1. midsegment

2. $\frac{1}{2}$

3. $D(-4, -2), E(-2, 0), F(-1, -4)$

4. Because the slopes of $\overline{DE}$ and $\overline{CB}$ are the same (1), $\overline{DE} \parallel \overline{CB}$. $DE = 2\sqrt{2}$ and $CB = 4\sqrt{2}$. Because $2\sqrt{2} = \frac{1}{2}\left(4\sqrt{2}\right)$, $DE = \frac{1}{2}CB$.

5. Because the slopes of $\overline{EF}$ and $\overline{AC}$ are the same (-4), $\overline{EF} \parallel \overline{AC}$. $EF = \sqrt{17}$ and $AC = 2\sqrt{17}$. Because $\sqrt{17} = \frac{1}{2}\left(2\sqrt{17}\right)$, $EF = \frac{1}{2}AC$.

6. Because the slopes of $\overline{DF}$ and $\overline{AB}$ are the same $\left(-\frac{2}{3}\right)$, $\overline{DF} \parallel \overline{AB}$. $DF = \sqrt{13}$ and $AB = 2\sqrt{13}$. Because $\sqrt{13} = \frac{1}{2}\left(2\sqrt{13}\right)$, $DF = \frac{1}{2}AB$.

7. $x = 13$

8. $x = 10$

9. $x = 6$

10. $x = 8$

11. $\overline{JK} \parallel \overline{YZ}$

12. $\overline{JL} \parallel \overline{XZ}$

13. $\overline{XY} \parallel \overline{KL}$

14. $\overline{JY} \cong \overline{JX} \cong \overline{KL}$

15. $\overline{JL} \cong \overline{XK} \cong \overline{KZ}$

16. $\overline{JK} \cong \overline{YL} \cong \overline{LZ}$

17. 14

18. 13

19. 17

20. $\overline{DE}$ is not parallel to $\overline{BC}$. So, $\overline{DE}$ is not a midsegment. So, according to the contrapositive of the Triangle Midsegment Theorem (Thm. 6.8), $\overline{DE}$ does not connect the midpoints of $\overline{AC}$ and $\overline{AB}$.

21. 45 ft

22. The midpoint of $\overline{OC}$ is $F(p, 0)$. Because the slopes of $\overline{DF}$ and $\overline{BC}$ are the same $\left(-\dfrac{r}{p-q}\right)$, $\overline{DF} \parallel \overline{BC}$. $DF = \sqrt{p^2 - 2pq + q^2 + r^2}$ and $BC = 2\sqrt{p^2 - 2pq + q^2 + r^2}$. Because $\sqrt{p^2 - 2pq + q^2 + r^2} = \frac{1}{2}\left(2\sqrt{p^2 - 2pq + q^2 + r^2}\right)$, $DF = \frac{1}{2}BC$.

23. An eighth segment, $\overline{FG}$,would connect the midpoints of $\overline{DL}$ and $\overline{EN}$; $\overline{DE} \parallel \overline{LN} \parallel \overline{FG}$, $DE = \frac{3}{4}LN$, and $FG = \frac{7}{8}LN$; Because you are finding quarter segments and eighth segments, use $8p$, $8q$, and $8r$: $L(0, 0)$, $M(8q, 8r)$, and $N(8p, 0)$.

Find the coordinates of X, Y, D, E, F, and G.

$X(4q, 4r)$, $Y(4q + 4p, 4r)$, $D(2q, 2r)$, $E(2q + 6p, 2r)$, $F(q, r)$, and $G(q + 7p, r)$.

