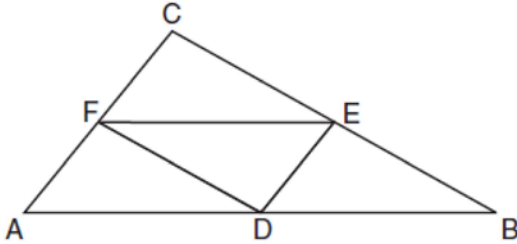## G.CO.C.10: Midsegments

1 In the diagram below of $\triangle ABC$, D, E, and F are the midpoints of $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$, respectively.

What is the ratio of the area of $\triangle CFE$ to the area of $\triangle CAB$?
1) 1:1
2) 1:2
3) 1:3
4) 1:4

2 The area of $\triangle TAP$ is 36 cm². A second triangle, JOE, is formed by connecting the midpoints of each side of $\triangle TAP$. What is the area of $\triangle JOE$, in square centimeters?
1) 9
2) 12
3) 18
4) 27

3 In the diagram below, the vertices of $\triangle DEF$ are the midpoints of the sides of equilateral triangle ABC, and the perimeter of $\triangle ABC$ is 36 cm.
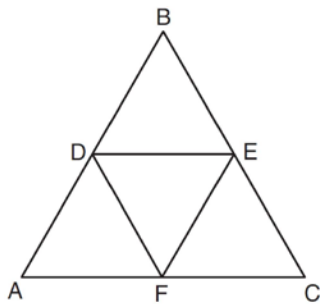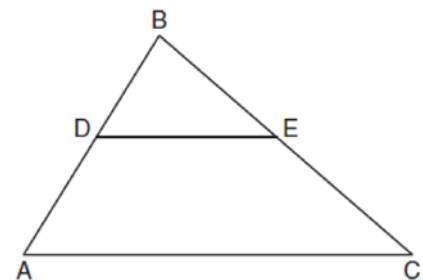

What is the length, in centimeters, of $\overline{EF}$?
1) 6
2) 12
3) 18
4) 4

4 In isosceles triangle RST shown below, $\overline{RS} \cong \overline{RT}$, M and N are midpoints of $\overline{RS}$ and $\overline{RT}$, respectively, and $\overline{MN}$ is drawn. If $MN = 3.5$ and the perimeter of $\triangle RST$ is 25, determine and state the length of $\overline{NT}$.
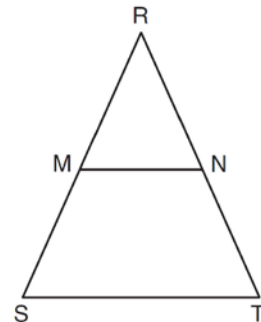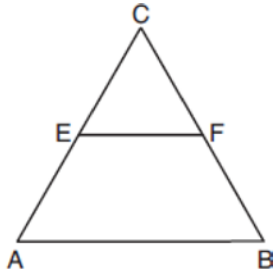

5 In the diagram below of $\triangle ABC$, $\overline{DE}$ is a midsegment of $\triangle ABC$, $DE = 7$, $AB = 10$, and $BC = 13$. Find the perimeter of $\triangle ABC$.

6 In the diagram of $\triangle ABC$ below, $AB = 10$, $BC = 14$, and $AC = 16$. Find the perimeter of the triangle formed by connecting the midpoints of the sides of $\triangle ABC$.
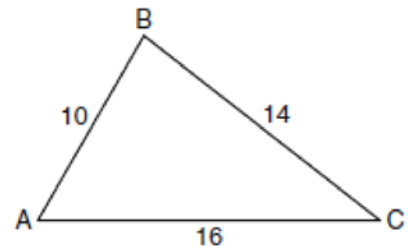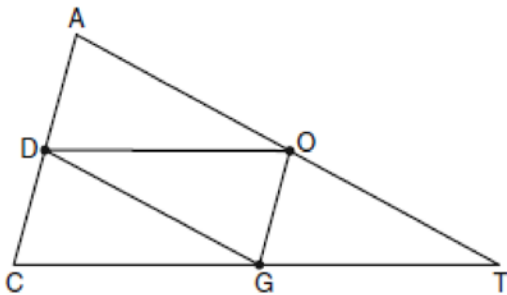
7 In the diagram of equilateral triangle ABC shown below, E and F are the midpoints of $\overline{AC}$ and $\overline{BC}$, respectively.

