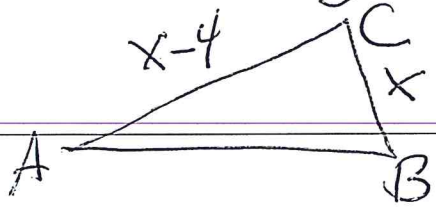
$\overline{AD}=12$

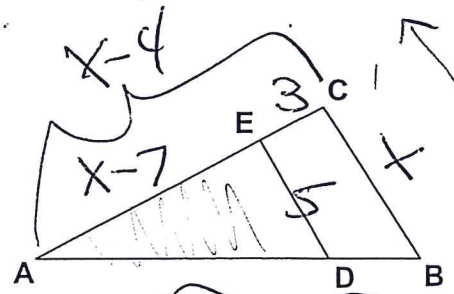
8. In the diagram, $\overline{ED} \parallel \overline{BC}$, $\overline{AE}$ is 7 less than $\overline{CB}$. If $\overline{ED} = 5$ and $\overline{EC} = 3$, find the measure of $\overline{AE}$.

AE: X-7

CB: X







2-7=5

$\frac{X-7}{X-4} = \frac{5}{X}$

$5(X-4)=X(X-7)$

$5X-20=X^2-7X$

$-5X+20 \quad -5X+20$

$0=X^2-12X+20$

$0=(X-10)(X-2)$

$X-10=0 \quad X-2=0$

$+10 \quad +10 \quad +2 \quad +2$

$X=10 \quad X=2$

$\overline{AE}=10-7=3$