

Practice

A

1. Solve each equation for x .

a) $x + 3y = 8$

c) $7y - x = -7$

b) $4y + x + 13 = 0$

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

2. Solve each equation for y .

a) $6x + y = 11$

c) $x - y = -2$

b) $5x + y + 9 = 0$

d) $3x - y + 4 = 0$

3. Solve each system of equations by substitution. If there is exactly one solution, check the solution.

a) $2x + y = 6$
 $3x + 2y = 10$

d) $3x + y = -9$
 $5x - 3y = -1$

g) $2x - y = 13$
 $x + 2y = -6$

j) $2c - d + 2 = 0$
 $3c + 2d + 10 = 0$

m) $2r - s = 2$
 $3r - 2s = 3$

p) $y = 5 - 2x$
 $3x = 2y + 11$

s) $6x = 3y + 2$
 $y - 2x + 4 = 0$

b) $x + 3y = 2$
 $2x + 5y = 3$

e) $2x + 3y = 6$
 $x + y = 3$

h) $3a + 4b = 15$
 $a + b = 5$

k) $a + 4b = 3$
 $5b = -2a + 3$

n) $5 = 2y - x$
 $7 = 3y - 2x$

q) $x + y - 4 = 0$
 $2x = 8 - 2y$

t) $p = 3q - 2$
 $9q - 3p - 6 = 0$

c) $x - 2y = 4$
 $2x - 3y = 7$

f) $x - y = 1$
 $3x + y = 11$

i) $2x + 3y = 5$
 $x - 4y = -14$

l) $x - 2y = 5$
 $2x - 3y = 6$

o) $x - 4y = 8$
 $2x - 8y = 8$

r) $m + n + 6 = 0$
 $2m - n - 3 = 0$

u) $3f = g - 4$
 $2g = f + 3$

4. Find the exact solution to each linear system.

a) $4x - y = 3$
 $6x - 2y = 5$

d) $x + 3y = 0$
 $3x - 6y = 5$

g) $3a - 2b = -12$
 $a - 4b = 8$

b) $3e - f - 2 = 0$
 $5e + 2f = 3$

e) $x + 7y = 1$
 $3x - 14y = -7$

h) $2m - n = -2$
 $6m + 7n = -1$

c) $2x - 5y = 12$
 $x + 10y = -9$

f) $y = \frac{1}{2}x + 3$
 $y = 5 - x$

i) $4x + y = 0$
 $x + 2y + 1 = 0$

Applications and Problem Solving

5. Communication Solve each system of equations by graphing and by substitution. Which method do you prefer? Why?

a) $x + y = 6$ **b)** $2x + y = -4$ **c)** $2x + y = 5$ **d)** $6y + 3x = -4$
 $x - y = 42$ $4x + 3y = -6$ $2y = 2x + 1$ $x - 2y = -2$

B

6. Highest points The highest point in British Columbia is on Fairweather Mountain, f metres above sea level. The highest point in Ontario is on Ishpatina Ridge, i metres above sea level. The relationship between the heights can be modelled by the following system of equations.

$$\begin{aligned}f - i &= 3970 \\f &= 7i - 188\end{aligned}$$

- a) Communication** Interpret each equation in words.
b) Solve the system of equations to find the height of Fairweather Mountain and the height of Ishpatina Ridge.

7. Measurement $\angle x$ and $\angle y$ are two acute angles in a right triangle. The measures of the angles are related by the following system of equations.

$$\begin{aligned}x + y &= 90 \\y - 6 &= 3x\end{aligned}$$

- a) Communication** Interpret each equation in words.
b) Solve the system of equations to find the measure of each acute angle.

8. Theatre tickets The receipts from 550 people attending a play were \$9184. The tickets cost \$20 for adults and \$12 for students. The relationship between the number of adult tickets sold, a , and the number of student tickets sold, s , can be modelled by the following system of equations.

$$\begin{aligned}a + s &= 550 \\20a + 12s &= 9184\end{aligned}$$

- a) Communication** Interpret each equation in words.
b) Solve the system of equations to find the numbers of adult tickets and student tickets sold.

9. Coordinate geometry The three lines $x - y + 1 = 0$, $2x + y - 4 = 0$, and $x + y + 5 = 0$ intersect to form a triangle. Find the coordinates of the vertices of the triangle.

