CHAPTER 3 Solutions Key
Parallel and Perpendicular Lines

ARE YOU READY? PAGE 143

1. F **2.** D

3. B **4.** E

5. A

6. Hypothesis: *E* is on $\overleftrightarrow{AC}$.
Conclusion: *E* lies in plane $\mathcal{P}$.

7. Hypothesis: *A* is not in plane $\mathcal{Q}$.
Conclusion: *A* is not on $\overleftrightarrow{BD}$.

8. Hypothesis: Plane $\mathcal{P}$ and plane $\mathcal{Q}$ intersect.
Conclusion: Plane $\mathcal{P}$ and plane $\mathcal{Q}$ intersect in a line.

9. Possible answer: ∠*GHJ*; acute

10. Possible answer: ∠*KLM*; obtuse

11. Possible answer: ∠*QPN*; right

12. Possible answer: ∠*RST*; straight

13. Possible answer: ∠*AGB* and ∠*EGD*

14. Possible answer: ∠*AGB* and ∠*BGC*

15. Possible answer: ∠*BGC* and ∠*CGD*

16. Possible answer: ∠*AGC* and ∠*CGD*

17. $4x + 9$
$= 4(31) + 9$
$= 133$

18. $6x - 16$
$= 6(43) - 16$
$= 242$

19. $97 - 3x$
$= 97 - 3(20)$
$= 37$

20. $5x + 3x + 12$
$= 8x + 12$
$= 8(17) + 12$
$= 148$

21. $4x + 8 = 24$
$4x = 16$
$x = 4$

22. $2 = 2x - 8$
$10 = 2x$
$5 = x$

23. $4x + 3x + 6 = 90$
$7x + 6 = 90$
$7x = 84$
$x = 12$

24. $21x + 13 + 14x - 8 = 180$
$35x + 5 = 180$
$35x = 175$
$x = 5$

3-1 LINES AND ANGLES, PAGES 146–151

CHECK IT OUT! PAGES 146–147

1a. Possible answer: $\overline{BF} \parallel \overline{EJ}$

b. Possible answer: $\overline{BF}$ and $\overline{DE}$ are skew.

c. Possible answer: $\overline{BF} \perp \overline{FJ}$

d. Possible answer: plane *FJH* || plane *BCD*

2a. Possible answer: ∠1 and ∠3

b. Possible answer: ∠2 and ∠7

c. Possible answer: ∠1 and ∠8

d. Possible answer: ∠2 and ∠3

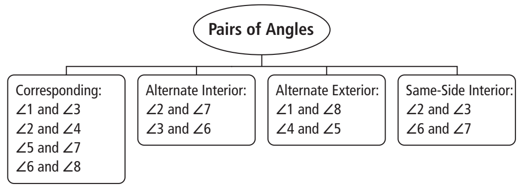
3. transv.: *n*; same-side int. ∠s

THINK AND DISCUSS, PAGE 148

1. Intersecting lines can intersect at any ∠. ⊥ lines intersect at 90° ∠s.

2. The ∠s are outside lines *m* and *n*, on opposite sides of line *p*.

3.



EXERCISES, PAGES 148–151

GUIDED PRACTICE, PAGE 148

1. alternate interior angles

2. Possible answer: $\overline{EH} \perp \overline{DH}$

3. Possible answer: $\overline{AB}$ and $\overline{DH}$ are skew.

4. Possible answer: $\overline{AB} \parallel \overline{CD}$

5. Possible answer: plane *ABC* || plane *EFG*

6. Possible answer: ∠2 and ∠4

7. Possible answer: ∠6 and ∠8

8. Possible answer: ∠6 and ∠3

9. Possible answer: ∠2 and ∠3

10. transv.: *n*; corr. ∠s **11.** transv.: *m*; alt. ext. ∠s

12. transv.: *n*; alt. int. ∠s

13. transv.: *p*; same-side. int. ∠s

PRACTICE AND PROBLEM SOLVING, PAGES 149–150

14. Possible answer: $\overline{AB} \parallel \overline{DE}$

15. Possible answer: $\overline{AB}$ and $\overline{CF}$ are skew.

16. Possible answer: $\overline{BD} \perp \overline{DF}$

17. Possible answer: plane *ABC* || plane *DEF*

18. Possible answer: ∠2 and ∠6

19. Possible answer: ∠1 and ∠8

20. Possible answer: ∠1 and ∠6

21. Possible answer: ∠2 and ∠5

22. transv.: *p*; corr. ∠s **23.** transv.: *q*; alt. int. ∠s

24. transv.: ℓ; alt. ext. ∠s

25. transv.: *p*; same-side. int. ∠s

26. The 30-yard line and goal line are ||, and the path of the runner is the transv.

27. Possible answer: corr. ∠s

28. Possible answer: alt. int. ∠s

29. Possible answer: same-side int. $\angle$s

30. Possible answer: $\overline{CD} \parallel \overline{GH}$

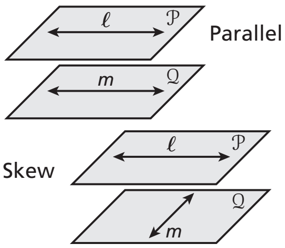
31. Possible answer: $\overline{CD}$ and $\overline{FG}$

32. Possible answer: $\overline{DH} \perp \overline{GH}$

33a. plane *MNR* $\parallel$ plane *KLP*; plane *LMQ* $\parallel$ plane *KNP*; plane *PQR* $\parallel$ plane *KLM*

b. same-side int. $\angle$s

34. parallel or skew;



35. Possible answer: $\angle 5$ and $\angle 8$

36. Possible answer: $\angle 2$ and $\angle 7$

37. Possible answer: $\angle 1$ and $\angle 5$

38. transv.: ℓ; corr. $\angle$s

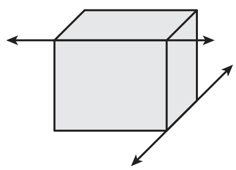
39. transv.: n; alt. int. $\angle$s

40. transv.: m; alt. ext. $\angle$s

41. The lines are skew.

42. $m \parallel n$

43. Possible answer: In a room, the intersection of the front wall and the ceiling forms part of one line, and the intersection of the right wall and the floor forms part of another line. The two lines are skew.



TEST PREP, PAGES 150–151

44. B

45. G
corr. $\angle$ pairs: $\angle 1$ and $\angle 8$, $\angle 2$ and $\angle 5$, $\angle 3$ and $\angle 6$, $\angle 4$ and $\angle 7$

46. C

47. F

48. D

CHALLENGE AND EXTEND, PAGE 151

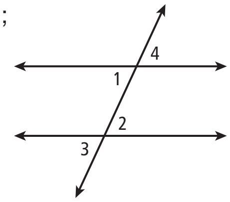
49. transv. m: $\angle 1$ and $\angle 3$, $\angle 2$ and $\angle 4$, $\angle 5$ and $\angle 7$, $\angle 6$ and $\angle 8$;
transv. n: $\angle 9$ and $\angle 11$, $\angle 10$ and $\angle 12$, $\angle 13$ and $\angle 15$, $\angle 14$ and $\angle 16$;
transv. p: $\angle 1$ and $\angle 9$, $\angle 2$ and $\angle 10$, $\angle 5$ and $\angle 13$, $\angle 6$ and $\angle 14$;
transv. q: $\angle 3$ and $\angle 11$, $\angle 4$ and $\angle 12$, $\angle 7$ and $\angle 15$, $\angle 8$ and $\angle 16$

50. transv. m: $\angle 2$ and $\angle 7$, $\angle 3$ and $\angle 6$;
transv. n: $\angle 10$ and $\angle 15$, $\angle 11$ and $\angle 14$;
transv. p: $\angle 5$ and $\angle 10$, $\angle 6$ and $\angle 9$;
transv. q: $\angle 7$ and $\angle 12$, $\angle 8$ and $\angle 11$

51. transv. m: $\angle 1$ and $\angle 8$, $\angle 4$ and $\angle 5$;
transv. n: $\angle 9$ and $\angle 16$, $\angle 12$ and $\angle 13$;
transv. p: $\angle 1$ and $\angle 14$, $\angle 2$ and $\angle 13$;
transv. q: $\angle 3$ and $\angle 16$, $\angle 4$ and $\angle 15$

52. transv. m: $\angle 2$ and $\angle 3$, $\angle 6$ and $\angle 7$;
transv. n: $\angle 10$ and $\angle 11$, $\angle 14$ and $\angle 15$;
transv. p: $\angle 5$ and $\angle 9$, $\angle 6$ and $\angle 10$;
transv. q: $\angle 7$ and $\angle 11$, $\angle 8$ and $\angle 12$

53. corr. $\angle$s;



54. the red and orange faces, the blue and purple faces, the yellow and green faces

SPIRAL REVIEW, PAGE 151

55. $4(-1)^2 - 7 = 4 - 7 = -3$;
$4(0)^2 - 7 = -7$;
$4(1)^2 - 7 = 4 - 7 = -3$;
$4(2)^2 - 7 = 16 - 7 = 9$;
$4(3)^2 - 7 = 36 - 7 = 29$

56. $-2(-1)^2 + 5 = -2 + 5 = 3$;
$-2(0)^2 + 5 = 5$;
$-2(1)^2 + 5 = -2 + 5 = 3$;
$-2(2)^2 + 5 = -8 + 5 = -3$;
$-2(3)^2 + 5 = -18 + 5 = -13$

57. $(-1 + 3)(-1 - 3) = (2)(-4) = -8$;
$(0 + 3)(0 - 3) = (3)(-3) = -9$;
$(1 + 3)(1 - 3) = (4)(-2) = -8$;
$(2 + 3)(2 - 3) = (5)(-1) = -5$;
$(3 + 3)(3 - 3) = (6)(0) = 0$

58. $C = 2\pi r$
$= 2\pi(80) = 160\pi$
≈ 502.7 cm

$A = \pi r^2$
$= \pi(80)^2 = 1600\pi$
$\approx 20{,}106.2 \text{ cm}^2$

59. $r = 3.8 \div 2 = 1.9$ m
$C = 2\pi r$
$= 2\pi(1.9) = 3.8\pi$
≈ 11.9 m

$A = \pi r^2$
$= \pi(1.9)^2 = 3.61\pi$
$\approx 11.3 \text{ m}^2$

60. Rt. $\angle \cong$ Thm. or Vert. $\angle$s Thm.

61. Lin. Pair Thm.

62. Vert. $\angle$s Thm.

CONNECTING GEOMETRY TO ALGEBRA: SYSTEMS OF EQUATIONS, PAGES 152–153

TRY THIS, PAGE 153

1. $10x + 4y = 90$
$26x - 4y = 90$
$36x + 0 = 180$
$36x = 180$
$x = 5$

$10x + 4y = 90$
$10(5) + 4y = 90$
$50 + 4y = 90$
$4y = 40$
$y = 10$

2. $3x + 3y = 45$
$-3x + 17y + 45 = 180$
$20y + 45 = 45 + 180$
$20y = 180$
$y = 9$

$3x + 3y = 45$
$3x + 3(9) = 45$
$3x + 27 = 45$
$3x = 18$
$x = 6$

3. $6x + 10y + 36 = 180$
$6x + 10y = 144$
$6x + 10y = 144 \rightarrow -3(6x + 10y = 144) \rightarrow$
$-18x - 30y = -432$

$-18x - 30y = -432$
$18x + 6y = 144$
$-24y = -288$
$y = 12$

$6x + 10y = 144$
$6x + 10(12) = 144$
$6x + 120 = 144$
$6x = 24$
$x = 4$

4. $32x + 2y = 90 \rightarrow -2(32x + 2y = 90) \rightarrow$
$-64x - 4y = -180$

$-64x - 4y = -180$
$19x + 4y = 90$
$-45x = -90$
$x = 2$

$32x + 2y = 90$
$32(2) + 2y = 90$
$64 + 2y = 90$
$2y = 26$
$y = 13$

TECHNOLOGY LAB: EXPLORE PARALLEL LINES AND TRANSVERSALS, PAGE 154

ACTIVITY, PAGE 154

4.

Angle	∠*AGE*	∠*BGE*	∠*AGH*	∠*BGH*
Measure	100°	80°	80°	100°
Measure	72°	108°	108°	72°

Angle	∠*CHG*	∠*DHG*	∠*CHF*	∠*DHF*
Measure	100°	80°	80°	100°
Measure	72°	108°	108°	72°

Possible measures are given in the tables. Possible answer: All acute ∠s are ≅. All obtuse ∠s are ≅. Any acute ∠ is supp. to any obtuse ∠.

TRY THIS, PAGE 154

1. The corr. ∠s are the pairs ∠*AGE* and ∠*CHG*, ∠*BGE* and ∠*DHG*, ∠*AGH* and ∠*CHF*, and ∠*BGH* and ∠*DHF*. The ∠s in each pair have = measures.
2. The alt. int. ∠s are the pairs ∠*CHG* and ∠*BGH*, and ∠*AGH* and ∠*DHG*. The ∠s in each pair have = measures.
   The alt. ext. ∠s are the pairs ∠*AGE* and ∠*DHF*, and ∠*BGE* and ∠*CHF*. The ∠s in each pair have = measures.
   The same-side int. ∠s are the pairs ∠*CHG* and ∠*AGH*, and ∠*BGH* and ∠*DHG*. The ∠s in each pair have measures that add up to 180°.
3. Possible answer: If the ∥ lines are dragged farther apart or closer together, there is no change in the ∠ measures. Since the lines remain ∥, the amount of “tilt” of the line remains the same, so the ∠ measures remain the same.

