1. Identify the ordered pair that satisfies both equations.

a) $x + y = 3$, $2x - y = 0$ — (0, 3), (1, 2), (2, 1)

b) $2x + y = -5$, $x + 5y = 2$ — (−4, 3), (−8, 11), (−3, 1)

c) $y = 2x - 1$, $y = -x + 5$ — (2, 3), (1, 1), (−1, 6)

d) $x + y = -2$, $3x + 2y = 2$ — (3, −4), (6, −8), (−7, 5)

e) $y = \frac{1}{2}x - 4$, $y = 2x - 1$ — (4, −2), (2, −3), (−2, −5)

f) $y = 2x + 15$, $y = -2x - 1$ — (−4, 7), (7, −4), (−7, 1)

2. Copy and complete each ordered pair so that it meets the stated condition.

a) $x + y = 1$, $3x - y = 3$ — (4, ■) satisfies the first equation but not the second.

b) $2x - y = -1$, $x + 2y = 12$ — (■, 3) satisfies the second equation but not the first.

c) $y = 3x + 3$, $y = 2x + 2$ — (■, 0) satisfies both equations.

d) $y = 4x - 3$, $y = -2x + 5$ — (■, ■) satisfies neither equation.

3 Problem Solving

1. Newspaper ads The costs of placing a classified ad in two newspapers are as follows.

Daily Gleaner: fixed cost \$25, plus \$10/day

Daily Standard: fixed cost \$10, plus \$15/day

The costs can be modelled by the following system of equations.

Daily Gleaner: $C = 10n + 25$

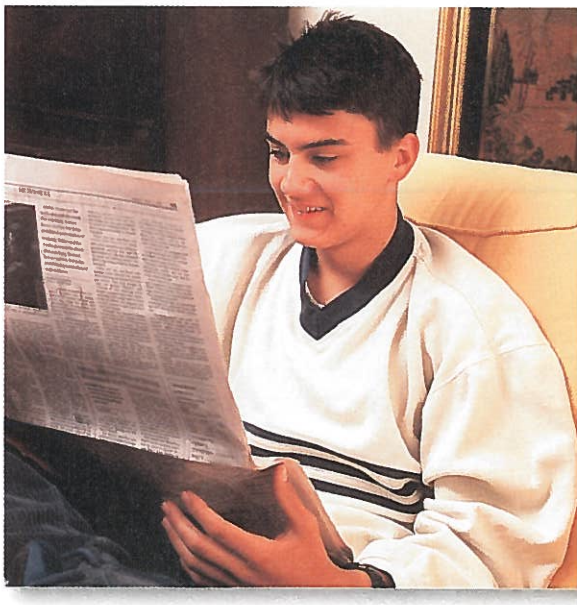
Daily Standard: $C = 15n + 10$

where C is the total cost and n is the number of days for which the ad is run.

a) Find the missing element in the ordered pair (3, ■) that satisfies both equations and is in the form (n, C).

b) What number of days gives equal costs for running the ad in each newspaper?

c) What is the total cost of running the ad for this number of days in either newspaper?



2. Communication **a)** An infinite number of ordered pairs, including (0, 1), (1, 0), and (2, −1), satisfy both equations. Explain why.

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

b) Find two more ordered pairs that satisfy both equations.

3. Communication No ordered pair satisfies both equations. Explain why.

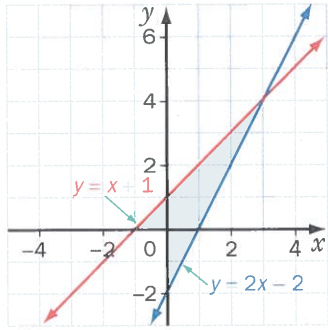
$$y = 2x + 1$$
$$y = 2x + 3$$

Key Concepts

1. To solve a system of linear equations graphically,
   a) graph the equations using a graphing calculator, graphing software, or paper and pencil
   b) determine the coordinates of the point of intersection
   c) check the solution by substituting it in each of the original equations
2. The number of solutions to a linear system is
   a) exactly one, if the lines intersect
   b) none, if the lines are parallel and distinct
   c) infinitely many, if the lines coincide

Communicate Your Understanding

1. The linear system $y = x + 1$ and $y = 2x - 2$ is modelled graphically at the right. State the solution to this system. Justify your answer.