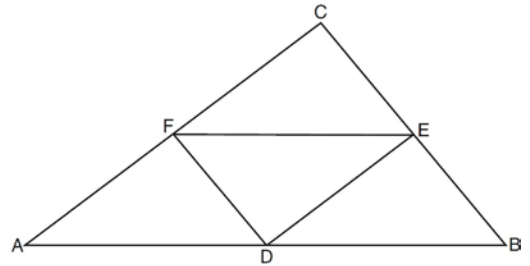If $EF = 2x + 8$ and $AB = 7x - 2$, what is the perimeter of trapezoid $ABFE$?
1) 36
2) 60
3) 100
4) 120

8 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 $\overline{CT}$.

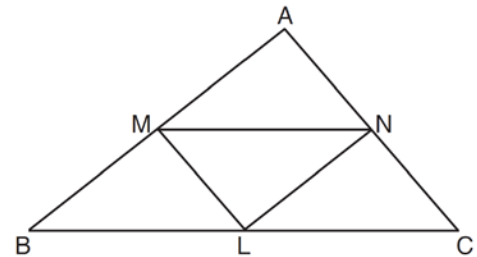If $AC = 10$, $AT = 18$, and $CT = 22$, what is the perimeter of parallelogram $CDOG$?
1) 21
2) 25
3) 32
4) 40

9 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 $\overline{AC}$.

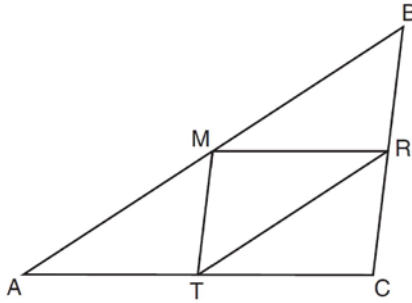If $AB = 20$, $BC = 12$, and $AC = 16$, what is the perimeter of trapezoid $ABEF$?
1) 24
2) 36
3) 40
4) 44

10 In $\triangle ABC$ shown below, L is the midpoint of $\overline{BC}$, M is the midpoint of $\overline{AB}$, and N is the midpoint of $\overline{AC}$.

If $MN = 8$, $ML = 5$, and $NL = 6$, the perimeter of trapezoid $BMNC$ is
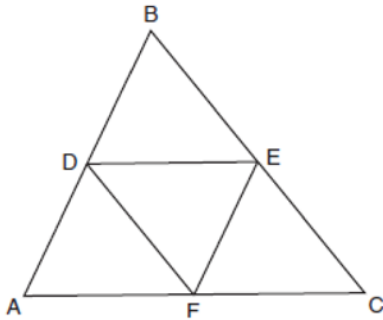1) 35
2) 31
3) 28
4) 26

11 As shown in the diagram below, *M*, *R*, and *T* are midpoints of the sides of △*ABC*.

If *AB* = 18, *AC* = 14, and *BC* = 10, what is the perimeter of quadrilateral *ACRM*?
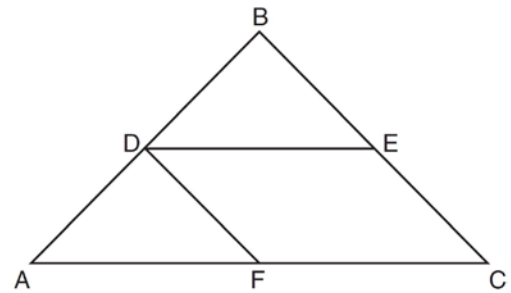1) 35
2) 32
3) 24
4) 21

12 In the diagram below, $\overline{DE}$, $\overline{DF}$, and $\overline{EF}$ are midsegments of △*ABC*.

The perimeter of quadrilateral *ADEF* is equivalent to
1) $AB + BC + AC$
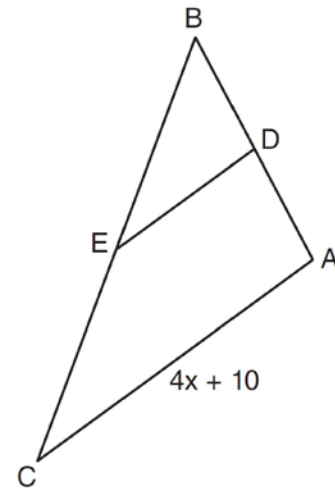2) $\frac{1}{2}AB + \frac{1}{2}AC$
3) $2AB + 2AC$
4) $AB + AC$

13 In the diagram below of △*ABC*, $\overline{DE}$ and $\overline{DF}$ are midsegments.

(Not drawn to scale)

