Name Schlansky   Date _____
Mr. Schlansky   Geometry

Joining Midpoints of a Triangle

1. In the diagram below of $\triangle ACT$, D is the midpoint of $\overline{AC}$, O is the midpoint of $\overline{AT}$, and G is the midpoint of $\overline{CT}$. If $AC = 10$, $AT = 18$, and $CT = 22$, what is the perimeter of parallelogram $CDOG$?

$$\begin{array}{r}11\\11\\5\\5\\\hline 32\end{array}$$
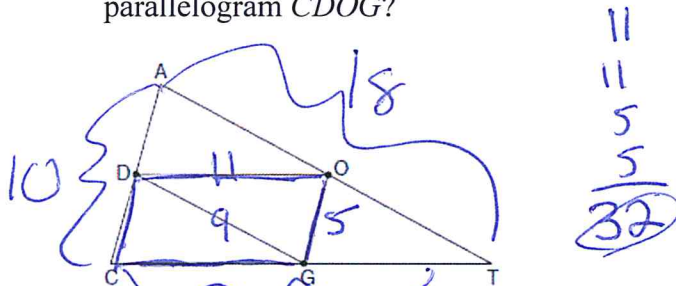
2. In the diagram of $\triangle ABC$ shown below, D is the midpoint of $\overline{AB}$, E is the midpoint of $\overline{BC}$, and F is the midpoint of $\overline{AC}$. If $AB = 20$, $BC = 12$, and $AC = 16$, what is the perimeter of trapezoid $ABEF$?

$$\begin{array}{r}10\\20\\8\\6\\\hline 44\end{array}$$
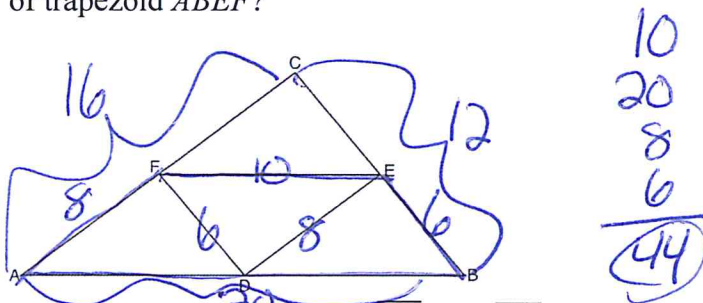
3. D and E are midpoints of $\overline{AB}$ and $\overline{BC}$ respectively. If $AC = x + 15$ and $DE = x - 3$, find the measure of $\overline{DE}$.
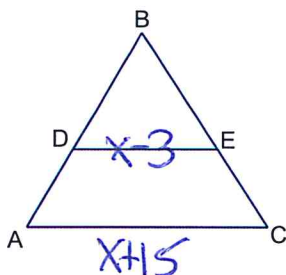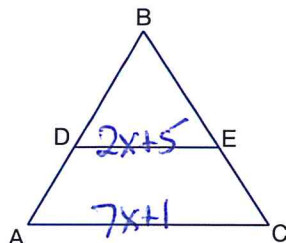
2(midsegment) = opposite side
$2(x-3) = x + 15$
$2x - 6 = x + 15$
$-x \quad -x$
$x - 6 = 15$
$+6 \quad +6$
$x = 21$

$DE = 21 - 3$
$DE = 18$

4. D and E are midpoints of $\overline{AB}$ and $\overline{BC}$ respectively. If $DE = 2x + 5$ and $AC = 7x + 1$, find the measure of $\overline{AC}$.

2(midsegment) = opposite side
$2(2x+5) = 7x + 1$
$4x + 10 = 7x + 1$
$-4x \qquad -4x$
$10 = 3x + 1$
$-1 \qquad -1$
$9 = 3x$
$\frac{9}{3} = \frac{3x}{3}$
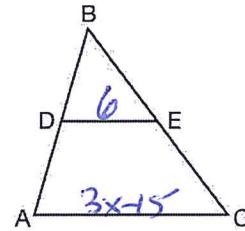$3 = x$