3-2 ANGLES FORMED BY PARALLEL LINES AND TRANSVERSALS, PAGES 155–161

CHECK IT OUT! PAGES 155–157

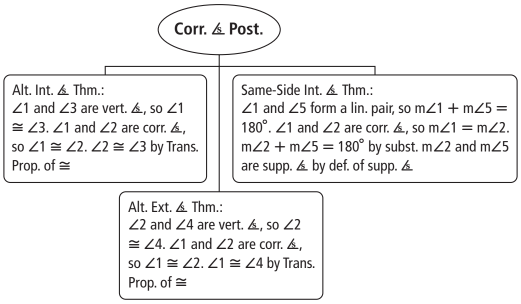
1. $x = 118$
$x + m\angle QRS = 180$
$118 + m\angle QRS = 180$
$m\angle QRS = 62°$

2. $(2x + 10)° = (3x - 15)°$
$10 = x - 15$
$25 = x$
$m\angle ABD = 2x + 10$
$= 2(25) + 10$
$= 60°$

3. Acute ∠s measure $180 - 120 = 60°$ and $180 - 125 = 55°$

THINK AND DISCUSS, PAGE 157

1. If the transv. is $\perp$, all the $\angle$s formed are rt. $\angle$s, and all rt. $\angle$s are $\cong$.

2. 

EXERCISES, PAGES 158–161

GUIDED PRACTICE, PAGE 158

1. $x = 127$
$m\angle JKL = x = 127°$

2. $(7x - 14)° = (4x + 19)°$
$3x - 14 = 19$
$3x = 33$
$x = 11$
$m\angle BEF = 4x + 19$
$= 4(11) + 19$
$= 63°$

3. $m\angle 1 = 90°$

4. $(6x)° + (3x + 9)° = 180°$
$9x + 9 = 180$
$9x = 171$
$x = 19$
$m\angle CBY = 3x + 9$
$= 3(19) + 9$
$= 66°$

5. $5x + 6y = 94$
$\underline{4x + 6y = 86}$
$x = 8$

$4x + 6y = 86$
$4(8) + 6y = 86$
$32 + 6y = 86$
$6y = 54$
$y = 9$

PRACTICE AND PROBLEM SOLVING, PAGES 158–160

6. $m\angle KLM = y = 115°$

7. $4a = 2a + 50$
$2a = 50$
$a = 25$
$m\angle VYX = 4(25) = 100°$

8. $m\angle ABC = x = 116°$

9. $13x + 17x = 180$
$30x = 180$
$x = 6$
$m\angle EFG = 17(6) = 102°$

10. $3n - 45 = 2n + 15$
$n - 45 = 15$
$n = 60$

$m\angle PQR + (2n + 15) = 180$
$m\angle PQR + 2(60) + 15 = 180$
$m\angle PQR + 135 = 180$
$m\angle PQR = 45°$

11. $4x - 14 = 3x + 12$
$x - 14 = 12$
$x = 26$

$m\angle STU + (3x + 12) = 180$
$m\angle STU + 3(26) + 12 = 180$
$m\angle STU + 90 = 180$
$m\angle STU = 90°$

12. $m\angle 1 = 60$ and $m\angle 2 + 60 = 180$
$2x - 3y = 60$
$\underline{x + 3y + 60 = 180}$
$3x + 60 = 240$
$3x = 180$
$x = 60$

$2x - 3y = 60$
$2(60) - 3y = 60$
$120 - 3y = 60$
$-3y = -60$
$y = 20$

13. $m\angle 1 = 120°$
Corr. $\angle$s Post.

14. $m\angle 1 + m\angle 2 = 180$
$120 + m\angle 2 = 180$
$m\angle 2 = 60°$
Lin. Pair Thm.

15. $120 + m\angle 3 = 180$
$m\angle 3 = 60°$
Same-Side. Int. $\angle$s Thm.

16. $m\angle 4 = 120°$
Alt. Int. $\angle$s Thm.

17. $120 + m\angle 5 = 180$
$m\angle 5 = 60°$
Lin. Pair Thm.

18. $120 + m\angle 6 = 180$
$m\angle 6 = 60°$
Lin. Pair Thm.

19. $m\angle 7 = 120°$
Vert. $\angle$s Thm.

20. Alt. Ext. $\angle$s Thm.;
$m\angle 1 = m\angle 2$
$7x + 15 = 10x - 9$
$15 = 3x - 9$
$24 = 3x$
$8 = x$

$m\angle 2 = 10x - 9$
$= 10(8) - 9$
$= 71°$
$m\angle 1 = m\angle 2 = 71°$

21. Same-Side Int. $\angle$s Thm.;
$m\angle 3 + m\angle 4 = 180$
$(23x + 11) + (14x + 21) = 180$
$37x + 32 = 180$
$37x = 148$
$x = 4$

$m\angle 3 = 23x + 11$
$= 23(4) + 11$
$= 103°$

$m\angle 4 = 14x + 21$
$= 14(4) + 21$
$= 77°$

22. Alt. Int. $\angle$s Thm.;
$m\angle 4 = m\angle 5$
$37x - 15 = 44x - 29$
$-15 = 7x - 29$
$14 = 7x$
$2 = x$

$m\angle 5 = 44x - 29$
$= 44(2) - 29$
$= 59°$
$m\angle 4 = m\angle 5 = 59°$

23. Corr. $\angle$s Post.;

$$\begin{aligned} m\angle 1 &= m\angle 4 \\ 6x + 24 &= 17x - 9 \\ 24 &= 11x - 9 \\ 33 &= 11x \\ 3 &= x \end{aligned}$$

$$\begin{aligned} m\angle 4 &= 17x - 9 \\ &= 17(3) - 9 \\ &= 42^\circ \\ m\angle 1 = m\angle 4 &= 42^\circ \end{aligned}$$

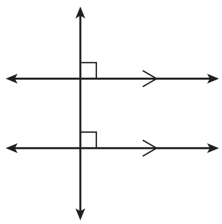
24. Corr. $\angle$s Post.

25a. $\angle 1 \cong \angle 3$ **b.** Corr. $\angle$s Post.

c. $\angle 1 \cong \angle 2$ **d.** Trans. Prop. of $\cong$

26. It is given that $r \parallel s$. By the Corr. $\angle$s Post., $\angle 1 \cong \angle 3$; so $m\angle 1 = m\angle 3$ by def. of $\cong$ $\angle$s. By the Lin. Pair Thm., $m\angle 3 + m\angle 2 = 180^\circ$. By subst., $m\angle 1 + m\angle 2 = 180^\circ$.

27.



28. The situation is impossible because when $\parallel$ lines are intersected by a transverse, same-side int. $\angle$s are supp.

29a. same-side int. $\angle$s

b. By the Same-Side Int. $\angle$s Thm.,

$$\begin{aligned} m\angle QRT + m\angle STR &= 180 \\ 25 + 90 + m\angle STR &= 180 \\ 115 + m\angle STR &= 180 \\ m\angle STR &= 65^\circ \end{aligned}$$

30. same-side int. $\angle$s;

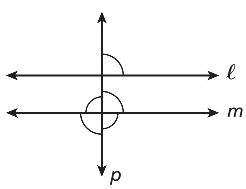
$$\begin{aligned} m\angle 1 + m\angle 2 &= 180 \\ (2x + 6) + (3x + 9) &= 180 \\ 5x + 15 &= 180 \\ 5x &= 165 \\ x &= 33 \end{aligned}$$

$$\begin{aligned} m\angle 1 &= 2x + 6 \\ &= 2(33) + 6 \\ &= 72^\circ \end{aligned} \qquad \begin{aligned} m\angle 2 &= 3x + 9 \\ &= 3(33) + 9 \\ &= 108^\circ \end{aligned}$$

31. A is incorrect because the $\angle$s are supp., not $\cong$.

32. By the Alt. Int. $\angle$s Thm., $x = y$, so $\frac{x}{y} = 1$.

33.



If all $\angle$s formed by m and p are $\cong$, then $m \perp p$. If the $\angle$ formed by ℓ and p is $\cong$ to the $\angle$s formed by m and p, it must be a rt. $\angle$, so $\ell \perp p$.

TEST PREP, PAGES 160–161

34. C

$$\begin{aligned} m\angle RST &= m\angle STU \\ x + 50 &= 3x + 20 \\ 50 &= 2x + 20 \\ 30 &= 2x \\ 15 &= x \end{aligned}$$

$$\begin{aligned} m\angle STU &= 3x + 20 \\ &= 3(15) + 20 \\ &= 45^\circ \\ m\angle RVT = m\angle STU &= 45^\circ \end{aligned}$$

35. J

m(comp. $\angle$) = 7°; this is smaller than other $\angle$ measures.

36. By the Lin. Pair Thm., $m\angle 1 + m\angle 2 = 180^\circ$. By the Alt. Int. $\angle$s Thm., $\angle 2 \cong \angle 3$, so $m\angle 2 = m\angle 3$. By subst., $m\angle 1 + m\angle 3 = 180^\circ$, so $\angle 1$ and $\angle 3$ are supp.

CHALLENGE AND EXTEND, PAGE 161

37.
$$\begin{aligned} m\angle 1 &= 40^\circ + (180 - 145)^\circ \\ &= 40 + 35 \\ &= 75^\circ \end{aligned}$$

38.
$$\begin{aligned} m\angle 1 &= 180^\circ - (105 - 80)^\circ \\ &= 180 - 25 \\ &= 155^\circ \end{aligned}$$

39. By the Same-Side Int. $\angle$s Thm.,

$10x + 5y + 80 = 180$ and $15x + 4y + 72 = 180$

$10x + 5y = 100$ and $15x + 4y = 108$

$10x + 5y = 100 \rightarrow -1.5(10x + 5y = 100) \rightarrow$
$-15x - 7.5y = -150$

$$\begin{aligned} -15x - 7.5y &= -150 \\ 15x + 4y &= 108 \\ \hline 3.5y &= 42 \\ y &= 12 \end{aligned}$$

$$\begin{aligned} 10x + 5y &= 100 \\ 10x + 5(12) &= 100 \\ 10x + 60 &= 100 \\ 10x &= 40 \\ x &= 4 \end{aligned}$$

40. $a + b = 180$ and $a = 2b$

$$\begin{aligned} 2b + b &= 180 \\ 3b &= 180 \\ b &= 60 \end{aligned}$$

$$\begin{aligned} a &= 2b \\ &= 2(60) \\ &= 120 \end{aligned}$$

SPIRAL REVIEW, PAGE 161

41. increase **42.** decrease

43. Let p, q, and r be the following:
p: $\angle 1$ and $\angle 2$ form a lin. pair.
q: $\angle 1$ and $\angle 2$ are supp.
r: $m\angle 1 + m\angle 2 = 180^\circ$
It is given that $p \rightarrow q$ and $q \rightarrow r$, and also that p is true. By the Law of Syllogism, $p \rightarrow r$. So by the Law of Detachment r is true: $m\angle 1 + m\angle 2 = 180^\circ$.

44. Let *p*, *q*, and *r* be the following:
p: A figure is a square.
q: A figure is a rect.
r: A figure's sides are ⊥.
It is given that $p \rightarrow q$ and $q \rightarrow r$, and also that *p* is true for figure *ABCD*. By the Law of Syllogism, $p \rightarrow r$. So by the Law of Detachment, *r* is true for figure *ABCD*: The sides of *ABCD* are ⊥.

45. Possible answer: ∠3 and ∠6

46. Possible answer: ∠1 and ∠8

47. Possible answer: ∠3 and ∠5

3-3 PROVING LINES PARALLEL, PAGES 162–169

CHECK IT OUT! PAGES 162–165

1a. $m\angle 1 = m\angle 3$
$\angle 1 \cong \angle 3$
So $\ell \parallel m$ by the Conv. of the Corr. ∠s Post.

b. $m\angle 7 = (4x + 25)° = 4(13) + 25 = 77°$
$m\angle 5 = (5x + 12)° = 5(13) + 12 = 77°$
So $\angle 7 \cong \angle 5$. $\ell \parallel m$ by the Conv. of the Corr. ∠s Post.

2a. $m\angle 4 = m\angle 8$
$\angle 4 \cong \angle 8$
So $r \parallel s$ by the Conv. of the Alt. Ext. ∠s Thm.

b. $m\angle 3 = 2x° = 2(50) = 100°$
$m\angle 7 = (x + 50)° = 50 + 50 = 100°$
So $\angle 7 \cong \angle 3$. $r \parallel s$ by the Conv. of the Alt. Int. ∠s Thm.

3.

Statements	Reasons
1. ∠1 ≅ ∠4	1. Given
2. m∠1 = m∠4	2. Def. ≅ ∠s
3. ∠3 and ∠4 are supp.	3. Given
4. m∠3 + m∠4 = 180°	4. Def. supp. ∠s
5. m∠3 + m∠1 = 180°	5. Subst.
6. m∠2 = m∠3	6. Vert. ∠s Thm.
7. m∠2 + m∠1 = 180°	7. Subst.
8. ℓ ∥ m	8. Conv. of Same-Side Int. ∠s Thm.

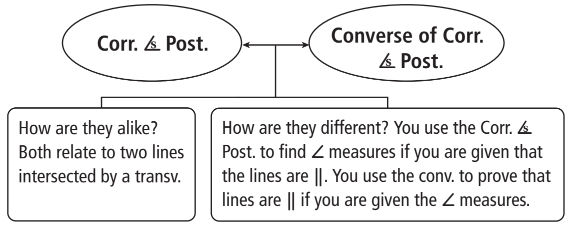
4. $4y - 2 = 4(8) - 2 = 30°$
$3y + 6 = 3(8) + 6 = 30°$
The ∠s are ≅, so the oars are ∥ by the Conv. of the Corr. ∠s Post.

THINK AND DISCUSS, PAGE 165

1. Prove 2 corr. ∠s are ≅, prove 2 same-side int. ∠s are supp., or prove 2 alt. int. ∠s are ≅.

2. If $m\angle 5 = m\angle 1$, then $m \parallel n$ by the Conv. of the Corr. ∠s Post. If $m\angle 7 = m\angle 1$, then $m \parallel n$ by the Conv. of the Alt. Ext. ∠s Thm. ∠6 and ∠8 each form a lin. pair with ∠5, so you could use the Lin. Pair Thm. and the Conv. of the Corr. ∠s Post.

3.