If *DE* = 9, and *BC* = 17, determine and state the perimeter of quadrilateral *FDEC*.
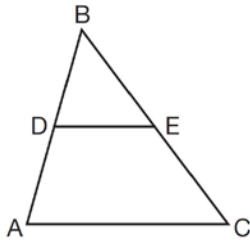
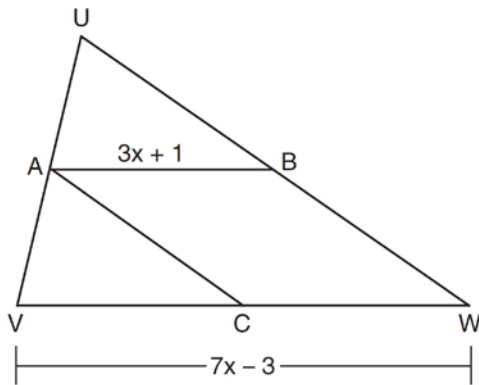14 In the diagram below of △*ABC*, *D* is the midpoint of $\overline{AB}$, and *E* is the midpoint of $\overline{BC}$.

If *AC* = 4*x* + 10, which expression represents *DE*?
1) *x* + 2.5
2) 2*x* + 5
3) 2*x* + 10
4) 8*x* + 20

3

15 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?
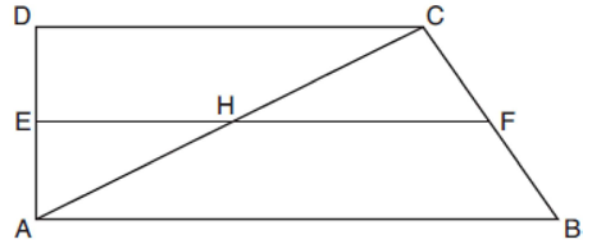

1) 6
2) 7
3) 9
4) 12

16 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.

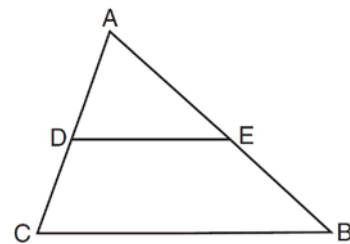If $VW = 7x - 3$ and $AB = 3x + 1$, what is the length of $\overline{VC}$?
1) 5
2) 13
3) 16
4) 32

17 In quadrilateral $ABCD$ below, $\overline{AB} \parallel \overline{CD}$, and E, H, and F are the midpoints of $\overline{AD}$, $\overline{AC}$, and $\overline{BC}$, respectively.

If $AB = 24$, $CD = 18$, and $AH = 10$, then FH is
1) 9
2) 10
3) 12
4) 21

18 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

19 Triangle ABC is shown in the diagram below.

If $\overline{DE}$ joins the midpoints of $\overline{ADC}$ and $\overline{AEB}$, which statement is *not* true?

1) $DE = \dfrac{1}{2} CB$

2) $\overline{DE} \parallel \overline{CB}$

3) $\dfrac{AD}{DC} = \dfrac{DE}{CB}$

4) $\triangle ABC \sim \triangle AED$

4

20 In the diagram below, $\overline{DE}$ joins the midpoints of two sides of $\triangle ABC$.
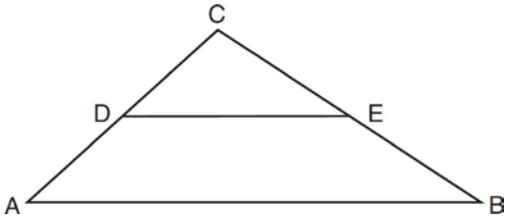
Which statement is *not* true?

