Answers for Lesson 6-7, pp. 349–353 Exercises

1. **a.** $W\left(\frac{a}{2}, \frac{b}{2}\right)$; $Z\left(\frac{c + e}{2}, \frac{d}{2}\right)$

b. $W(a, b)$; $Z(c + e, d)$

c. $W(2a, 2b)$; $Z(2c + 2e, 2d)$

d. c; it uses multiples of 2 to name the coordinates of W and Z.

2. **a.** origin

b. x-axis

c. 2

d. coordinates

3. **a.** y-axis

b. Distance

4. **a.** rt. ∠

b. legs

c. multiples of 2

d. M

e. N

f. Midpoint

g. Distance

5. **a.** isos.

b. x-axis

c. y-axis

d. midpts.

e. ≅ sides

f. slopes

g. the Distance Formula

6. **a.** $\sqrt{(b + a)^2 + c^2}$

b. $\sqrt{(a + b)^2 + c^2}$

7. **a.** $\sqrt{a^2 + b^2}$

b. $2\sqrt{a^2 + b^2}$

8. **a.** $D(-a - b, c), E(0, 2c), F(a + b, c), G(0, 0)$

b. $\sqrt{(a + b)^2 + c^2}$

c. $\sqrt{(a + b)^2 + c^2}$

d. $\sqrt{(a + b)^2 + c^2}$

e. $\sqrt{(a + b)^2 + c^2}$

f. $\frac{c}{a + b}$

g. $\frac{c}{a + b}$

h. $-\frac{c}{a + b}$

i. $-\frac{c}{a + b}$

j. sides

k. $DEFG$

9. **a.** (a, b)

b. (a, b)

c. the same point

10. Answers may vary. Sample: The △ Midsegment Thm.; the segment connecting the midpts. of 2 sides of the △ is ∥ to the 3rd side and half its length; you can use the Midpoint Formula and the Distance Formula to prove the statement directly.

11. The vertices of $KLMN$ are $L(b, a + c)$, $M(b, c)$, $N(-b, c)$, and $K(-b, a + c)$. The slopes of $\overline{KL}$ and $\overline{MN}$ are zero, so these segments are horizontal. The endpoints of $\overline{KN}$ have equal x-coordinates and so do the endpoints of $\overline{LM}$. So these segments are vertical. Hence opposite sides of $KLMN$ are parallel and consecutive sides are $\perp$. It follows that $KLMN$ is a rectangle.

12–23. Answers may vary. Samples are given.

12. yes; Dist. Formula

13. yes; same slope

14. yes; prod. of slopes $= -1$

15. no; may not have intersection pt.

16. no; may need $\angle$ measures

17. no; may need $\angle$ measures

18. yes; prod. of slopes of sides of $\angle A = -1$

19. yes; Dist. Formula

20. yes; Dist. Formula, 2 sides $=$

21. no; may need $\angle$ measures

22. yes; intersection pt. for all 3 segments

23. yes; Dist. Formula, $AB = BC = CD = AD$

24. A

25. 1, 4, 7

26. 0, 2, 4, 6, 8

27. $-0.8, 0.4, 1.6, 2.8, 4, 5.2, 6.4, 7.6, 8.8$

28. $-1.76, -1.52, -1.28, \ldots, 9.52, 9.76$

29. $-2 + \frac{12}{n}, -2 + 2\left(\frac{12}{n}\right), -2 + 3\left(\frac{12}{n}\right), \ldots, -2 + (n - 1)\left(\frac{12}{n}\right)$

30. (0, 7.5), (3, 10), (6, 12.5)

31. $\left(-1, 6\frac{2}{3}\right), \left(1, 8\frac{1}{3}\right), (3, 10), \left(5, 11\frac{2}{3}\right), \left(7, 13\frac{1}{3}\right)$

32. $(-1.8, 6), (-0.6, 7), (0.6, 8), (1.8, 9), (3, 10), (4.2, 11), (5.4, 12),$
$(6.6, 13), (7.8, 14)$

33. $(-2.76, 5.2), (-2.52, 5.4), (-2.28, 5.6), \ldots, (8.52, 14.6),$
$(8.76, 14.8)$

34. $\left(-3 + \frac{12}{n}, 5 + \frac{10}{n}\right), \left(-3 + 2\left(\frac{12}{n}\right), 5 + 2\left(\frac{10}{n}\right)\right), \ldots,$
$\left(-3 + (n - 1)\left(\frac{12}{n}\right), 5 + (n - 1)\left(\frac{10}{n}\right)\right)$