2. Describe how you would solve the linear system $2x + 3y = 3$ and $3x - y = 7$ graphically.

3. Explain why a system of linear equations cannot have exactly two solutions.

4. Decide how many solutions there are to the following linear system just by looking at the equations. Explain your reasoning.

$$y = 7x - 4$$
$$y = 7x + 5$$

Practice

A

1. Solve each system by graphing. Check your solutions.

a) $y = x - 1$, $y = 9 - x$ **b)** $y = x + 3$, $y = 1 - x$ **c)** $y = 2x + 1$, $y = x - 2$ **d)** $y = 1 - 2x$, $y = x - 5$

2. Solve each system by graphing. Check your solutions.

a) $x - y = -5$, $x + y = 1$ **b)** $5x - 2y = 10$, $x + 2y = 2$ **c)** $3x - 2y = 12$, $x - 2y = 8$ **d)** $2x + 3y = -12$, $2x - y = -4$

3. Solve each system by graphing. Check your solutions.

a) $x - y = 4$, $x + y = 2$ **b)** $x + y = 5$, $x - y = -7$ **c)** $x + 2y = 2$, $x + y = 3$ **d)** $x + 3y = -1$, $2x + 6y + 2 = 0$

e) $2x + y = 12$, $3x - 2y = 18$ **f)** $2x + y = -2$, $4x = y - 16$ **g)** $y = 2x - 3$, $2x - y = 5$ **h)** $2x + y = -5$, $3x - y = -5$

i) $2x - y = 5$, $y = x - 3$ **j)** $3x + y = -11$, $y = 2x + 4$ **k)** $3x + 4y - 16 = 0$, $x - 2y - 2 = 0$ **l)** $3x = y + 8$, $6x - 2y - 1 = 0$

m) $2x + 3y = 7$
$2x - 3y = 13$

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

o) $2x - 3y = 4$
$3x - 4y = 5$

p) $3x + 2y - 10 = 0$
$2x - 3y + 2 = 5$

4. Solve by graphing. Check each solution.

a) $y = 4x$
$y = 2x + 1$

b) $2x - 2y - 1 = 0$
$x - 4y + 4 = 0$

c) $x + 2y = 0$
$x - 2y = -2$

d) $x + y = -1$
$3x - y = 7$

5. Solve by graphing.

a) $3x + 2y = 3$
$2x + 10y = -5$

b) $x + 2y = 10$
$x - y = 5$

c) $2x + 3y - 7 = 0$
$3x - 5y - 13 = 0$

d) $y = -0.5x - 1$
$y = 0.25x + 1$

e) $y = 3$
$y = 2.58x - 3$

f) $y = 0.35x + 6.02$
$y = -3.22x - 3.12$

6. Without graphing, determine whether each system has one solution, no solution, or infinitely many solutions.

a) $2x + y = 5$
$4x + y = 9$

b) $3x - y = 0$
$6x - 2y = 3$

c) $x + y = 2$
$3x = 6 - 3y$

d) $x + 4y = 8$
$y + 2x = 0$

e) $2y = 3x - 1$
$8y - 4 = 12x$

f) $2y - x - 4 = 0$
$3x - 6y - 12 = 0$

Applications and Problem Solving

7. Geography The total number of states in Austria and Germany is 25. Germany has 7 more states than Austria. Solve the following system of equations graphically to find the number of states in each country.

$$a + g = 25$$
$$g = a + 7$$

B

8. Health clubs Phoenix Health Club charges a $200 initiation fee, plus $15 a month. Champion Health Club charges a $100 initiation fee, plus $20 a month. The costs can be compared using the following equations.

Phoenix Cost: $C = 200 + 15m$
Champion Cost: $C = 100 + 20m$

a) Find the point of intersection of the two lines.
b) After how many months are the costs the same?
c) If you joined a club for only a year, which club would be less expensive?

9. Coordinate geometry The arms of an angle lie on the lines $y = \frac{2}{3}x + 7$ and $3x + 2y = -12$. What are the coordinates of the vertex of the angle?

10. Coordinate geometry The three lines $y = 2x$, $y = 6 - x$, and $y = -2$ intersect to form a triangle. What are the coordinates of the vertices of the triangle?

11. Coordinate geometry The three lines $y = \frac{1}{3}x - 2$, $x - y = 4$, and $x + 3y = 4$ intersect to form a triangle. Find the coordinates of the vertices.

Answers

Chapter 1

Getting Started p. 2

1. 10; The check digit will be 0. **2. a)** 9 **b)** 9 **c)** 2 **d)** 8 **3. a)** No, the check digit should be 6. **b)** Yes, the check digit is correct. **c)** Yes, the check digit is correct. **4.** Answers may vary. 123 456 717; 223 456 740 **5. a)** $10 - m$ **b)** 0 **c)** The check digit is equal to $10 - m$ if $m \neq 0$ and 0 if $m = 0$.

Review of Prerequisite Skills p. 3

1. a) $x + 2$ **b)** $2x + 8$ **c)** $3y - 5$ **d)** $-5a + 3$ **e)** $6x + 14$ **f)** $5z - 8$ **g)** $7t + 41$ **h)** $2x - 9$ **2. a)** $6x$ **b)** $-2c$ **c)** x **d)** $3n$ **e)** $x + 2y$ **f)** $3p - r$ **3. a)** 8 **b)** 2 **c)** -6 **d)** -5 **4. a)** 7 **b)** -3 **c)** 2 **d)** 12 **e)** $-\frac{1}{2}$ **f)** $\frac{3}{2}$ **g)** 4 **h)** -5 **i)** $-\frac{5}{2}$ **j)** -4 **k)** -1 **l)** 2 **5. a)** $x = 11 - 3y$ **b)** $x = 5y - 8$ **c)** $x = 2y - 4$ **d)** $x = \frac{5 - 3y}{2}$ **6. a)** $y = 3 - 2x$ **b)** $y = x - 2$ **c)** $y = \frac{-1 - 2x}{4}$ **d)** $y = \frac{3x - 4}{2}$ **10. a)** (3, 1) **b)** (5, −2) **c)** (−1, 6) **d)** (4, 8) **e)** (−4, −5) **f)** (2, −1) **11. a)** $9x - 4y + 1$ **b)** $13m^2 - 6m - 19$ **c)** $-a - 3b - 10$ **d)** $-e - 2$ **12. a)** $x - 8y + 10$ **b)** $-t^2 - 5t - 11$ **c)** $-9a + 3b + 1$ **d)** $12e - 1$