$AC = 7(3) + 1$
$AC = 22$

15

5. In $\triangle ABC$, D is the midpoint of $\overline{AB}$ and E is the midpoint of $\overline{BC}$. If $AC = 3x - 15$ and $DE = 6$, what is the value of x?
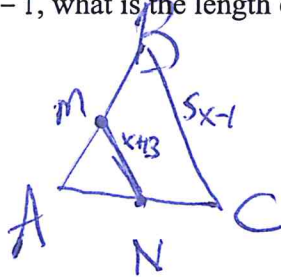
1) 6
2) 7
3) 9
4) 12

Handwritten work:
$2(ms) = $ opp side
$2(6) = 3x-15$
$12 = 3x-15$
$+15 \quad +15$
$\frac{27}{3} = \frac{3x}{3}$
$9 = x$

Diagram: triangle with B at top, D and E on sides with 6 between them, A and C at base with $3x-15$.

6. In $\triangle ABC$, M is the midpoint of $\overline{AB}$ and N is the midpoint of $\overline{AC}$. If $MN = x + 13$ and $BC = 5x - 1$, what is the length of $\overline{MN}$?
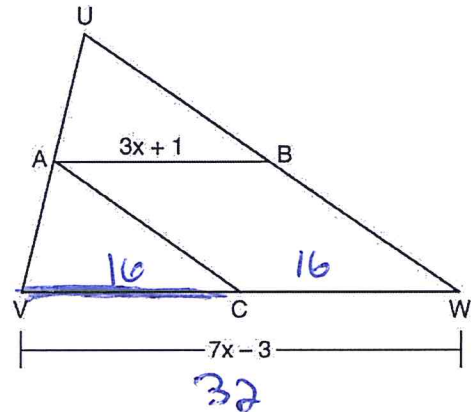
1) 3.5
2) 9
3) 16.5
4) 22

Diagram: triangle with M, x+13, 5x-1, A, N, C.

Handwritten work:
$2(ms) = $ opp side
$2(x+13) = 5x-1$
$2x+26 = 5x-1$
$-2x \qquad -2x$
$26 = 3x-1$
$+1 \qquad +1$
$\frac{27}{3} = \frac{3x}{3}$
$9 = x$
$\overline{MN} = x+13$
$\overline{MN} = 9+13 = 22$

7. In the diagram of $\triangle UVW$ below, A is the midpoint of $\overline{UV}$, B is the midpoint of $\overline{UW}$, C is the midpoint of $\overline{VW}$, and $\overline{AB}$ and $\overline{AC}$ are drawn.

If $VW = 7x - 3$ and $AB = 3x + 1$, what is the length of $\overline{VC}$?

1) 5
2) 13
3) 16
4) 32

Handwritten work:
$2(ms) = $ opp side
$2(3x+1) = 7x-3$
$6x+2 = 7x-3$
$-6x \qquad -6x$
$2 = x-3$
$+3 \quad +3$
$5 = x$
all 40

$\overline{VW} = 7(5)-3$
$\overline{VW} = 32$
$\overline{VC} = \frac{1}{2}(32)$
$VC = 16$

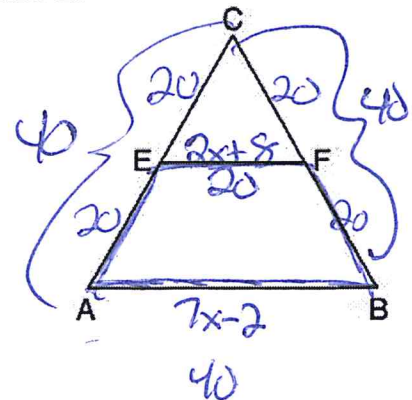*Diagram: triangle UVW with A ($3x+1$) B across top, 16 and 16 at bottom, V, C, W at base, $7x-3 = 32$.*

8. In the diagram of equilateral triangle ABC shown below, E and F are the midpoints of $\overline{AC}$ and $\overline{BC}$, respectively.
If $EF = 2x + 8$ and $AB = 7x - 2$, what is the perimeter of trapezoid $ABFE$?

Handwritten work:
$2(ms) = $ opp side
$2(2x+8) = 7x-2$
$4x+16 = 7x-2$
$-4x \qquad -4x$
$16 = 3x-2$
$+2 \qquad +2$
$\frac{18}{3} = \frac{3x}{3}$
$6 = x$

$2(6)+8 = 20$
$7(6)-2 = 40$

20
20
20
40
100

Diagram: triangle ABC with C at top, 20, 20, 40; E, $2x+8 = 20$, F; 20, 20; A, $7x-2 = 40$, B.