C

10. Simplify each system, and then solve it by substitution. Check each solution.

a) $2(x - 4) + y = 6$ **b)** $2(x - 1) - 3(y - 3) = 0$
 $3x - 2(y - 3) = 13$ $3(x + 2) - (y - 7) = 20$
c) $2(3x - 1) - (y + 4) = -7$ **d)** $2(x - 1) - 4(2y + 1) = -1$
 $4(1 - 2x) - 3(3 - y) = -12$ $x + 3(3y + 2) = 2$

11. Coordinate geometry The line $Ax + By = 8$ passes through the points $(2, 1)$ and $(4, -2)$. Find the values of A and B .

12. Three variables Use substitution to solve each system of equations. Write each solution as an ordered triple, (x, y, z) .

a) $x + y + z = 3$
 $y = 4x$
 $z = -2x$

b) $2x - 3y + z = 10$
 $x + 2z = 8$
 $y + 4z = 11$

13. What value of m gives a system with no solution?

$$\begin{aligned}x(m - 1) - y + 6 &= 0 \\ 2x + y - 3 &= 0\end{aligned}$$

14. What value of n gives a system with an infinite number of solutions?

$$\begin{aligned}2x - 4y - 4 &= 0 \\ y + 1 &= nx\end{aligned}$$

Modelling Math

Comparing Costs and Revenues

ABC Plumbing charges \$70 for a service call, plus \$50/h for the time worked. Quality Plumbers charges \$50 for a service call, plus \$55/h. The costs of the two plumbing companies can be compared using the following equations.

ABC Plumbing: $C = 70 + 50h$

Quality Plumbers: $C = 50 + 55h$

a) Solve the system of equations.

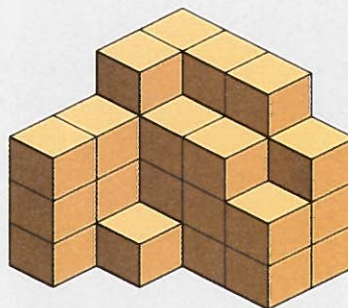
b) Communication Describe the situations in which each company costs a customer less. Explain your reasoning.

c) Communication Describe a situation in which the revenue for Quality Plumbers is \$30 more than the revenue for ABC Plumbing. Explain your reasoning.

LOGIC POWER

Assume that no cubes are missing from the back or the base of the stack.

1. How many cubes are in the stack?
2. If the outside of the stack were painted green, how many cubes would have
a) 4 green faces? **b)** 1 green face?



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) $(-1, \frac{2}{7})$

f) $(\frac{4}{3}, \frac{11}{3})$ g) $(-\frac{32}{5}, -\frac{18}{5})$ h) $(-\frac{3}{4}, \frac{1}{2})$ i) $(\frac{1}{7}, -\frac{4}{5})$

Applications and Problem Solving 5. a) (24, -18)

b) (-3, 2) c) $(\frac{3}{2}, 2)$ d) $(-\frac{5}{3}, \frac{1}{6})$ 6. a) Fairweather

Mountain is 3970 m higher than Ishpatina Ridge. Fairweather Mountain is 188 m less than seven time higher than Ishpatina Ridge.

b) Fairweather Mountain: 4663 m, Ishpatina Ridge:

693 m 7. a) The angles are complementary. Six degrees less than $\angle y$ is three times $\angle x$. b) $\angle x = 21^\circ$, $\angle y = 69^\circ$ 8. a) The total number of tickets sold is 550. The total revenue from tickets is \$9184.

b) adult tickets: 323, student tickets: 227 9. (1, 2), (9, -14), (-3, -2) 10. a) (5, 4) b) (4, 5) c) (-1, -5)

d) $(\frac{1}{2}, -\frac{1}{2})$ 11. A = 3, B = 2 12. a) (1, 4, -2)

b) (2, -1, 3) 13. $m = -1$ 14. $n = \frac{1}{2}$

Modelling Math pp. 23

a) $(h, C) = (4, 270)$ b) Quality is cheaper for less than 4 h. ABC is cheaper for more than 4 h.

c) 10 h of work

Section 1.4 pp. 24-25

1 Equivalent Forms 1. Answers may vary. (0, 6), (1, 5), (2, 4) 2. a) $2x + 2y = 12$ b) yes

3. a) $-3x - 3y = -18$ b) yes 4. Yes, they all have the same solution. 5. Answers may vary. a) $2x + 2y = 4$, $-x - y = -2$, $-2x - 2y = -4$ b) $2x - 2y = 8$, $-x + y = -4$, $-2x + 2y = -8$ c) $-2x - y = -7$, $-4x - 2y = -14$, $4x + 2y = 14$ d) $2y = 8x - 6$, $3y = 12x - 9$, $4y = 16x - 12$

2 Equivalent Systems 1. (5, 2) 2. (5, 2)

3. a) $2x - 2y = 6$, $-x - y = -7$ b) (5, 2) 4. They all have the same solution. 5. Answers may vary. $x + y = 3$, $x - y = 1$

3 Adding Equations 1. (2, 1) 2. a) $2x + y$ b) 5

c) $2x + y = 5$ 3. They all pass through (2, 1).