35. **a.** $L(b, d), M(b + c, d), N(c, 0)$

b. $\overleftrightarrow{AM}: y = \frac{d}{b + c}x$; $\overleftrightarrow{BN}: y = \frac{2d}{2b - c}(x - c)$;

$\overleftrightarrow{CL}: y = \frac{d}{b - 2c}(x - 2c)$

c. $P\left(\frac{2(b + c)}{3}, \frac{2d}{3}\right)$

d. Pt. P satisfies the eqs. for $\overleftrightarrow{AM}$ and $\overleftrightarrow{CL}$.

e. $AM = \sqrt{(b + c)^2 + d^2}$; $AP = \sqrt{\left(\frac{2(b + c)}{3}\right)^2 + \left(\frac{2d}{3}\right)^2} =$

$\sqrt{\left(\frac{2}{3}\right)^2\left((b + c)^2 + d^2\right)} = \frac{2}{3}\sqrt{(b + c)^2 + d^2} = \frac{2}{3}AM$

The other 2 distances are found similarly.

36. **a.** $\frac{b}{c}$

b. Let a pt. on line p be (x, y). Then the eq. of p is $\frac{y - 0}{x - a} = \frac{b}{c}$ or $y = \frac{b}{c}(x - a)$.

c. $x = 0$

d. When $x = 0, y = \frac{b}{c}(x - a) = \frac{b}{c}(-a) = -\frac{ab}{c}$. So p and q intersect at $\left(0, -\frac{ab}{c}\right)$.

e. $\frac{a}{c}$

f. Let a pt. on line r be (x, y). Then the eq. of r is $\frac{y - 0}{x - b} = \frac{a}{c}$ or $y = \frac{a}{c}(x - b)$.

g. $-\frac{ab}{c} = \frac{a}{c}(0 - b)$

h. $\left(0, -\frac{ab}{c}\right)$

37. Assume $b > a$. $a + \frac{b - a}{n}, a + 2\left(\frac{b - a}{n}\right), \ldots,$ $a + (n - 1)\left(\frac{b - a}{n}\right)$

38. Assume $b \geq a, d \geq c$. $\left(a + \frac{b - a}{n}, c + \frac{d - c}{n}\right),$ $\left(a + 2\left(\frac{b - a}{n}\right), c + 2\left(\frac{d - c}{n}\right)\right), \ldots,$ $\left(a + (n - 1)\left(\frac{b - a}{n}\right), c + (n - 1)\left(\frac{d - c}{n}\right)\right)$

39. **a.** The $\triangle$s with bases d and b, and heights c and a, respectively, have the same area. They share the small right $\triangle$ with base d and height c, and the remaining areas are $\triangle$s with base c and height $(b - d)$. So $\frac{1}{2}ad = \frac{1}{2}bc$. Mult. both sides by 2 gives $ad = bc$.

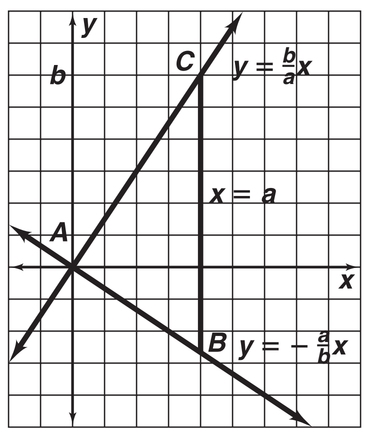
b. The diagram shows that $\frac{a}{b} = \frac{c}{d}$, since both represent the slope of the top segment of the $\triangle$. So by (a), $ad = bc$.

40. Divide the quad. into 2 △s. Find the centroid for each △ and connect them. Now divide the quad. into 2 other △s and follow the same steps. Where the two lines meet connecting the centroids of the 4 △s is the centroid of the quad.

41. a. Horiz. lines have slope 0, and vert. lines have undef. slope. Neither could be mult. to get -1.

b. Assume the lines do not intersect. Then they have the same slope, say m. Then $m \cdot m = m^2 = -1$, which is impossible. So the lines must intersect.

c. Let the eq. for ℓ_1 be $y = \frac{b}{a}x$, and for ℓ_2 be $y = -\frac{a}{b}x$, and the origin be the int. point.



Define $C(a, b)$, $A(0, 0)$, and $B\left(a, -\frac{a^2}{b}\right)$. Using the Distance Formula, $AC = \sqrt{a^2 + b^2}$, $BA = \sqrt{a^2 + \frac{a^4}{b^2}}$, and $CB = b + \frac{a^2}{b}$. Then $AC^2 + BA^2 = CB^2$, and $m\angle A = 90$ by the Conv. of the Pythagorean Thm. So $\ell_1 \perp \ell_2$.