EXERCISES, PAGES 166–169

GUIDED PRACTICE, PAGE 166

1. $\angle 4 \cong \angle 5$, so $p \parallel q$ by the Conv. of the Corr. ∠s Post.

2. $m\angle 1 = (4x + 16)° = 4(28) + 16 = 128°$
$m\angle 8 = (5x - 12)° = 5(28) - 12 = 128°$
So $\angle 1 \cong \angle 8$. $p \parallel q$ by the Conv. of the Corr. ∠s Post.

3. $m\angle 4 = (6x - 19)° = 6(11) - 19 = 47°$
$m\angle 5 = (3x + 14)° = 3(11) + 14 = 47°$
So $\angle 4 \cong \angle 5$. $p \parallel q$ by the Conv. of the Corr. ∠s Post.

4. $\angle 1 \cong \angle 5$, so $r \parallel s$ by the Conv. of the Alt. Ext. ∠s Thm.

5. ∠3 and ∠4 are supp., so $r \parallel s$ by the Conv. of the Same-Side Int. ∠s Thm.

6. $\angle 3 \cong \angle 7$, so $r \parallel s$ by the Conv. of the Alt. Int. ∠s Thm.

7. $m\angle 4 = (13x - 4)° = 13(5) - 4 = 61°$
$m\angle 8 = (9x + 16)° = 9(5) + 16 = 61°$
So $\angle 4 \cong \angle 8$. $r \parallel s$ by the Conv. of the Alt. Int. ∠s Thm.

8. $m\angle 8 = (17x + 37)° = 17(6) + 37 = 139°$
$m\angle 7 = (9x - 13)° = 9(6) - 13 = 41°$
$m\angle 8 + m\angle 7 = 139° + 41° = 180°$
So m∠8 and m∠7 are supp. $r \parallel s$ by the Conv. of the Same-Side Int. ∠s Thm.

9. $m\angle 2 = (25x + 7)° = 25(5) + 7 = 132°$
$m\angle 6 = (24x + 12)° = 24(5) + 12 = 132°$
So $\angle 2 \cong \angle 6$. $r \parallel s$ by the Conv. of the Alt. Ext. ∠s Thm.

10a. Trans. Prop. of ≅ **b.** $\overline{XY} \parallel \overline{WV}$

10c. Conv. of the Alt. Int. ∠s Thm.

11. $m\angle 1 = (17x + 9)° = 17(3) + 9 = 60°$
$m\angle 2 = (14x + 18)° = 14(3) + 18 = 60°$
So $\angle 1 \cong \angle 2$. By the Conv. of the Alt. Int. ∠s Thm., landings are ∥.

PRACTICE AND PROBLEM SOLVING, PAGES 166–168

12. $\angle 3 \cong \angle 7$, so $\ell \parallel m$ by the Conv. of the Corr. ∠s Post.

13. $m\angle 4 = 54°$
$m\angle 8 = (7x + 5)° = 7(7) + 5 = 54°$
So $\angle 4 \cong \angle 8$. $\ell \parallel m$ by the Conv. of the Corr. ∠s Post.

14. $m\angle 2 = (8x + 4)° = 8(15) + 4 = 124°$
$m\angle 6 = (11x - 41)° = 11(15) - 41 = 124°$
So $\angle 2 \cong \angle 6$. $\ell \parallel m$ by the Conv. of the Corr. ∠s Post.

15. $m\angle 1 = (3x + 19)° = 3(12) + 19 = 55°$
$m\angle 5 = (4x + 7)° = 4(12) + 7 = 55°$
So $\angle 1 \cong \angle 5$. $\ell \parallel m$ by the Conv. of the Corr. ∠s Post.

16. $\angle 3 \cong \angle 6$, so $n \parallel p$ by the Conv. of the Alt. Int. ∠s Thm.

17. $\angle 2 \cong \angle 7$, so $n \parallel p$ by the Conv. of the Alt. Ext. ∠s Thm.

18. $\angle 4$ and $\angle 6$ are supp., so $n \parallel p$ by the Conv. of the Same-Side Int. ∠s Thm.

19. $m\angle 1 = (8x - 7)° = 8(14) - 7 = 105°$
$m\angle 8 = (6x + 21)° = 6(14) + 21 = 105°$
So $\angle 1 \cong \angle 8$. $n \parallel p$ by the Conv. of the Alt. Ext. ∠s Thm.

20. $m\angle 4 = (4x + 3)° = 4(25) + 3 = 103°$
$m\angle 5 = (5x - 22)° = 5(25) - 22 = 103°$
So $\angle 4 \cong \angle 5$. $n \parallel p$ by the Conv. of the Alt. Int. ∠s Thm.

21. $m\angle 3 = (2x + 15)° = 2(30) + 15 = 75°$
$m\angle 5 = (3x + 15)° = 3(30) + 15 = 105°$
$m\angle 3 + m\angle 5 = 75° + 105° = 180°$
So $m\angle 3$ and $m\angle 5$ are supp. $n \parallel p$ by the Conv. of the Same-Side Int. ∠s Thm.

22a. Corr. ∠s Post. **b.** Given
c. Trans. Prop. of $\cong$ **d.** $\overline{BC} \parallel \overline{DE}$
e. Conv. of the Corr. ∠s Post.

23. $m\angle 1 = (3x + 2)° = 3(6) + 2 = 20°$
$m\angle 2 = (5x - 10)° = 5(6) - 10 = 20°$
So $\angle 1 \cong \angle 2$. $\overline{DJ} \parallel \overline{EK}$ by the Conv. of the Corr. ∠s Post.

24. Conv. of the Corr. ∠s Post.

25. Conv. of the Alt. Ext. ∠s Thm.

26. Conv. of the Alt. Int. ∠s Thm.

27. Conv. of the Corr. ∠s Post.

28. Conv. of the Alt. Int. ∠s Thm.

29. Conv. of the Same-Side Int. ∠s Thm.

30. $\ell \parallel m$; Conv. of the Alt. Int. ∠s Thm.

31. $m \parallel n$; Conv. of the Same-Side Int. ∠s Thm.

32. $\ell \parallel n$; Conv. of the Alt. Ext. ∠s Thm.

33. $m \parallel n$; Conv. of the Alt. Ext. ∠s Thm.

34. $\ell \parallel n$; Conv. of the Alt. Int. ∠s Thm.

35. $\ell \parallel n$; Conv. of the Same-Side Int. ∠s Thm.

36. Conv. of the Alt. Int. ∠s Thm.

37a. $\angle URT$; $m\angle URT = m\angle URS + m\angle SRT$ by the $\angle$ Add. Post. It is given that $m\angle SRT = 25°$ and $m\angle URS = 90°$, so $m\angle URT = 25° + 90° = 115°$.

b. It is given that $m\angle SUR = 65°$. From part **a**, $m\angle URT = 115°$. $65° + 115° = 180°$, so $\overleftrightarrow{SU} \parallel \overleftrightarrow{RT}$ by the Conv. of the Same-Side Int. ∠s Thm.

38a. $\angle 1 \cong \angle 2$ **b.** Trans. Prop. of $\cong$
c. $\ell \parallel m$ **d.** Conv. of the Corr. ∠s Post.

39. It is given that $\angle 1$ and $\angle 2$ are supp., so $m\angle 1 + m\angle 2 = 180°$. By the Lin. Pair Thm., $m\angle 2 + m\angle 3 = 180°$. By the Trans. Prop. of $=$, $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$. By the Subtr. Prop. of $=$, $m\angle 1 = m\angle 3$. By the Conv. of the Corr. ∠s Post., $\ell \parallel m$.

40. The $\angle$ formed by the wall and the roof and the $\angle$ formed by the plumb line and the roof are corr. ∠s. If they have the same measure, then they are $\cong$, so the wall is $\parallel$ to the plumb line, by the Conv. of the Corr. ∠s Post. Since the plumb line is perfectly vertical, the wall must also be perfectly vertical.

41. The Reflex. Prop. is not true for $\parallel$ lines, because a line is not $\parallel$ to itself. The Sym. Prop. is true, because if $\ell \parallel m$, then ℓ and m are coplanar and do not intersect. So $m \parallel \ell$. The Trans. Prop. is not true for $\parallel$ lines, because if $\ell \parallel m$ and $m \parallel n$, ℓ and n could be the same line. So they would not be $\parallel$.

42. Yes; by the Vert. ∠s Thm.; the $\angle$ that forms a same-side int. $\angle$ with the 55° $\angle$ measures 125°. $125° + 55° = 180°$, so the same-side int. ∠s are supp. By the Conv. of the Same-Side Int. ∠s Thm., $a \parallel b$.

TEST PREP, PAGES 168–169

43. C **44.** D

45. 15
$$(5x - 10) + (8x - 5) = 180$$
$$13x - 15 = 180$$
$$13x = 195$$
$$x = 15$$

CHALLENGE AND EXTEND, PAGE 169

46. $q \parallel r$ by the Conv. of the Alt. Ext. ∠s Thm.

47. No lines can be proven $\parallel$.

48. $s \parallel t$ by the Conv. of the Corr. ∠s Post.

49. $q \parallel r$ by the Conv. of the Alt. Int. ∠s Thm.

50. No lines can be proven $\parallel$.

51. $s \parallel t$ by the Conv. of the Alt. Ext. ∠s Thm.

52. $s \parallel t$ by the Conv. of the Same-Side Int. ∠s Thm.

53. No lines can be proven $\parallel$.

54. It is given that $m\angle E = 60°$ and $m\angle BDE = 120°$, so $m\angle E + m\angle BDE = 180°$. So $\angle E$ and $\angle BDE$ are supp., so $\overline{AE} \parallel \overline{BD}$ by the Conv. of the Same-Side Int. ∠s Thm.

55. By the Vert. ∠s Thm., $\angle 6 \cong \angle 3$, so $m\angle 6 = m\angle 3$. It is given that $m\angle 2 + m\angle 3 = 180°$. By subst., $m\angle 2 + m\angle 6 = 180°$. By the Conv. of the Same-Side Int. ∠s Thm., $\ell \parallel m$.

56. It is given that $m\angle 2 + m\angle 5 = 180°$. By the Lin. Pair Thm., $m\angle 4 + m\angle 5 = 180°$. By the Trans. Prop. of $=$, $m\angle 2 + m\angle 5 = m\angle 4 + m\angle 5$. By the Subtr. Prop of $=$, $m\angle 2 = m\angle 4$. By the Conv. of the Corr. ∠s Post., $\ell \parallel n$.

SPIRAL REVIEW, PAGE 169

57. $a - b = -c$
$a = b - c$

58. $y = \frac{1}{2}x - 10$
$2y = x - 20$
$2y + 20 = x$
$x = 2y + 20$

59. $4y + 6x = 12$
$4y = 12 - 6x$
$y = -\frac{3}{2}x + 3$

60. Converse: If an animal has wings, then it is a bat; F
Inverse: If an animal is not a bat, then it has no wings; F
Contrapositive: If an animal has no wings, then it is not a bat; T

61. Converse: If a polygon has exactly 3 sides, then it is a triangle; T
Inverse: If a polygon is not a triangle, then it does not have exactly 3 sides; T
Contrapositive: If a polygon does not have exactly 3 sides, then it is not a triangle; T

62. Converse: If a whole number is even, then the digit in the ones place of the number is 2; F
Inverse: If the digit in the ones place of a whole number is not 2, then the number is not even; F
Contrapositive: If a whole number is not even, then the digit in the ones place of the number is not 2; T

63. $\overline{AD} \parallel \overline{BC}$

64. Possible answer: $\overline{AB}$ and $\overline{DE}$ are skew.

65. $\overline{AB} \perp \overline{AD}$

GEOMETRY LAB: CONSTRUCT PARALLEL LINES, PAGES 170–171

TRY THIS, PAGE 170

1. Yes; lines are still $\parallel$.
2. Check students' work.
3. $\parallel$ Post.
4. If you draw quadrilateral *PQRS* in the diagram, then it is a rhombus, because the same compass setting was used to construct all 4 side lengths.

TRY THIS, PAGE 171

5. Yes; lines are still $\parallel$.
6. The corr. $\angle$s measure 90°. By the Conv. of the Corr. $\angle$s Post., the lines must be $\parallel$.
7. Check students' work.
8. the lines are $\parallel$

3-4 PERPENDICULAR LINES, PAGES 172–178

CHECK IT OUT! PAGES 172–174

1a. $\overline{AB}$

b. $AB < AC$
$x - 5 < 12$
$+5 \quad +5$
$x < 17$

2.

Statements	Reasons
1. $\angle EHF \cong \angle HFG$	1. Given
2. $\overleftrightarrow{EH} \parallel \overleftrightarrow{FG}$	2. Conv. of Alt. Int. $\angle$s Thm.
3. $\overleftrightarrow{FG} \perp \overleftrightarrow{GH}$	3. Given
4. $\overleftrightarrow{EF} \perp \overleftrightarrow{GH}$	4. $\perp$ Transv. Thm.

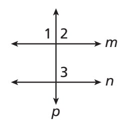
3. The shoreline and the path of the swimmer should both be $\perp$ to the current, so they should be $\parallel$ to each other.

THINK AND DISCUSS, PAGE 174

1. If two intersecting lines form a lin. pair of $\cong$ $\angle$s, then the $\angle$s in the lin. pair have the same measure. By the Lin. Pair Thm., they are also supp., so their measures add to 180°. This means the measure of each $\angle$ must be 90°, so the lines must be $\perp$.

2. If the transv. is $\perp$ to $\parallel$ the lines, all pairs of corr. $\angle$s must be rt. $\angle$s. Since all rt. $\angle$s are $\cong$, the transv. and the $\parallel$ lines form 8 $\cong$ $\angle$s.

3.

Diagram	If you are given . . .	Then you can conclude . . .
	$m\angle 1 = m\angle 2$	$m \perp p$
	$m\angle 2 = 90°$, $m\angle 3 = 90°$	$m \parallel n$
	$m\angle 2 = 90°$, $m \parallel n$	$n \perp p$

EXERCISES, PAGES 175–178

GUIDED PRACTICE, PAGE 175

1. $\overline{AB}$ and $\overleftrightarrow{CD}$ are $\perp$. $\overline{AC}$ and $\overline{BC}$ are $\cong$.