9. In the diagram of △SRA below, $\overline{KP}$ is drawn such that ∠SKP ≅ ∠SRA.

If SK = 10, SP = 8, and PA = 6, what is the length of $\overline{KR}$, to the *nearest tenth*?
1) 4.8
2) 7.5
3) 8.0
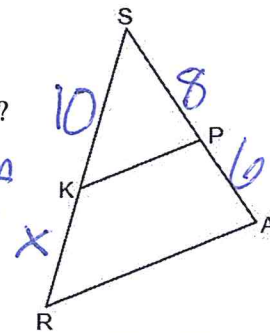4) 13.3

$\frac{10}{8} = \frac{x}{6}$ $\frac{8x=60}{8} \frac{}{8}$

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

$x=7.5$

10. In triangle ABC below, D is a point on $\overline{AB}$ and E is a point on $\overline{AC}$, such that $\overline{DE} \parallel \overline{BC}$.

If AD = 12, DB = 8, and EC = 10, what is the length of $\overline{AC}$?
1) 15
2) 22
3) 24
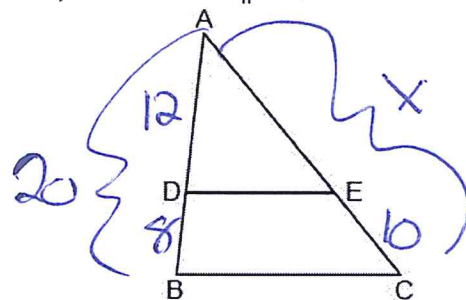4) 25

$\frac{side}{side} = \frac{bottom}{bottom}$
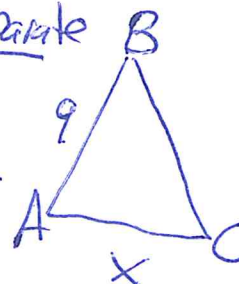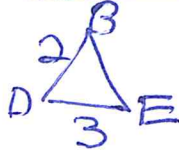
$\frac{20}{x=10}$ $x=25$

$\frac{8x=200}{8} \frac{}{8}$

11. In △ABC, point D is on $\overline{AB}$, and point E is on $\overline{BC}$ such that $\overline{DE} \parallel \overline{AC}$. If DB = 2, DA = 7,
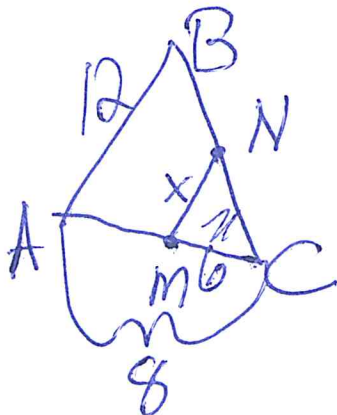and DE = 3, what is the length of $\overline{AC}$?
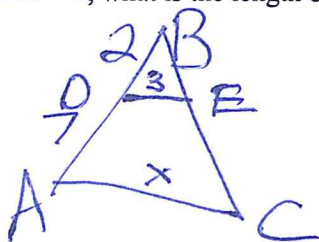
bases separate

$\frac{2}{9} = \frac{3}{x}$

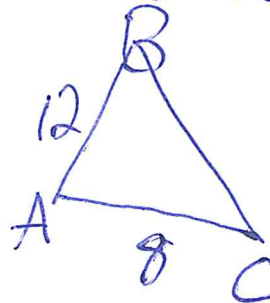$\frac{2x=27}{2} \frac{}{2}$

$x=13.5$

12. In triangle ABC, M is a point on $\overline{AC}$ and N is a point on $\overline{CB}$ such that $\overline{MN} \parallel \overline{AB}$ If
$\overline{AC}$ = 8, $\overline{AB}$ = 12, and $\overline{CM}$ = 6. Find the length of $\overline{MN}$

bases separate

$\frac{12}{x} = \frac{8}{6}$

$\frac{8x=72}{8} \frac{}{8}$

$x=9$