1) $CE = \frac{1}{2} CB$

2) $DE = \frac{1}{2} AB$

3) area of $\triangle CDE = \frac{1}{2}$ area of $\triangle CAB$

4) perimeter of $\triangle CDE = \frac{1}{2}$ perimeter of $\triangle CAB$

21 On the set of axes below, graph and label $\triangle DEF$ with vertices at $D(-4,-4)$, $E(-2,2)$, and $F(8,-2)$. If G is the midpoint of $\overline{EF}$ and H is the midpoint of $\overline{DF}$, state the coordinates of G and H and label each point on your graph. Explain why $\overline{GH} \parallel \overline{DE}$.
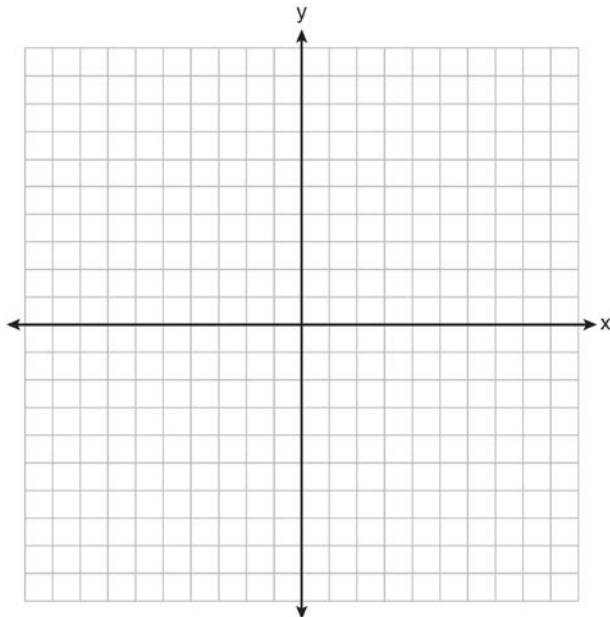
22 Triangle HKL has vertices $H(-7,2)$, $K(3,-4)$, and $L(5,4)$. The midpoint of $\overline{HL}$ is M and the midpoint of $\overline{LK}$ is N. Determine and state the coordinates of points M and N. Justify the statement: $\overline{MN}$ is parallel to $\overline{HK}$. [The use of the set of axes below is optional.]
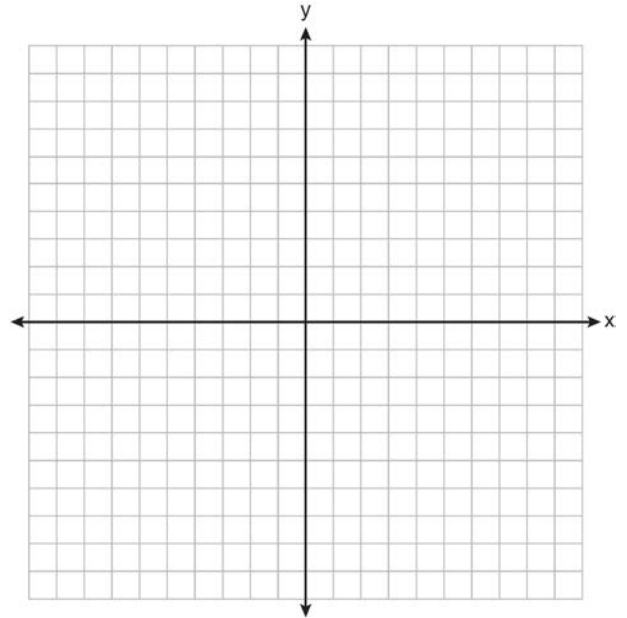
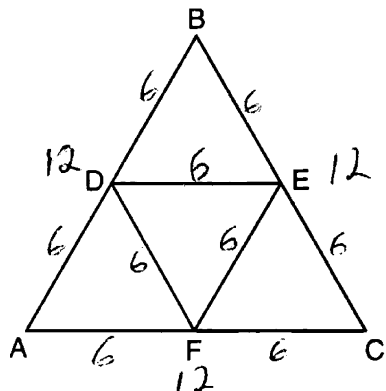# G.CO.C.10: Midsegments
Answer Section

1 ANS: 4   REF: 081716geo
2 ANS: 1

$$\frac{36}{4} = 9$$

REF: 012321geo
3 ANS: 1

REF: 081003ge
4 ANS:

$2x + 7 = 25 \quad NT = 4.5$

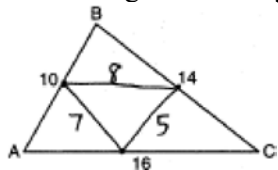$\quad 2x = 18$

$\quad x = 9$

REF: 081531ge
5 ANS:

37. Since $\overline{DE}$ is a midsegment, $AC = 14$. $10 + 13 + 14 = 37$

REF: 061030ge
6 ANS:

20. The sides of the triangle formed by connecting the midpoints are half the sides of the original triangle.

$5 + 7 + 8 = 20$.