2. $\overline{EB}$

3. $ED > EB$
$x + 12 > 7$
$-12 \quad -12$
$x > -5$

4a. 2 intersecting lines form a lin. pair of $\cong$ $\angle$s $\rightarrow$ lines $\perp$.
b. $\overleftrightarrow{DE} \perp \overleftrightarrow{AF}$
c. 2 lines $\perp$ to same line $\rightarrow$ 2 lines $\parallel$.

5. The service lines are coplanar lines that are $\perp$ to the same line (the center line), so they must be $\parallel$ to each other.

PRACTICE AND PROBLEM SOLVING, PAGES 175–177

6. $\overline{WY}$

7. $WY < WZ$
$x + 8 < 19$
$-8 \quad -8$
$x < 11$

8a. Given
b. $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$
c. $\perp$ Transv. Thm.

9. The frets are lines that are $\perp$ to the same line (the string), so the frets must be $\parallel$ to each other.

10. $x < 2x - 5$
$-x < -5$
$x > 5$

11. $6x + 5 < 9x - 3$
$-3x + 5 < -3$
$-3x < -8$
$x > \frac{8}{3}$

12. **Step 1** Find x. Use the ⊥ Transv. Thm.
$2x = 90$
$x = 45$
Step 2 Find y. Use the fact that transv. is ⊥.
$3y - 2x = 90$
$3y - 90 = 90$
$3y = 180$
$y = 60$

13. **Step 1** Find y. Use the fact that the transv. is ⊥.
$6y = 90$
$y = 15$
Step 2 Find x. Use the ⊥ Transv. Thm.
$5x + 4y = 90$
$5x + 4(15) = 90$
$5x + 60 = 90$
$5x = 30$
$x = 6$

14. **Step 1** Write 2 equations for x and y.
$2x + y = 90$
$10x - 4y = 90$
Step 2 Solve equations.
$8x + 4y = 360$
$\underline{10x - 4y = 90}$
$18x = 450$
$x = 25$

$2x + y = 90$
$2(25) + y = 90$
$50 + y = 90$
$y = 40$

15. **Step 1** Write 2 equations for x and y.
$x + y + x = 180$
$x + y = 2y$
Step 2 Solve equations.
$2x + y = 180$
$\underline{x - y = 0}$
$3x = 180$
$x = 60$

$x - y = 0$
$60 - y = 0$
$60 = y$

16. yes
17. no
18. no
19. no
20. yes
21. yes

22. The Reflex. Prop. is not true for ⊥ lines because a line is not ⊥ to itself. The Sym. Prop. is true, because if $\ell \perp m \rightarrow \ell$ and m intersect to form a 90° angle, so $m \perp \ell$. The Trans. Prop. is not true, because $\ell \perp m$ and $m \perp n$, then $\ell \parallel n$.

23a. It is given that $\overline{QR} \perp \overline{PQ}$ and $\overline{PQ} \parallel \overline{RS}$, so $\overline{QR} \perp \overline{RS}$ by the ⊥ Transv. Thm. It is given that $\overline{PS} \parallel \overline{QR}$. Since $\overline{QR} \perp \overline{RS}$, $\overline{PS} \perp \overline{RS}$ by the ⊥ Transv. Thm.

b. It is given that $\overline{PS} \parallel \overline{QR}$ and $\overline{QR} \perp \overline{PQ}$. So $\overline{PQ} \perp \overline{PS}$ by the ⊥ Transv. Thm.

24. By the ⊥ Transv. Thm., all given ∠s are rt. ∠s.
$16x - 6 = 90$
$16x = 96$
$x = 6$

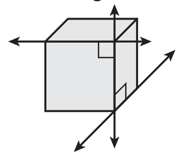
$3x + 12y = 90$
$3(6) + 12y = 90$
$18 + 12y = 90$
$12y = 72$
$y = 6$

or

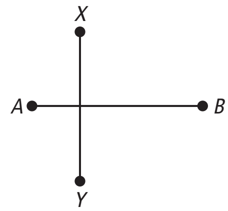
$24x - 9y = 90$
$24(6) - 9y = 90$
$144 - 9y = 90$
$-9y = -54$
$y = 6$

25. Possible answer: 1.6 cm

26. Possible answer: The two edges of cube that are skew are ⊥ to a third edge, but they are not ∥.



27. Possible answer:



28. The rungs of the ladder are lines that are all ⊥ to the same line, a side of the ladder, so the rungs must be parallel.

29. Check students' work.
30. Check students' work.

TEST PREP, PAGES 177–178

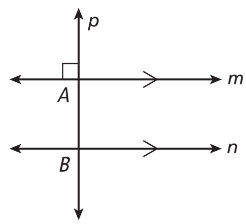
31. C

32. F
$22x + 10y = 180$
$\underline{4x + 10y = 90}$
$18x = 90$
$x = 5$

$4x + 10y = 90$
$4(5) + 10y = 90$
$20 + 10y = 90$
$10y = 70$
$y = 7$

33. D
34. C

35a. $n \perp p$



b. AB; AB; the shortest distance from a point to a line is measured along a ⊥ segment.

c. The distance between two ∥ lines is the length of a segment that is ⊥ to both lines and has one endpoint on each line.

CHALLENGE AND EXTEND, PAGE 178

36. $m\angle 1 = 180° - \frac{1}{2}(90°)$
$= 180 - 45$
$= 135°$

37. Label the ≅ ∠s ∠1 and ∠2. By def. of ≅ ∠s, m∠1 = m∠2. By the Lin. Pair Thm., m∠1 + m∠2 = 180°. By subst., 2(m∠1) = 180°. By the Div. Prop. of =, m∠1 = 90°, so the lines are ⊥ by the def. of ⊥ lines.

38. Label a pair of corr. rt. ∠s ∠1 and ∠2. By the Rt. ∠ ≅ Thm., ∠1 ≅ ∠2. So $r \parallel s$ by the Conv. of the Corr. ∠s Post.

SPIRAL REVIEW, PAGE 178

39. $2(5 + 4 + 3 + 2 + 1) = 2(15) = 30$ games

40. $m\angle + m\angle DJE = 180$
$m\angle + 28 = 180$
$m\angle = 152°$

41. $m\angle + m\angle FJG = 90$
$m\angle + 65 = 90$
$m\angle = 25°$

42. $m\angle + m\angle GJH = 180$ and $m\angle DJG + m\angle GJH =$ 180, so $m\angle = m\angle DJG$
$= m\angle DJF + m\angle FJG$
$= 90 + 65 = 155°$

43. Conv. of the Alt. Ext. ∡ Thm.

44. Conv. of the Alt. Int. ∡ Thm.

45. Conv. of the Same-Side Int. ∡ Thm.

GEOMETRY LAB: CONSTRUCT PERPENDICULAR LINES, PAGE 179

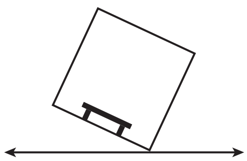
TRY THIS, PAGE 179

1. Check students' work. **2.** Check students' work.

3. Check students' work. The lines are ∥ because two lines that are ⊥ to the same line are ∥ to each other.

MULTI-STEP TEST PREP, PAGE 180

1. The table top is parallel to the floor and ceiling of the room, and perpendicular to the walls.



2. The table top is parallel to the floor, which forms a 25° ∠ with the ground. Thus the table top also forms a 25° ∠ relative to the ground. If a ball were placed on the table, it would roll down the table top. To a person in the room, the table would appear to be level and the ball would appear to roll of its own power.

3. $\overline{RS}$ forms a transversal relative to the board and the ground. The board is parallel to the ground by the Converse of the Alternate Interior Angles Theorem. From the point of view of a person in the room, the person on one end of the board would appear higher than the person on other end of the board.

4. The lamp is hanging straight down, so it would form a 25° ∠ with the walls. To a person in the room, the walls would appear straight, so the lamp would appear to be hanging at a 25° tilt.

READY TO GO ON? PAGE 181

1. Possible answer: $\overline{AE} \perp \overline{AB}$

2. Possible answer: $\overline{AB}$ and $\overline{FG}$ are skew.

3. Possible answer: $\overline{AE} \parallel \overline{FB}$

4. Possible answer: plane *AEF* ∥ plane *DHG*

5. Possible answer: ∠3 and ∠5

6. Possible answer: ∠1 and ∠7

7. Possible answer: ∠2 and ∠8

8. Possible answer: ∠4 and ∠5

9. $m\angle = x° = 135°$

10. $15x - 7 = 19x - 15$
$-7 = 4x - 15$
$2 = x$

$m\angle = 15x - 7$
$= 15(2) - 7$
$= 23°$

11. $54x + 14 = 43x + 36$
$11x + 14 = 36$
$11x = 22$
$x = 2$

$m\angle = 54x + 14$
$= 54(2) + 14$
$= 122°$

12. $m\angle 8 = (13x + 20)° = 13(3) + 20 = 59°$
$m\angle 6 = (7x + 38)° = 7(3) + 38 = 59°$
So $\angle 8 \cong \angle 6$. *a* ∥ *b* by the Conv. of the Corr. ∡ Post.

13. $\angle 1 \cong \angle 5$, so *a* ∥ *b* by the Conv. of the Alt. Ext. ∡ Thm.

14. ∠8 and ∠7 are supp., so *a* ∥ *b* by the Conv. of the Same-Side Int. ∡ Thm.

15. $\angle 8 \cong \angle 4$, so *a* ∥ *b* by the Conv. of the Alt. int. ∡ Thm.

16. $m\angle 1 = (3x + 12)° = 3(14) + 12 = 54°$
$m\angle 2 = (4x - 2)° = 4(14) - 2 = 54°$
So $\angle 1 \cong \angle 2$. The guy wires are ∥ by the Conv. of the Corr. ∡ Post.

17.

Statements	Reasons
1. $\angle 1 \cong \angle 2$, $\ell \perp n$	1. Given
2. $p \parallel n$	2. Conv. of Alt. Int. ∡ Thm.
3. $\ell \perp p$	3. ⊥ Transv. Thm.

3-5 SLOPES OF LINES, PAGES 182–187

CHECK IT OUT! PAGES 183–184

1. Substitute (3, 1) for (x_1, y_1) and (2, −1) for (x_2, y_2) in the slope formula and then simplify.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 1}{2 - 3} = \frac{-2}{-1} = 2$$

2. From the graph, Tony will have traveled approximately 390 mi.

3a. $\overleftrightarrow{WX}$ is vert. and $\overleftrightarrow{YZ}$ is horiz., so the lines are perpendicular.

b. slope of $\overleftrightarrow{KL} = \frac{-3 - 4}{-2 - (-4)} = \frac{-7}{2} = -\frac{7}{2}$

slope of $\overleftrightarrow{MN} = \frac{-1 - 1}{-5 - 3} = \frac{-2}{-8} = \frac{1}{4}$

The slopes are not the same, so the lines are not parallel. The product of the slopes is not −1, so the lines are not perpendicular.

c. slope of $\overleftrightarrow{BC} = \frac{5-1}{3-1} = \frac{4}{2} = 2$

slope of $\overleftrightarrow{DE} = \frac{4-(-6)}{3-(-2)} = \frac{10}{5} = 2$

The lines have the same slope, so they are parallel.

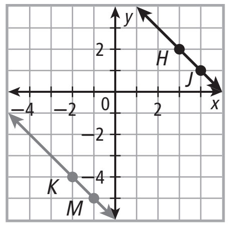
THINK AND DISCUSS, PAGE 185

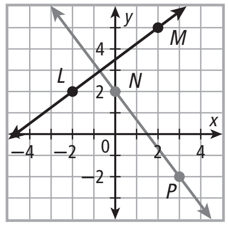
1. Subtract the first y-value from the second y-value. Subtract the first x-value from the second x-value. Divide the difference of the y-values by the difference of the x-values.
2. Any two points on a horiz. line have the same y-value, so the numerator of the slope is 0. Thus the slope of a horiz. line is 0. Any two points on a vert. line have the same x-value, so the denominator of the slope is 0. Thus the slope of a vert. line is undefined.
3.

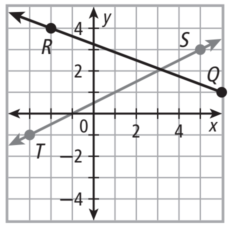
Pairs of Lines		
Type	**Slopes**	**Example**
Parallel	Same	$y = 2x + 5$ $y = 2x - 3$
Perpendicular	Opposite reciprocals	$y = 2x + 5$ $y = -\frac{1}{2}x - 3$

EXERCISES, PAGES 185–187

GUIDED PRACTICE, PAGE 185

1. rise; run
2. Substitute (5, 7) for (x_1, y_1) and (–2, 1) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1-7}{-2-5} = \frac{-6}{-7} = \frac{6}{7}$
3. Substitute (–5, 3) for (x_1, y_1) and (4, –2) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-3}{4-(-5)} = \frac{-5}{9} = -\frac{5}{9}$
4. Substitute (0, 1) for (x_1, y_1) and (–5, 1) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1-1}{-5-0} = \frac{0}{-5} = 0$
5. Substitute (4, –2) for (x_1, y_1) and (6, 3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-(-2)}{6-4} = \frac{5}{2}$
6. Use the points (8, 80) and (11, 200) to graph the line and find the slope.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{200-80}{11-8} = \frac{120}{3} = 40$
The slope is 40, which means the bird is flying at an average speed of 40 mi/h.
7. 

slope of $\overleftrightarrow{HJ} = \frac{1-2}{4-3} = \frac{-1}{1} = -1$
slope of $\overleftrightarrow{KM} = \frac{-5-(-4)}{-1-(-2)} = \frac{-1}{1} = -1$
The slopes are the same, so the lines are parallel.
8. 

slope of $\overleftrightarrow{LM} = \frac{5-2}{2-(-2)} = \frac{3}{4}$
slope of $\overleftrightarrow{NP} = \frac{-2-2}{3-0} = \frac{-4}{3} = -\frac{4}{3}$
The product of the slopes is $\left(\frac{3}{4}\right)\left(-\frac{4}{3}\right) = -1$, so lines are perpendicular.
9. 