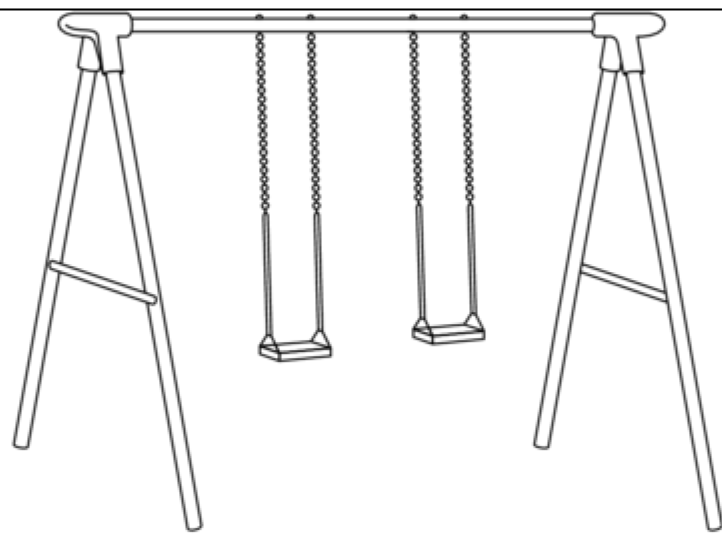
The y-coordinates of D and E are the same, so $\overline{DE}$ has a slope of 0. The y-coordinates of F and G are also the same, so $\overline{FG}$ also has a slope of 0. $\overline{LN}$ is on the x-axis, so its slope is 0. Because their slopes are the same, $\overline{DE} \parallel \overline{LN} \parallel \overline{FG}$.

Use the Ruler Postulate (Post. 1.1) to find DE, FG, and LN.

$DE = 6p$, $FG = 7p$, and $LN = 8p$.

Because $6p = \frac{3}{4}(8p)$, $DE = \frac{3}{4}LN$. Because $7p = \frac{7}{8}(8p)$, $FG = \frac{7}{8}LN$.

24. *Sample answer:*



The crossbars on the ends of the swing set are midsegments.

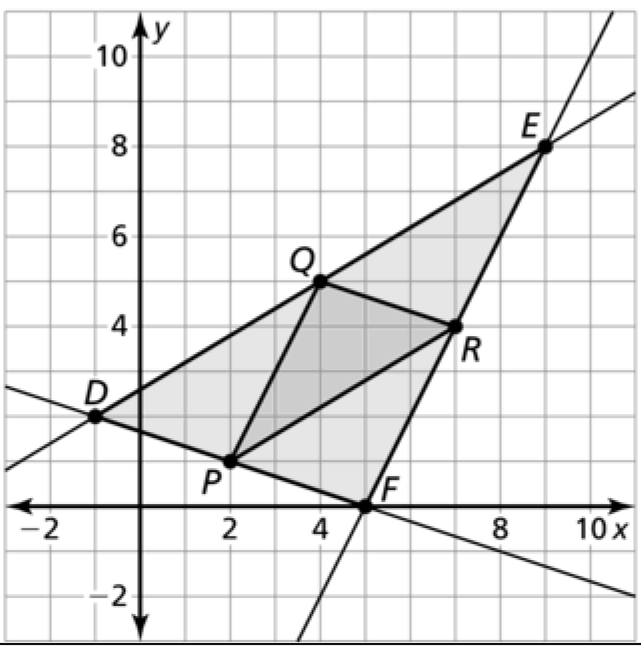
25. **a.** 24 units

b. 60 units

c. 114 units

26. Two sides of the red triangle have a length of 4 tile widths. A yellow segment connects the midpoints, where there are two tile lengths on either side. The third red side has a length of 4 tile diagonals, and the other two yellow segments meet at the midpoint, where there are two tile diagonals on either side.

27. After graphing the midsegments, find the slope of each segment. Graph the line parallel to each midsegment passing through the opposite vertex. The intersections of these three lines will be the vertices of the original triangle: $(-1, 2)$, $(9, 8)$, and $(5, 0)$.



28. *Sample answer:* $-2 - (-7) = 5$, and $5 > -2$

29. *Sample answer:* An isosceles triangle whose sides are 5 centimeters, 5 centimeters, and 3 centimeters is not equilateral.