Section 1.1 pp. 4–5

1 Ordered Pairs and One Equation **1. a)** (1, 13), (24, −10) **b)** (−2, −4), (−12, 0) **c)** (2, 3) **d)** (0.5, −2.5) **2. a)** 3, 9, 10, −2 **b)** 2, −9, 11, −2 **c)** −1, 5, 13, 10 **d)** 5, 3, −4, −7

2 Ordered Pairs and Two Equations **1. a)** (1, 2) **b)** (−3, 1) **c)** (2, 3) **d)** (6, −8) **e)** (−2, −5) **f)** (−4, 7) **2. a)** (4, −3) **b)** (6, 3) **c)** (−1, 0) **d)** Answers may vary. (0, 0)

3 Problem Solving **1. a)** 55 **b)** 3 days **c)** $55 **2. a)** The equations represent the same graph. **b)** Answers may vary. (−1, 2), (−2, 3) **3.** The equations represent parallel and distinct lines. The lines never intersect.

Section 1.2 pp. 12–14

Practice **1. a)** (5, 4) **b)** (−1, 2) **c)** (−3, −5) **d)** (2, −3) **2. a)** (−2, 3) **b)** (2, 0) **c)** (2, −3) **d)** (−3, −2) **3. a)** (3, −1) **b)** (−1, 6) **c)** (4, −1) **d)** infinitely many solutions **e)** (6, 0) **f)** (−3, 4) **g)** no solution **h)** (−2, −1) **i)** (2, −1) **j)** (−3, −2) **k)** (4, 1) **l)** no solution **m)** (5, −1) **n)** infinitely many solutions **o)** (−1, −2) **p)** (2, 2) **4. a)** (0.5, 2) **b)** (2, 1.5) **c)** (−1, 0.5) **d)** (1.5, −2.5) **5. a)** (1.5, −0.8) **b)** (6.7, 1.7) **c)** (3.9, −0.3) **d)** (−2.7, 0.3) **e)** (2.3, 3) **f)** (−2.6, 5.1) **6. a)** one solution **b)** no solution **c)** infinitely many solutions **d)** one solution **e)** no solution **f)** no solution **7.** Austria: 9, Germany: 16 **8. a)** (20, 500) **b)** 20 months **c)** Champion **9.** (−6, 3) **10.** (2, 4), (−1, −2), (8, −2) **11.** $(3, -1), (5, -\frac{1}{3}), (4, 0)$ **12.** parallelogram **13.** Answers may vary. **a)** $x + y = 5$ **b)** $2x + 2y = 8$ **c)** $x + 2y = 4$ **14.** Answers may vary. **a)** $x + y = 5$, $x - y = 1$ **b)** $x - y = 1$, $2x - 2y = 2$ **15.** The system has infinitely many solutions: all points on the line $x - 2y + 6 = 0$. **17. a)** (−12.5, 9); (48, 24); (−16, −18)

Modelling Math p. 14

a) $(t, d) = (50, 1000)$ **b)** 50 **c)** less than 50 **d)** greater than 50

Career Connection p. 15

1. south: 5000, north: 125 000

Section 1.3 pp. 21–23

Practice **1. a)** $x = 8 - 3y$ **b)** $x = -4y - 13$ **c)** $x = 7y + 7$ **d)** $x = 2y - 1$ **2. a)** $y = 11 - 6x$ **b)** $y = -5x - 9$ **c)** $y = x + 2$ **d)** $y = 3x + 4$ **3. a)** (2, 2) **b)** (−1, 1) **c)** (2, −1) **d)** (−2, −3) **e)** (3, 0) **f)** (3, 2) **g)** (4, −5) **h)** (5, 0) **i)** (−2, 3) **j)** (−2, −2) **k)** (−1, 1) **l)** (−3, −4) **m)** (1, 0) **n)** (1, 3) **o)** no solution **p)** (3, −1) **q)** infinitely many solutions **r)** (−1, −5) **s)** no solution **t)** (1, 1) **u)** (−1, 1) **4. a)** $(\frac{1}{2}, -1)$ **b)** $(\frac{7}{11}, -\frac{1}{11})$ **c)** $(3, -\frac{6}{5})$ **d)** $(1, -\frac{1}{3})$ **e)** $(-1, \frac{2}{7})$