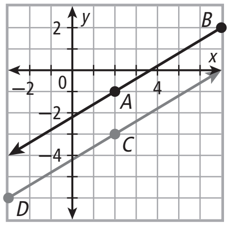
slope of $\overleftrightarrow{QR} = \frac{4-1}{-2-6} = \frac{3}{-8} = -\frac{3}{8}$
slope of $\overleftrightarrow{ST} = \frac{-1-3}{-3-5} = \frac{-4}{-8} = \frac{1}{2}$
The slopes are not the same, so the lines are not parallel. The product of the slopes is not –1, so lines are not perpendicular.

PRACTICE AND PROBLEM SOLVING, PAGE 186

10. Substitute (0, 7) for (x_1, y_1) and (0, 3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-7}{0-0} = \frac{-4}{0}$
The slope is undefined.
11. Substitute (5, –2) for (x_1, y_1) and (3, –2) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-(-2)}{3-5} = \frac{0}{-2} = 0$
12. Substitute (3, 4) for (x_1, y_1) and (4, 3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-4}{4-3} = \frac{-1}{1} = -1$
13. Substitute (0, 4) for (x_1, y_1) and (3, –3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-4}{3-0} = \frac{-7}{3} = -\frac{7}{3}$

14. Use the points (2.5, 100) and (5, 475) to graph the line and find the slope.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{475 - 100}{5 - 2.5} = \frac{375}{2.5} = 150$
The slope is 150, which means that the plane is flying at an average speed of 150 mi/h.

15.

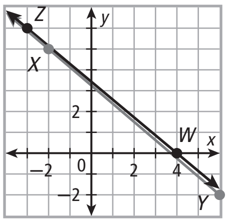


slope of $\overleftrightarrow{AB} = \frac{2 - (-1)}{7 - 2} = \frac{3}{5}$

slope of $\overleftrightarrow{CD} = \frac{-6 - (-3)}{-3 - 2} = \frac{-3}{-5} = \frac{3}{5}$

The slopes are the same, so the lines are parallel.

16.

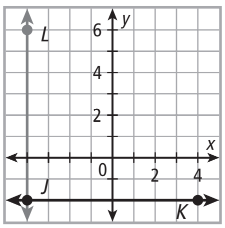


slope of $\overleftrightarrow{XY} = \frac{-2 - 5}{6 - (-2)} = \frac{-7}{8} = -\frac{7}{8}$

slope of $\overleftrightarrow{ZW} = \frac{0 - 6}{4 - (-3)} = \frac{-6}{7} = -\frac{6}{7}$

The slopes are not the same, so the lines are not parallel. The product of the slopes is not −1, so lines are not perpendicular.

17.



$\overleftrightarrow{JK}$ is horiz. and $\overleftrightarrow{JL}$ is vert, so the lines are perpendicular.

18. $m = \frac{1150}{2400} \approx 0.5$; the average change in the elevation of the river is about 0.5 m per km of length.

19. Substitute (7, 6) for (x_1, y_1) and (5, −3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 6}{-3 - 7} = \frac{-1}{-10} = \frac{1}{10}$

20. Substitute (−3, 5) for (x_1, y_1) and (4, −2) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 5}{4 - (-3)} = \frac{-7}{7} = -1$

21. Substitute (−2, −3) for (x_1, y_1) and (6, 1) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-3)}{6 - (-2)} = \frac{4}{8} = \frac{1}{2}$

22. Substitute (−3, 5) for (x_1, y_1) and (6, 1) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 5}{6 - (-3)} = \frac{-4}{9} = -\frac{4}{9}$

23. slope of $\overleftrightarrow{AB} > 0 \rightarrow m < 0$
$\left|\text{slope of } \overleftrightarrow{AB}\right| < 1 \rightarrow |m| > 1$
Therefore the inequal. is $m < -1$.

24. The lines have the same slope. They are either ∥ or they are the same line.

25a. speed $= \frac{330 - 132}{5 - 2} = \frac{198}{3} = 66$ ft/s

b. speed = 66 ft/s $\cdot \frac{15 \text{ mi/h}}{22 \text{ ft/s}} = 45$ mi/h

TEST PREP, PAGE 187

26. A
slope of $\overleftrightarrow{AB} = \frac{-2 - 3}{4 - 1} = \frac{-5}{3} = -\frac{5}{3}$
slope of $\overleftrightarrow{CD} = \frac{y - 1}{x - 6} = \frac{3}{5}$
Since $\frac{-2 - 1}{1 - 6} = \frac{3}{5}$, $x = 1$ and $y = -2$ are possible.

27. F
slope of $\overleftrightarrow{MN} = \frac{3 - 1}{1 - (-3)} = \frac{2}{4} = \frac{1}{2}$
slope of $\overleftrightarrow{PQ} = \frac{1 - 4}{2 - 8} = \frac{-3}{-6} = \frac{1}{2}$

28. C
slope of $C = \frac{200}{4.5} \approx 45$ mi/h

CHALLENGE AND EXTEND, PAGE 187

29. $\overleftrightarrow{JK}$ is a vert. line.

30. $\overleftrightarrow{JK}$ is a horiz. line.

31a. slope of $\overleftrightarrow{AB} = \frac{4 - (-2)}{6 - 0} = \frac{6}{6} = 1$
slope of $\overleftrightarrow{CD} = \frac{4 - 10}{-6 - 0} = \frac{-6}{-6} = 1$
slope of $\overleftrightarrow{BC} = \frac{10 - 4}{0 - 6} = \frac{6}{-6} = -1$
slope of $\overleftrightarrow{DA} = \frac{-2 - 4}{0 - (-6)} = \frac{-6}{6} = -1$
The opp. sides $\overline{AB}$ and $\overline{CD}$ both have slope 1, so they are ∥. The opp. sides $\overline{BC}$ and $\overline{DA}$ both have slope −1, so they are ∥.

b. The slopes of any two consecutive sides are opp. reciprocals, so the consecutive sides are ⊥.

c. By the Dist. Formula,

$AB = \sqrt{(6-0)^2 + (4-(-2))^2}$

$= \sqrt{6^2 + 6^2}$

$= 6\sqrt{2}$

$BC = \sqrt{(0-6)^2 + (10-4)^2}$

$= \sqrt{(-6)^2 + 6^2}$

$= 6\sqrt{2}$

$CD = \sqrt{(-6-0)^2 + (4-10)^2}$

$= \sqrt{(-6)^2 + (-6)^2}$

$= 6\sqrt{2}$

$DA = \sqrt{[(0-(-6)]^2 + (-2-4)^2}$

$= \sqrt{6^2 + (-6)^2}$

$= 6\sqrt{2}$

All 4 sides have the same length, so they are ≅.

32. slope of $\overleftrightarrow{ST} = \frac{-1-5}{1-(-3)} = \frac{-6}{4} = -\frac{3}{2}$

slope of $\overleftrightarrow{VW} = \frac{y-(-3)}{1-x} = -\frac{3}{2}$

$2(y+3) = -3(1-x)$

$2y + 6 = 3x - 3$

$2y = 3x - 9$

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

Possible answer: $x = 3$, $y = 0$

33. slope of $\overleftrightarrow{MN} = \frac{0-1}{-3-2} = \frac{-1}{-5} = \frac{1}{5}$

slope of $\overleftrightarrow{PQ} = \frac{y-4}{3-x} = -5$

$y - 4 = -5(3-x)$

$y - 4 = 5x - 15$

$y = 5x - 11$

Possible answer: $x = 1$, $y = -6$

SPIRAL REVIEW, PAGE 187

34. x-int.: −5; y-int.: −5

35. The y-int. is 1.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7-1}{2-0} = \frac{-8}{2} = -4$

$y = mx + b$

$y = -4x + 1$

Find the x-int.

$y = -4x + 1$

$0 = -4x + 1$

$4x = 1$

$x = 0.25$

The x-int. is 0.25.

36. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-(-3)}{3-1} = \frac{6}{2} = 3$

$y - y_1 = m(x - x_1)$

$y - 3 = 3(x - 3)$

$y - 3 = 3x - 9$

$y = 3x - 6$

The y-int is −6.

Find the x-int.

$y = 3x - 6$

$0 = 3x - 6$

$6 = 3x$

$2 = x$

The x-int. is 2.

37.

Statements	Reasons
1. ∠1 is supp. to ∠3	1. Given
2. ∠1 and ∠2 are supp.	2. Lin. Pair Thm.
3. ∠2 ≅ ∠3	3. ≅ Supps. Thm.

38. T; Alt. Ext. ∡ Thm. **39.** T; Corr. ∡ Post.

40. F; Same-Side Int. ∡ Thm.

TECHNOLOGY LAB: EXPLORE PARALLEL AND PERPENDICULAR LINES, PAGES 188–189

ACTIVITY 1, PAGE 188

1. $y = 3x - 4$ and $y = 3x + 1$ appear to be ∥. The slopes of the lines are the same.
2. Possible answer: $y = 2x + 1$; the slope of the new line is 2.
3. Possible answer: $y = -\frac{1}{2}x + 1$; the slope of the new line is $-\frac{1}{2}$.

TRY THIS, PAGE 188

1. Possible answer: $y = x$ and $y = x + 1$
2. Possible answer: Yes; the lines are still ∥ if the window settings changed; both lines appear steeper.
3. Changing the y-intercept of the lines does not change whether they are ∥.

ACTIVITY 2, PAGE 189

1. yes
2. Possible answer: $y = -\frac{1}{3}x + 1$; the slope of the new line is $-\frac{1}{3}$.
3. Possible answer: $y = -\frac{3}{2}x$; the slope of the new line is $-\frac{3}{2}$.

TRY THIS, PAGE 189

4. The students' equations should have slopes that are opp. reciprocals of each other. The product of the two slopes should be −1.

5. Possible answer: No; the lines still intersect, but the ∠ does not look like a rt. ∠.

6. Changing the *y*-intercept of the lines does not change whether they are ⊥.

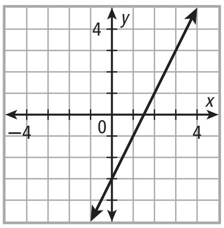
3-6 LINES IN THE COORDINATE PLANE, PAGES 190–197

CHECK IT OUT! PAGES 191–193

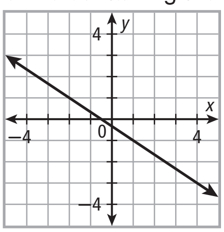
1a. $y = mx + b$
$6 = 0(4) + b$
$6 = b$
$y = 0x + 6$
$y = 6$

b. $m = \dfrac{2 - 2}{1 - (-3)} = 0$
$y - y_1 = m(x - x_1)$
$y - 2 = 0\big(x - (-3)\big)$
$y - 2 = 0$
$y = 2$

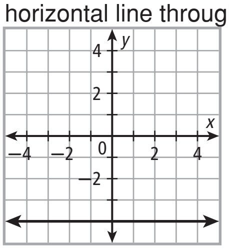
2a. The equation is given in slope-intercept form, with a slope of 2 and a *y*-intercept of −3. Plot the point (0, −3) and then rise 2 and run 1 to find another point. Draw the line containing the two points.



b. The equation is given in point-slope form, with a slope of $-\frac{2}{3}$ through the point (−2, 1). Plot the point (−2, 1) and then rise −2 and run 3 to find another point. Draw the line containing the two points.



c. The equation is given in the form for a horizontal line with a *y*-intercept of −4. The equation tells you that the *y*-coordinate of every point on the line is −4. Draw the horizontal line through (0, −4).



3. Solve both equations for *y* to find the slope-intercept form.

$3x + 5y = 2$
$5y = -3x + 2$
$y = -\frac{3}{5}x + \frac{2}{5}$

$3x + 6 = -5y$
$5y = -3x - 6$
$y = -\frac{3}{5}x - \frac{6}{5}$

Both lines have a slope of $-\frac{3}{5}$, and the *y*-intercepts are different. So the lines are parallel.

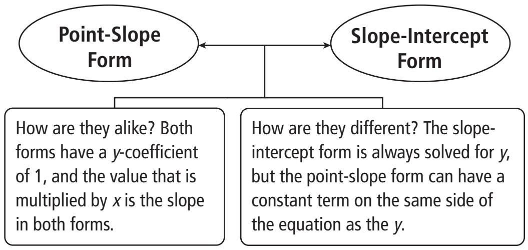
4. The equation for Plan B becomes $y = 35x + 60$. The lines would have the same slope, so they would be parallel.

THINK AND DISCUSS, PAGE 193

1. If the slopes are the same and the *y*-intercepts are different, then the lines are ∥.

2. If the slopes of the two ⊥ lines are multiplied, the product is −1. Each slope is the opp. reciprocal of the other slope. However, if the lines are horiz. and vert., one slope is 0 and the other is undefined.

3.



EXERCISES, PAGES 194–197

GUIDED PRACTICE, PAGE 194

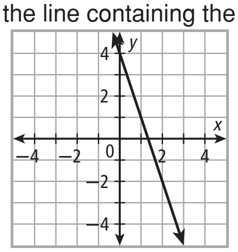
1. The slope-intercept form of an equation is solved for *y*. The *x*-term is the first, and constant term is the second.