REF: 060929ge

7 ANS: 3

$2(2x + 8) = 7x - 2$ $AB = 7(6) - 2 = 40.$ Since $\overline{EF}$ is a midsegment, $EF = \dfrac{40}{2} = 20.$ Since $\triangle ABC$ is equilateral,
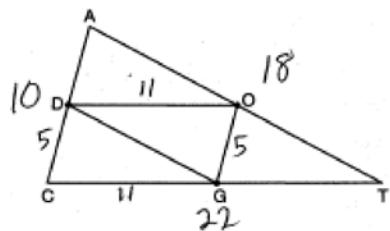
$\quad 4x + 16 = 7x - 2$

$\qquad 18 = 3x$

$\qquad 6 = x$

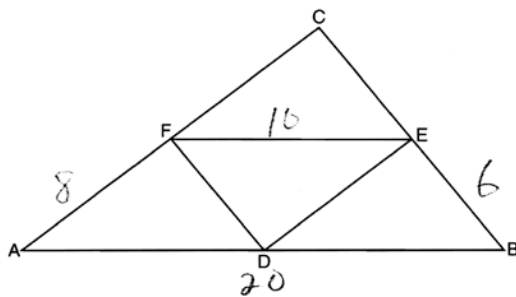$AE = BF = \dfrac{40}{2} = 20.$ $40 + 20 + 20 + 20 = 100$
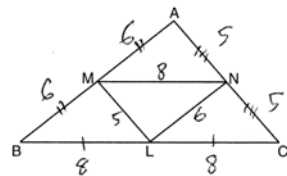
REF: 061923geo

8 ANS: 3

REF: 080920ge

9 ANS: 4

$20 + 8 + 10 + 6 = 44.$

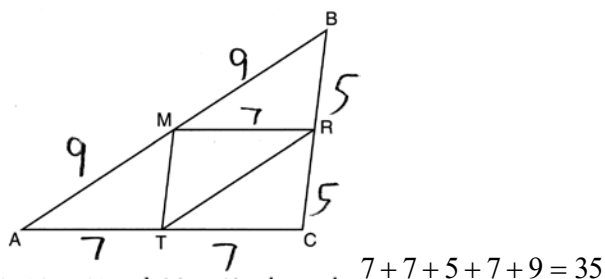REF: 061211ge

10 ANS: 1

REF: 011413ge

11 ANS: 1

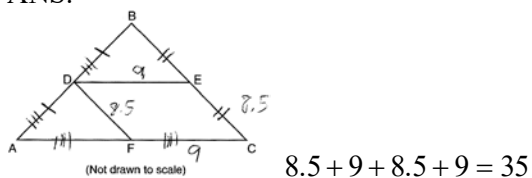$7 + 7 + 5 + 7 + 9 = 35$

REF: 011611ge

12 ANS: 4   REF: 011704geo

13 ANS:

(Not drawn to scale) $8.5 + 9 + 8.5 + 9 = 35$

REF: 081430ge

14 ANS: 2

$$\frac{4x + 10}{2} = 2x + 5$$

REF: 011103ge

15 ANS: 3

$3x - 15 = 2(6)$

$3x = 27$

$x = 9$

REF: 061311ge

16 ANS: 3   REF: 081320ge

17 ANS: 3

$$\frac{1}{2} \times 24 = 12$$

REF: 012009geo

18 ANS: 4

$2(x + 13) = 5x - 1 \quad MN = 9 + 13 = 22$
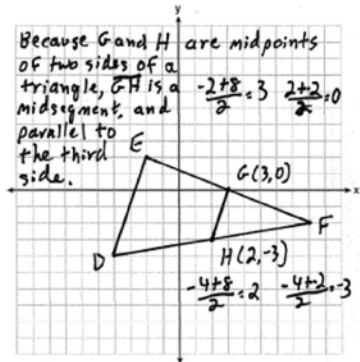
$2x + 26 = 5x - 1$

$27 = 3x$

$x = 9$

REF: 062322geo

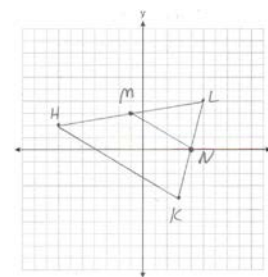19 ANS: 3   REF: 011311ge

20 ANS: 3   REF: 081227ge

21 ANS:

Because G and H are midpoints of two sides of a triangle, GH is a midsegment, and parallel to the third side.

$\frac{-2+8}{2}=3$ $\frac{2+2}{2}=0$

E

G(3,0)

F

D   H(2,-3)

$\frac{-4+8}{2}=2$ $\frac{-4+2}{2}=-3$

REF: fall0835ge

22 ANS:

$M\left(\dfrac{-7+5}{2},\dfrac{2+4}{2}\right)=M(-1,3). \quad N\left(\dfrac{3+5}{2},\dfrac{-4+4}{2}\right)=N(4,0). \quad \overline{MN}$ is a midsegment.

REF: 011237ge