2. $m = \dfrac{1 - 7}{-2 - 4} = \dfrac{-6}{-6} = 1$
$y = mx + b$
$7 = 1(4) + b$
$3 = b$
$y = x + 3$

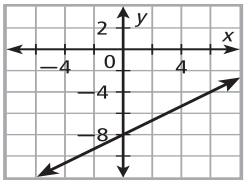
3. $y - y_1 = m(x - x_1)$
$y - 2 = \frac{3}{4}\big(x - (-4)\big)$
$y - 2 = \frac{3}{4}(x + 4)$

4. $m = \dfrac{-2 - 0}{0 - 4} = \dfrac{-2}{-4} = \dfrac{1}{2}$
$y = mx + b$
$y = \frac{1}{2}x - 2$

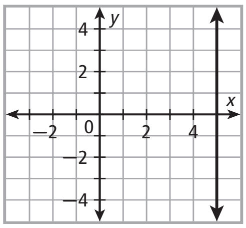
5. The equation is given in slope-intercept form, with a slope of −3 and a *y*-intercept of 4. Plot the point (0, 4) and then rise −3 and run 1 to find another point. Draw the line containing the two points.



6. The equation is given in point-slope form, with a slope of $\frac{2}{3}$ through the point (6, −4). Plot the point (6, −4) and then rise 2 and run 3 to find another point. Draw the line containing the two points.



7. The equation is given in the form for a vertical line with an *x*-intercept of 5. The equation tells you that the *x*-coordinate of every point on the line is 5. Draw the vertical line through (5, 0).



8. Both lines have a slope of −3, and the *y*-intercepts are different. So the lines are parallel.

9. Solve both equations for *y* to find the slope-intercept form.

$6x - 12y = -24$ $\qquad$ $3y = 2x + 18$

$6x + 24 = 12y$ $\qquad$ $y = \frac{2}{3}x + 6$

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

The lines have different slopes, so they intersect.

10. Solve the second equation for *y* to find the slope-intercept form.

$3y = x + 2$

$y = \frac{1}{3}x + \frac{2}{3}$

Both lines have a slope of $\frac{1}{3}$ and *y*-intercept of $\frac{2}{3}$, so they coincide.

11. Solve the first equation for *y* to find the slope-intercept form.

$4x + 2y = 10$

$2y = -4x + 10$

$y = -2x + 5$

Both lines have a slope of −2, and the *y*-intercepts are different. So the lines are parallel.

12. Write and slove the system of equations for the ticket costs.

Conroe: $y = x + 115$

Lakeville: $y = 10x + 50$

$0 = -9x + 65$

$9x = 65$

$x \approx 7$

For 55 + 10 + 7 = 72 mi/h, tickets would cost approximately the same.

PRACTICE AND PROBLEM SOLVING, PAGES 194–196

13. $m = \frac{6 - (-2)}{4 - 0} = \frac{8}{4} = 2$

$y - y_1 = m(x - x_1)$

$y - (-2) = 2(x - 0)$

$y + 2 = 2x$

14. $m = \frac{2 - 2}{-2 - 5} = 0$

$y = mx + b$

$2 = 0(5) + b$

$2 = b$

$y = 0x + 2$

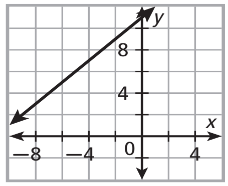
$y = 2$

15. $y - y_1 = m(x - x_1)$

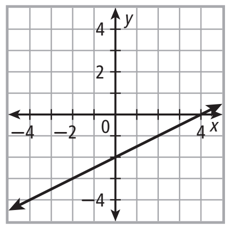
$y - (-4) = \frac{2}{3}(x - 6)$

$y + 4 = \frac{2}{3}(x - 6)$

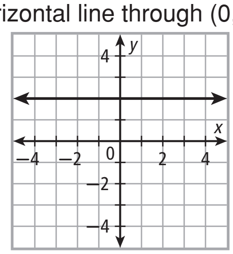
16. The equation is given in point-slope form, with a slope of 1 through the point (−4, 7). Plot the point (−4, 7) and then rise 1 and run 1 to find another point. Draw the line containing the two points.



17. The equation is given in slope-intercept form, with a slope of $\frac{1}{2}$ and a *y*-intercept of −2. Plot the point (0, −2) and then rise 1 and run 2 to find another point. Draw the line containing the two points.



18. The equation is given in the form for a horizontal line with a *y*-intercept of 2. The equation tells you that the *y*-coordinate of every point on the line is 2. Draw the horizontal line through (0, 2).



19. The lines have different slopes, so they intersect.

20. Solve the second equation for *y* to find the slope-intercept form.

$2y = 5x - 4$

$y = \frac{5}{2}x - 2$

Both lines have a slope of $\frac{5}{2}$, and the *y*-intercepts are different. So the lines are parallel.

21. Solve the first equation for y to find the slope-intercept form.

$$x + 2y = 6$$
$$2y = -x + 6$$
$$y = -\frac{1}{2}x + 3$$

Both line have a slope of $-\frac{1}{2}$ and a y-intercept of 3, so they coincide.

22. Solve both equations for y to find the slope-intercept form.

$$7x + 2y = 10 \qquad 3y = 4x - 5$$
$$2y = -7x + 10 \qquad y = \frac{4}{3}x - \frac{5}{3}$$
$$y = -\frac{7}{2}x + 5$$

The lines have different slopes, so they intersect.

23. Job 1: $y = \quad 0.2x + 375$

Job 2: $y = \quad 0.25x + 325$

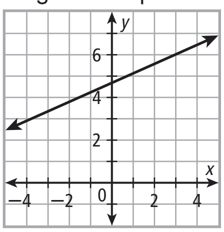
$$0 = -0.05x + 50$$
$$0.05x = 50$$
$$x = 1000$$

Chris must make \$1000 in sales per week.

24. $m = \frac{6 - 2}{3 - (-6)} = \frac{4}{9}$

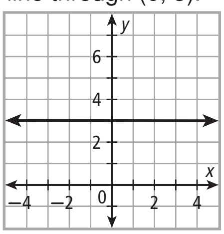
$$y - y_1 = m(x - x_1)$$
$$y - 6 = \frac{4}{9}(x - 3)$$
$$y - 6 = \frac{4}{9}x - \frac{4}{3}$$
$$y = \frac{4}{9}x + \frac{14}{3}$$

The equation in slope-intercept form has a slope of $\frac{4}{9}$ and a y-intercept of $\frac{14}{3}$. Plot the point $\left(0, \frac{14}{3}\right)$ and then rise 4 and run 9 to find another point. Draw the line containing the two points.



25. $y = 3$

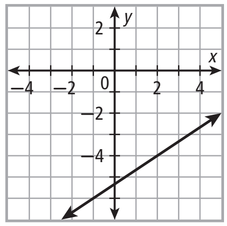
The equation in the form for a horizontal line has a y-intercept of 3. The equation tells you that the y-coordinate of every point on the line is 3. Draw the horizontal line through (0, 3).



26.

$$y - y_1 = m(x - x_1)$$
$$y - (-2) = \frac{2}{3}(x - 5)$$
$$y + 2 = \frac{2}{3}x - \frac{10}{3}$$
$$y = \frac{2}{3}x - \frac{16}{3}$$

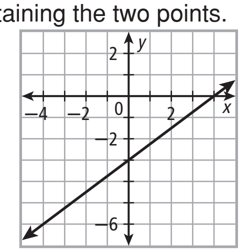
The equation in slope-intercept form has a slope of $\frac{2}{3}$ and a y-intercept of $-\frac{16}{3}$. Plot the point $\left(0, -\frac{16}{3}\right)$ and then rise 2 and run 3 to find another point. Draw the line containing the two points.



27. $m = \frac{-3 - 0}{0 - 4} = \frac{3}{4}$

$$y = mx + b$$
$$y = \frac{3}{4}x - 3$$

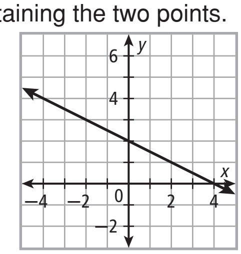
The equation in slope-intercept form has a slope of $\frac{3}{4}$ and a y-intercept of −3. Plot the point (0, −3) and then rise 3 and run 4 to find another point. Draw the line containing the two points.



28. $y - y_1 = m(x - x_1)$

$$y - 2 = -\frac{1}{2}(x - 0)$$
$$y - 2 = -\frac{1}{2}x$$

The equation in point-slope form has a slope of $-\frac{1}{2}$ through the point (0, 2). Plot the point (0, 2) and then rise −1 and run 2 to find another point. Draw the line containing the two points.

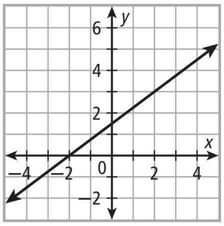


29. $y - y_1 = m(x - x_1)$

$$y - 0 = \frac{3}{4}(x - (-2))$$

$$y = \frac{3}{4}(x + 2)$$

The equation in point-slope form has a slope of $\frac{3}{4}$ through the point (–2, 0). Plot the point (–2, 0) and then rise 3 and run 4 to find another point. Draw the line containing the two points.

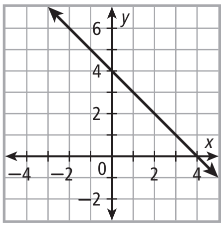


30. $y - y_1 = m(x - x_1)$

$$y - (-1) = -1(x - 5)$$

$$y + 1 = -(x - 5)$$

The equation in point-slope form has a slope of –1 through the point (5, –1). Plot the point (5, –1) and then rise –1 and run 1 to find another point. Draw the line containing the two points.

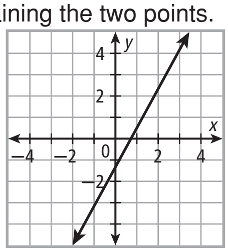


31. $m = \frac{-5 - 6}{-2 - 4} = \frac{11}{6}$

$$y - y_1 = m(x - x_1)$$

$$y - 6 = \frac{11}{6}(x - 4)$$

The equation in point-slope form has a slope of $\frac{11}{6}$ through the point (4, 6). Plot the point (4, 6) and then rise 11 and run 6 to find another point. Draw the line containing the two points.



32. B is incorrect. In B, the *x*- and *y*-values of the pt. used to find the point-slope form are interchanged.

33. The product of the slopes is $(3)(-3) = -9$; no

34. The product of the slopes is $(-1)(1) = -1$; yes

35. The product of the slopes is $\left(-\frac{2}{3}\right)\left(\frac{3}{2}\right) = -1$; yes

36. The product of the slopes is $(-2)\left(-\frac{1}{2}\right) = 1$; no

37. Step 1 Find the slope.

$m = 3$

Step 2 Find the equation of the || line through *P*.

$$y - y_1 = m(x - x_1)$$
$$y - 3 = 3(x - 2)$$
$$y - 3 = 3x - 6$$
$$y = 3x - 3$$

Step 3 Find the equation of the ⊥ line through *P*.

$$y - y_1 = m(x - x_1)$$
$$y - 3 = -\frac{1}{3}(x - 2)$$
$$y - 3 = -\frac{1}{3}x + \frac{2}{3}$$
$$y = -\frac{1}{3}x + \frac{11}{3}$$

38. Step 1 Find the slope.

$m = -2$

Step 2 Find the equation of the || line through *P*.

$$y - y_1 = m(x - x_1)$$
$$y - 4 = -2[(x - (-1)]$$
$$y - 4 = -2x - 2$$
$$y = -2x + 2$$

Step 3 Find the equation of the ⊥ line through *P*.

$$y - y_1 = m(x - x_1)$$
$$y - 4 = \frac{1}{2}[(x - (-1)]$$
$$y - 4 = \frac{1}{2}x + \frac{1}{2}$$
$$y = \frac{1}{2}x + \frac{9}{2}$$

39. Step 1 Find the slope.

$$4x + 3y = 8$$
$$3y = -4x + 8$$
$$y = -\frac{4}{3}x + \frac{8}{3}$$
$$m = -\frac{4}{3}$$

Step 2 Find the equation of the || line through *P*.

$$y - y_1 = m(x - x_1)$$
$$y - (-2) = -\frac{4}{3}(x - 4)$$
$$y + 2 = -\frac{4}{3}x + \frac{16}{3}$$
$$y = -\frac{4}{3}x + \frac{10}{3}$$

Step 3 Find the equation of the ⊥ line through *P*.

$$y - y_1 = m(x - x_1)$$
$$y - (-2) = \frac{3}{4}(x - 4)$$
$$y + 2 = \frac{3}{4}x - 3$$
$$y = \frac{3}{4}x - 5$$

40. Step 1 Find the slope.

$2x - 5y = 7$

$2x - 7 = 5y$

$y = \frac{2}{5}x - \frac{7}{5}$

$m = \frac{2}{5}$

Step 2 Find the equation of the ∥ line through *P*.

$y - y_1 = m(x - x_1)$

$y - 4 = \frac{2}{5}[(x - (-2)]$

$y - 4 = \frac{2}{5}x + \frac{4}{5}$

$y = \frac{2}{5}x + \frac{24}{5}$

Step 3 Find the equation of the ⊥ line through *P*.

$y - y_1 = m(x - x_1)$

$y - 4 = -\frac{5}{2}[(x - (-2)]$

$y - 4 = -\frac{5}{2}x - 5$

$y = -\frac{5}{2}x - 1$

41. slope of $\overline{AB} = \frac{-2 - 3}{0 - (-5)} = \frac{-5}{5} = -1$

slope of $\overline{BC} = \frac{3 - (-2)}{5 - 0} = \frac{5}{5} = 1$

$\overline{AB} \perp \overline{BC}$: yes; ∠*B* is a rt. ∠.

42. slope of $\overline{DE} = \frac{7 - 0}{2 - 1} = \frac{7}{1} = 7$

slope of $\overline{EF} = \frac{1 - 7}{5 - 2} = \frac{-6}{3} = -2$

slope of $\overline{DF} = \frac{1 - 0}{5 - 1} = \frac{1}{4}$

no

43. slope of $\overline{GH} = \frac{4 - 4}{-3 - 3} = 0$

slope of $\overline{HJ} = \frac{-2 - 4}{1 - (-3)} = \frac{-6}{4} = -\frac{3}{2}$

slope of $\overline{GJ} = \frac{-2 - 4}{1 - 3} = \frac{-6}{-2} = 3$

no

44. slope of $\overline{KL} = \frac{1 - 4}{2 - (-2)} = -\frac{3}{4}$

slope of $\overline{LM} = \frac{8 - 1}{1 - 2} = -7$

slope of $\overline{KM} = \frac{8 - 4}{1 - (-2)} = \frac{4}{3}$

$\overline{KL} \perp \overline{KM}$: yes; ∠*K* is a rt. ∠.

45. Write and solve the system of equations for prices.

$y = 1.5x + 8$

$y = 0.75x + 11$

$0 = 0.75x - 3$

$3 = 0.75x$

$4 = x$

$y = 1.50(4) + 8 = 14$

For 4 toppings, both pizzas will cost $14.

46. Possible answer: $x = 1.2$ and $y = 3.7$

47. slope $= \frac{9 - 5}{4 - 2} = 2$, mdpt. $= \left(\frac{2 + 4}{2}, \frac{5 + 9}{2}\right) = (3, 7)$

$y - y_1 = m(x - x_1)$

$y - 7 = -\frac{1}{2}(x - 3)$

$y - 7 = -\frac{1}{2}x + \frac{3}{2}$

$y = -\frac{1}{2}x + \frac{17}{2}$

48. The segment is a horizontal line with a midpoint of (2, 1). The perpendicular bisector is a vertical line, so its equation is $x = 2$.

49. slope $= \frac{4 - 3}{-1 - 1} = -\frac{1}{2}$, mdpt. $= \left(\frac{1 + (-1)}{2}, \frac{3 + 4}{2}\right) = \left(0, \frac{7}{2}\right)$

$y - y_1 = m(x - x_1)$

$y - \frac{7}{2} = 2(x - 0)$

$y - \frac{7}{2} = 2x$

$y = 2x + \frac{7}{2}$

50. The segment is a vertical line with a midpoint of (−3, −4). The perpendicular bisector is a horizontal line, so its equation is $y = -4$.

51a. $y - y_1 = m(x - x_1)$

$y - 5 = 2(x - 3)$

$y - 5 = 2x - 6$

$y = 2x - 1$

b. $y = 2x - 1$

$y = -\frac{1}{2}x + 4$

$0 = \frac{5}{2}x - 5$

$5 = \frac{5}{2}x$

$2 = x$

$y = 2x - 1$

$= 2(2) - 1$

$= 3$

ℓ and *m* intercept at (2, 3).

c. $D = \sqrt{(3 - 2)^2 + (5 - 3)^2}$

$= \sqrt{1^2 + 2^2}$

$= \sqrt{1 + 4}$

$= \sqrt{5}$ units

52a. Possible answer: $y = -x + 1$

b. Possible answer:

Intersection of *p* and *r*:

$y = x + 3$

$y = -x + 1$

$0 = 2x + 2$

$-2x = 2$

$x = -1$

$y = x + 3$

$= -1 + 3$

$= 2$

(−1, 2)

Intersection of *q* and *r*:

$y = x - 1$

$y = -x + 1$

$0 = 2x - 2$

$-2x = -2$

$x = 1$

$y = x - 1$

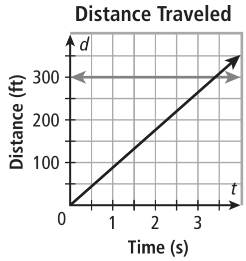
$= 1 - 1$

$= 0$

(1, 0)

c. $D = \sqrt{(-1 - 1)^2 + (2 - 0)^2}$
$= \sqrt{(-2)^2 + 2^2}$
$= \sqrt{4 + 4}$
$= \sqrt{8}$
$= 2\sqrt{2}$ units

53a–b.



b. the time when the car has traveled 300 ft

c. Possible answer: 3.5 s

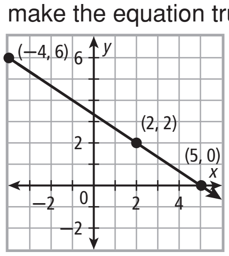
54. It is given that the eqn. of the line through (x_1, y_1) with slope m is $y - y_1 = m(x - x_1)$. Let $(0, b)$ be a pt. on the line. Then 0 is a possible value for x_1, and b is a possible value for y_1. Substitute these values into the eqn. $y - y_1 = m(x - x_1)$ to get $y - b = m(x - 0)$. Simplify to get $y - b = mx$. By the Add. Prop. of =, $y = mx + b$. Thus the equation of the line through $(0, b)$ with slope m is $y = mx + b$.

55. Check students' work.

56. The slope of the line is $m = \frac{2 - 6}{2 - (-4)} = -\frac{2}{3}$. The pt.-slope form of the line is $y - 6 = -\frac{2}{3}(x + 4)$. To see if the line crosses the x-axis at (5, 0), substitute 5 for x and 0 for y:

$0 - 6 = -\frac{2}{3}(5 + 4)$
$-6 = -\frac{2}{3}(9)$
$-6 = -6$ ✓

These values make the equation true, so (5, 0) is on the line.



57. The top line passes through (−4, 0) and (0, 3), so its slope is $m = \frac{3 - 0}{0 - (-4)} = \frac{3}{4}$. The bottom line passes through (0, −2) and (3, 0), so its slope is $m = \frac{0 - (-2)}{3 - 0} = \frac{2}{3}$. The lines do not have same slope, so they are not parallel.

TEST PREP, PAGES 196–197

58. D
Find the slope-intercept forms:

$-3x + y = 7$	$2x + y = -3$
$y = 3x + 7$	$y = -2x - 3$

59. J
Find the slope intercept-form of J:
$x + \frac{1}{2}y = 1$
$\frac{1}{2}y = -x + 1$
$y = -2x + 2$

60. D
slope is $-\frac{2}{3}$, y-intercept is 3

61. J
$2 = -\frac{1}{2}(-4)$ ✓ and $-3 = -\frac{1}{2}(6)$ ✓

CHALLENGE AND EXTEND, PAGE 197

62. The vertices of the hypotenuse are at intercepts (0, 5) and $\left(\frac{5}{2}, 0\right)$. By the Pyth. Thm.,
length of hyp. $= \sqrt{\left(\frac{5}{2}\right)^2 + 5^2}$
$= \sqrt{\frac{25}{4} + 25}$
$= \sqrt{\frac{125}{4}} = \frac{5\sqrt{5}}{2}$ units

63. Possible answer: let the leg lengths be 8 and 15, so the intercepts are (0, 8) and (15, 0). The slope is $-\frac{8}{15}$, so the equation is $y = -\frac{8}{15}x + 8$.

64. Possible answer: let the vertices be (0, 0), (0, 5), and (12, 0). The equations of the lines containing the legs are $x = 0$ and $y = 0$. The slope of the line containing the hyp. is $-\frac{5}{12}$, so the equation is $y = -\frac{5}{12}x + 5$.

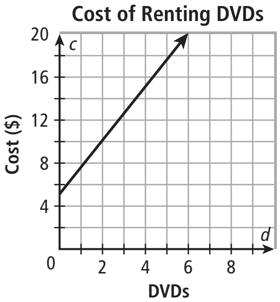
65. Possible answer: I found the equation of the line through the first 2 pts., which is $y = \frac{2}{7}x - \frac{24}{7}$. Then I substituted the x- and y-values for the third pt. to see if it lies on the line. The values did not make the equation true, so the pts. are not colinear.

66a. $d^2 = (x - 3)^2 + (y - 2)^2$
$= (x - 3)^2 + (x + 1 - 2)^2$
$= (x - 3)^2 + (x - 1)^2$
$= x^2 - 6x + 9 + x^2 - 2x + 1$
$= 2x^2 - 8x + 10$

b. Complete the square:
$d^2 = 2(x^2 - 4x + 4) + 2$
$= 2(x - 2)^2 + 2$
The shortest distance is $\sqrt{2}$ (when $x = 2$). The perpendicular line through P is $y - 2 = -(x - 3)$ or $y = -x + 5$. They intersect at $x + 1 = -x + 5$ or $x = 2$, $y = 2 + 1 = 3$. The distance between $P(3, 2)$ and $(2, 3)$ is $\sqrt{1^2 + 1^2} = \sqrt{2}$, so the distances are the same.

SPIRAL REVIEW, PAGE 197

67. $c = 2.5d + 5$



$20 = 2.5d + 5$
$15 = 2.5d$
$6 = d$
If his bill was $20.00, Sean rented 6 DVDs.

68. $\left(\frac{-3+2}{2}, \frac{1+3}{2}\right) = \left(-\frac{1}{2}, 2\right)$

69. $\left(\frac{2+0}{2}, \frac{3+(-3)}{2}\right) = (1, 0)$

70. $\left(\frac{-3+0}{2}, \frac{1+(-3)}{2}\right) = \left(-\frac{3}{2}, -1\right)$

71. Substitute (–3, 1) for (x_1, y_1) and (2, 3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 1}{2 - (-3)} = \frac{2}{5}$

72. Substitute (2, 3) for (x_1, y_1) and (0, –3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 3}{0 - 2} = \frac{-6}{-2} = 3$

73. Substitute (–3, 1) for (x_1, y_1) and (0, –3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 1}{0 - (-3)} = \frac{-4}{3} = -\frac{4}{3}$

CONNECTING GEOMETRY TO DATA ANALYSIS: SCATTER PLOTS AND LINES OF BEST FIT, PAGES 198–199

TRY THIS, PAGE 199

1. Possible answer: $y = -\frac{4}{3}x + \frac{34}{3}$

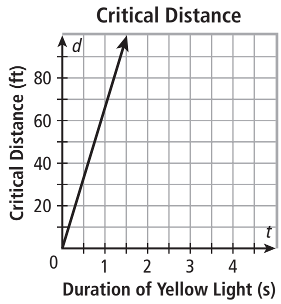
2. Possible answer: $y = 90 - x$

3. Check students' work.

MULTI-STEP TEST PREP, PAGE 200

1. speed limit = slope
$= \frac{264 - 88}{6 - 2}$
$= 44$ ft/s
$44 \text{ ft/s} \cdot \frac{15 \text{ mi/h}}{22 \text{ ft/s}} = 30 \text{ mi/h}$

2. $d = \frac{22}{15}(45)t$
$d = 66t$



Yes, the lines intersect at (0, 0). The line for Porter Street is steeper because the slope of the line is greater.

READY TO GO ON? PAGE 201

1. Substitute (–2, 5) for (x_1, y_1) and (6, –3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 5}{6 - (-2)} = \frac{-8}{8} = -1$

2. Substitute (6, –3) for (x_1, y_1) and (–3, –2) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - (-3)}{-3 - (6)} = \frac{1}{-9} = -\frac{1}{9}$

3. Substitute (–2, 5) for (x_1, y_1) and (4, 1) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 5}{4 - (-2)} = \frac{-4}{6} = -\frac{2}{3}$

4. Substitute (4, 1) for (x_1, y_1) and (–3, –2) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 1}{-3 - 4} = \frac{-3}{-7} = \frac{3}{7}$

5. Substitute (0, 7) for (x_1, y_1) and (2, 3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 3}{0 - 2} = \frac{4}{-2} = -2$

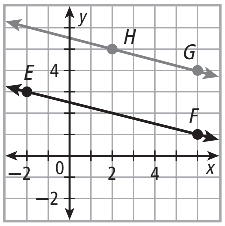
6. Substitute (–1, 4) for (x_1, y_1) and (5, –1) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 4}{5 - (-1)} = \frac{-5}{6} = -\frac{5}{6}$

7. Substitute (4, 0) for (x_1, y_1) and (1, –3) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 0}{1 - 4} = \frac{-3}{-3} = 1$

8. Substitute (4, 2) for (x_1, y_1) and (–3, 2) for (x_2, y_2) in the slope formula and then simplify.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 2}{-3 - 4} = \frac{0}{-7} = 0$

9. Use the points (4, 0) and (4.75, 2.5) to graph the line and find the slope.
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2.5 - 0}{4.75 - 4} = \frac{2.5}{0.75} \approx 3.3$
The slope is about 3.3, which means Sonia's average speed was about 3.3 mi/h.

10.

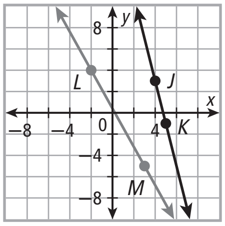


slope of $\overleftrightarrow{EF} = \dfrac{1-3}{6-(-2)} = \dfrac{-2}{8} = -\dfrac{1}{4}$

slope of $\overleftrightarrow{GH} = \dfrac{5-4}{2-6} = -\dfrac{1}{4}$

The lines have the same slope, so they are parallel.

11.

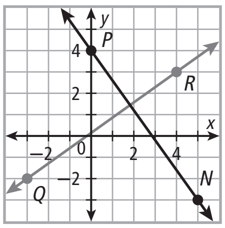


slope of $\overleftrightarrow{JK} = \dfrac{-1-3}{5-4} = \dfrac{-4}{1} = -4$

slope of $\overleftrightarrow{LM} = \dfrac{-5-4}{3-(-2)} = \dfrac{-9}{5} = -\dfrac{9}{5}$

The slopes are not the same, so the lines are not parallel. The product of the slopes is not −1, so the lines are not perpendicular.

12.

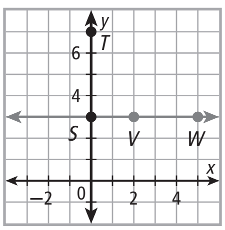


slope of $\overleftrightarrow{NP} = \dfrac{4-(-3)}{0-5} = \dfrac{7}{-5} = -\dfrac{7}{5}$

slope of $\overleftrightarrow{QR} = \dfrac{3-(-2)}{4-(-3)} = \dfrac{5}{7}$

The product of the slopes is $\left(-\dfrac{5}{7}\right)\left(\dfrac{5}{7}\right) = -1$, so the lines are perpendicular.

13.



$\overleftrightarrow{ST}$ is vert. and $\overleftrightarrow{VW}$ is horiz, so the lines are perpendicular.

14. $m = \dfrac{4-8}{-3-3} = \dfrac{4}{-6} = \dfrac{2}{3}$

$y - y_1 = m(x - x_1)$

$y - 8 = \dfrac{2}{3}(x-3)$

$y - 8 = \dfrac{2}{3}x - 2$

$y = \dfrac{2}{3}x + 6$

15. $y - y_1 = m(x - x_1)$

$y - 4 = \dfrac{2}{3}(x - (-5))$

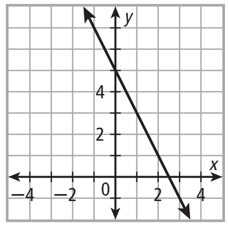
$y - 4 = \dfrac{2}{3}(x + 5)$

16. $m = \dfrac{1-2}{4-0} = \dfrac{-1}{4} = -\dfrac{1}{4}$

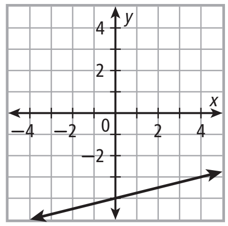
$y = mx + b$

$y = -\dfrac{1}{4}x + 2$

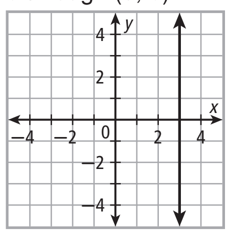
17. The equation is given in slope-intercept form, with a slope of −2 and a *y*-intercept of 5. Plot the point (0, 5) and then rise −3 and run 5 to find another point. Draw the line containing the two points.



18. The equation is given in point-slope form, with a slope of $\dfrac{1}{4}$ through the point (4, −3). Plot the point (4, −3) and then rise 1 and run 4 to find another point. Draw the line containing the two points.



19. The equation is given in the form for a vertical line with an *x*-intercept of 3. The equation tells you that the *x*-coordinate of every point on the line is 3. Draw the vertical line through (3, 0).



20. horiz. line: $y = 3$

21. slope $= \dfrac{\text{rise}}{\text{run}} = \dfrac{2}{1} = 2$

y-intercept = 3

$y = 2x + 3$

22. vert. line: $x = -1$

23. Both lines have a slope of −2, and the *y*-intercepts are different. So the lines are parallel.

24. Solve the first equation for *y* to find the slope-intercept form.

$3x + 2y = 8$

$2y = -3x + 8$

$y = -\dfrac{3}{2}x + 4$

Both lines have a slope of $-\dfrac{3}{2}$ and a *y*-intercept of 4, so they coincide.

25. Solve the second equation for y to find the slope-intercept form.

$3x + 4y = 7$

$4y = -3x + 7$

$y = -\frac{3}{4}x + \frac{7}{4}$

The lines have different slopes, so they intersect.

STUDY GUIDE: REVIEW, PAGES 202–205

1. alternate interior angles

2. skew lines

3. transversal

4. point-slope form

5. rise; run

LESSON 3-1, PAGES 202–203

6. Possible answer: $\overline{DE}$ and $\overline{BC}$ are skew.

7. Possible answer: $\overline{AB} \parallel \overline{DE}$

8. Possible answer: $\overline{AD} \perp \overline{DE}$

9. Possible answer: plane ABC ∥ plane DEF

10. ℓ; alt. int. ∠s

11. n; corr. ∠s

12. ℓ; same-side int. ∠s

13. m; alt. ext. ∠s

LESSON 3-2, PAGE 203

14. $x + 90 = 180$

$x = 90$

$m\angle WYZ = x° = 90°$

15. $26x + 22 = 38x - 14$

$22 = 12x - 14$

$36 = 12x$

$3 = x$

$m\angle KLM = 38x - 14$

$= 38(3) - 14$

$= 100°$

16. $33x + 35 = 26x + 49$

$7x + 35 = 49$

$7x = 14$

$x = 2$

$m\angle DEF + (26x + 49) = 180$

$m\angle DEF + 26(2) + 49 = 180$

$m\angle DEF + 101 = 180$

$m\angle DEF = 79°$

17. $17x + 8 = 13x + 24$

$4x + 8 = 24$

$4x = 16$

$x = 4$

$m\angle QRS = 13x + 24$

$= 13(4) + 24$

$= 76°$

LESSON 3-3, PAGE 204

18. $\angle 4 \cong \angle 6$, so $c \parallel d$ by the Conv. of the Alt. Int. ∠s Thm.

19. $m\angle 1 = (23x + 38)° = 23(3) + 38 = 107°$

$m\angle 5 = (17x + 56)° = 17(3) + 56 = 107°$

$\angle 1 \cong \angle 5$, so $c \parallel d$ by the Conv. of the Corr. ∠s Post.

20. $m\angle 6 = (12x + 6)° = 12(5) + 6 = 66°$

$m\angle 3 = (21x + 9)° = 21(5) + 9 = 114°$

$m\angle 6 + m\angle 3 = 66° + 114° = 180°$

$\angle 6$ and $\angle 3$ are supp., so $c \parallel d$ by the Conv. of the Same-Side Int. ∠s Thm.

21. $m\angle 1 = 99°$

$m\angle 7 = (13x + 8)° = 13(7) + 8 = 99°$

$\angle 1 \cong \angle 7$, so $c \parallel d$ by the Conv. of the Alt. Ext. ∠s Thm.

LESSON 3-4, PAGE 204

22. $\overline{KM}$

23. $KM < KL$

$x - 5 < 8$

$x < 13$

24.

Statements	Reasons
1. $\overline{AD} \parallel \overline{BC}$, $\overline{AD} \perp \overline{AB}$, $\overline{DC} \perp \overline{BC}$	1. Given
2. $\overline{AB} \perp \overline{BC}$	2. ⊥ Transv. Thm.
3. $\overline{AB} \parallel \overline{CD}$	3. 2 lines ⊥ to the same line → the two lines are ∥

LESSON 3-5, PAGE 205

25. Substitute (−3, 2) for (x_1, y_1) and (4, 1) for (x_2, y_2) in the slope formula and then simplify.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 2}{4 - (-3)} = \frac{-1}{7} = -\frac{1}{7}$

26. Substitute (1, 4) for (x_1, y_1) and (−2, −1) for (x_2, y_2) in the slope formula and then simplify.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 4}{-2 - 1} = \frac{-5}{-3} = \frac{5}{3}$

27. slope of $\overleftrightarrow{EF} = \frac{4 - 2}{-3 - 8} = \frac{2}{-11} = -\frac{2}{11}$

slope of $\overleftrightarrow{GH} = \frac{3 - 1}{-4 - 6} = \frac{2}{-10} = -\frac{1}{5}$

The slopes are not the same, so the lines are not parallel. The product of the slopes is not −1, so the lines are not perpendicular.

28. slope of $\overleftrightarrow{JK} = \frac{-2 - 3}{-4 - 4} = \frac{-5}{-8} = \frac{5}{8}$

slope of $\overleftrightarrow{LM} = \frac{1 - 6}{-3 - 5} = \frac{-5}{-8} = \frac{5}{8}$

The lines have the same slope, so they are parallel.

29. slope of $\overleftrightarrow{ST} = \frac{3 - 5}{2 - (-4)} = \frac{-2}{6} = -\frac{1}{3}$

slope of $\overleftrightarrow{UV} = \frac{4 - 1}{4 - 3} = 3$

The product of the slopes is $\left(-\frac{1}{3}\right)(3) = -1$, so the lines are perpendicular.

LESSON 3-6, PAGE 205

30. $m = \frac{5-1}{-3-6} = -\frac{4}{9}$

$y - y_1 = m(x - x_1)$

$y - 1 = -\frac{4}{9}(x - 6)$

$y - 1 = -\frac{4}{9}x + \frac{8}{3}$

$y = -\frac{4}{9}x + \frac{11}{3}$

31. $y - y_1 = m(x - x_1)$

$y - (-4) = \frac{2}{3}\big(x - (-3)\big)$

$y + 4 = \frac{2}{3}(x + 3)$

$y + 4 = \frac{2}{3}x + 2$

$y = \frac{2}{3}x - 2$

32. $m = \frac{-2-0}{0-1} = \frac{-2}{-1} = 2$

$y - y_1 = m(x - x_1)$

$y - 0 = 2(x - 1)$

33. Solve both equations for y to find the slope-intercept form.

$-3x + 2y = 5$
$2y = 3x + 5$
$y = \frac{3}{2}x + \frac{5}{2}$

$6x - 4y = 8$
$6x - 8 = 4y$
$y = \frac{3}{2}x - 2$

Both lines have a slope of $\frac{3}{2}$, and the y-intercepts are different. So the lines are parallel.

34. Solve the second equation for y to find the slope-intercept form.

$5x + 2y = 1$
$2y = -5x + 1$
$y = -\frac{5}{2}x + \frac{1}{2}$

The lines have different slopes, so they intersect.

35. Solve the second equation for y to find the slope-intercept form.

$2x - y = -1$
$2x + 1 = y$
$y = 2x + 1$

Both lines have a slope of 2 and y-intercept of 1, so they coincide.

CHAPTER TEST, PAGE 206

1. Possible answer: plane *ABC* ∥ plane *DEF*

2. Possible answer: $\overline{AC} \parallel \overline{DF}$

3. Possible answer: $\overline{AB}$ and $\overline{CF}$ are skew.

4. $3x + 21 = 4x + 9$
$21 = x + 9$
$12 = x$
$3(12) + 21 = 57$
$4(12) + 9 = 57$
Both labeled $\angle$s measure 57°.

5. $26x - 7 = 20x + 17$
$6x - 7 = 17$
$6x = 24$
$x = 4$
$26(4) - 7 = 97$
$20(4) + 17 = 97$
Both labeled $\angle$s measure 97°.

6. $42x - 9 = 35x + 12$
$7x - 9 = 12$
$7x = 21$
$x = 3$
$42(3) - 9 = 117$
$35(3) + 12 = 117$
Both labeled $\angle$s measure 117°.

7. $m\angle 4 = (16x + 20)° = 16(3) + 20 = 68°$
$m\angle 5 = (12x + 32)° = 12(3) + 32 = 68°$
$\angle 4 \cong \angle 5$, so $f \parallel g$ by the Conv. of the Alt. Int. $\angle$s Thm.

8. $m\angle 3 = (18x + 6)° = 18(4) + 6 = 78°$
$m\angle 5 = (21x + 18)° = 21(4) + 18 = 102°$
$m\angle 3 + m\angle 5 = 78° + 102° = 180°$
$\angle 3$ and $\angle 5$ are supp., so $f \parallel g$ by the Conv. of the Same-Side Int. $\angle$s Thm.

9.

Statements	Reasons
1. $\angle 1 \cong \angle 2$, $n \perp \ell$	1. Given
2. $\ell \parallel m$	2. Conv. of the Corr. $\angle$s Post.
3. $n \perp m$	3. $\perp$ Transv. Thm.

10. Substitute (−3, −4) for (x_1, y_1) and (−1, 3) for (x_2, y_2) in the slope formula and then simplify.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-4)}{-1 - (-3)} = \frac{7}{2}$

11. Substitute (−1, −3) for (x_1, y_1) and (2, −1) for (x_2, y_2) in the slope formula and then simplify.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - (-1)}{2 - (-3)} = \frac{0}{5} = 0$

12. Substitute (0, −3) for (x_1, y_1) and (5, 1) for (x_2, y_2) in the slope formula and then simplify.

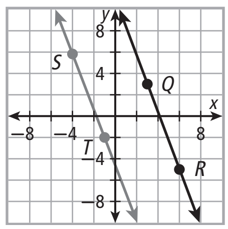
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-3)}{5 - 0} = \frac{4}{5}$

13. Use the points (9.5, 0) and (14, 32) to graph the line and find the slope.

$m = \frac{32 - 0}{14 - 9.5} = \frac{32}{4.5} \approx 7.1$

The slope is about 7.1, which means Greg's average speed was about 7.1 mi/h.

14.



slope of $\overleftrightarrow{QR} = \frac{-5 - 3}{6 - 3} = \frac{-8}{3} = -\frac{8}{3}$

slope of $\overleftrightarrow{ST} = \frac{-2 - 6}{-1 - (-4)} = \frac{-8}{3} = -\frac{8}{3}$

The lines have the same slope, so they are parallel.

15. $y - y_1 = m(x - x_1)$

$y - (-5) = -\frac{3}{4}\big(x - (-2)\big)$

$y + 5 = -\frac{3}{4}(x + 2)$

16. Solve both equations for y to find the slope-intercept form.

$6x + y = 3$
$y = -6x + 3$

$2x + 3y = 1$
$3y = -2x + 1$
$y = -\frac{2}{3}x + \frac{1}{3}$

The lines have different slopes, so they intersect.

COLLEGE ENTRANCE EXAM PRACTICE, PAGE 207

1. A

Slope of line A $= \frac{4}{5} =$ slope of given line;

$-4(2) + 5(-3) = -8 - 15 = -23$

2. K

I is false; II is true by the Vert. ∠s Thm.; III is true by the Alt. Ext. ∠s Thm.

3. B

slope of the first line $= \frac{5 - (-7)}{-8 - 1} = \frac{12}{-9} = -\frac{4}{3}$

slope of the second line $= \frac{b - 6}{-1 - 3} = \frac{-3}{-4} = \frac{3}{4}$

$$4(b - 6) = 3(-4)$$
$$4b - 24 = -12$$
$$4b = 12$$
$$b = 3$$

4. H

By the Conv. of the Corr. ∠s Post., $\angle 2 \cong \angle 5 \rightarrow m \parallel n$.

$$m\angle 2 = m\angle 5$$
$$x + 18 = 2x - 28$$
$$18 = x - 28$$
$$46 = x$$

5. B

slope of $\overline{EF} = \frac{-2 - (-2)}{7 - 1} = 0$

The equation of the line through E and F is $y = -2$. The line through G must be vert., so its equation is $x = 4$. The point of intersection is at (4, −2); the distance between this point and G(4, 2) is 4.