4. They are equivalent systems. They have the same solution. 5. They are equivalent systems. They have the same solution.

Section 1.5 pp. 30-33

Practice 1. a) (5, 2) b) (3, 5) c) (1, 7) d) (1, 2)

2. a) (2, 6) b) (-1, -3) c) (-4, 1) d) (3, -2) e) (-2, 1)

f) (5, 3) 3. a) (1, 1) b) (2, -1) c) (-6, -3) d) (-2, 0)

4. a) -4, 17 b) -20, 7 5. a) (1, -2) b) (-2, -2)

c) (3, 1) d) no solution e) (1, 0) f) infinitely many solutions g) (4, 2) h) (-3, 2) i) (-2, -3) 6. a) (9, -4)

b) (-3, 8) c) (2, -1) d) $(\frac{1}{3}, 1)$ e) $(-2, \frac{1}{2})$ f) $(\frac{5}{9}, \frac{1}{9})$

g) infinitely many solutions h) $(\frac{4}{5}, \frac{3}{5})$ i) no solution

7. a) (-1, -3) b) (-0.2, 0.1) c) (4, 3) d) (3, 4)

e) (-0.5, 0.3) f) (-0.4, -1.1) 8. a) (6, 10) b) (3, 4)

c) (6, -4) d) (3, -3) e) (-6, -8) f) (1, -1)

Applications and Problem Solving 9. Answers may vary. a) substitution b) elimination

c) substitution d) elimination e) elimination

f) elimination 10. a) There are 10 provinces. Three times the number of names with First Nations

origins is equal to twice the number of names with other origins. b) 4 11. ham: \$5, roast beef: \$6

12. a) (-1, -3) b) (1, 6) c) (-2, 3) d) (2, 1)

13. a) $x = a$, $y = -b$ b) $x = 3a$, $y = -b$ 14. (3, 2),

(-2, 4), (0, -2) 15. $a = -2$, $b = 3$ 16. (4, 6) 17. a) 10

b) 6 18. a) -2 b) 3 19. (2, 5) 20. Answers may

vary. $2x + 3y = -3$, $x - 2y = 16$ 21. Answers may

vary. a) $2x + 3y = 19$, $-2x + 3y = 11$ b) $3x + 2y = 2$,

$4x + 5y = 19$ c) $2x + 3y = 0$, $-3x - 6y = 1$

Technology Extension pp. 34-35

1 Solving Systems Using a Graphing Calculator

Program 1. b) Each of the following systems has $AE - BD = 0$. In the system $ax + by = c$,

$kax + kby = kc$, one equation is a multiple of the other. Thus, there are infinitely many solutions.

$CE - BF = ckb - bkc = 0$. In the system $ax + by = c$,

$ax + by = d$, the lines are parallel and distinct when $c \neq d$. There is no solution, and

$CE - BF = cb - bd = b(c - d) \neq 0$, since $c \neq d$.

2. a) (-1, -2) b) (7, 10) c) infinitely many solutions

d) no solution

2 Solving Systems Using Preprogrammed

Calculators 1. a) (2, 4) b) (2, -3) c) $(\frac{1}{2}, -1)$

2. a) infinitely many solutions b) no solution

Section 1.6 pp. 36-37

1 Expressions in Two Variables 1. a) $x + y$

b) $x - y$ c) $5y - x$ d) $6x + 2y$ 2. a) $x - y$ b) $x + y$

3. a) $x + 7y$ b) $x + 15y$ 4. a) $x + y$ b) $10x$ c) $5y$

d) $10x + 5y$ 5. a) $x + y$ b) $0.07x$ c) $0.06y$

d) $0.07x + 0.06y$

2 Equations in Two Variables 1. a) $x + y = 8$

b) $x - y = 5$ c) $y = 3x + 1$ d) $y = 2x - 1$

2. a) $l + w = 40$ b) $2b + 3t = 61$

3 Systems of Equations 1. a) $x + y = 7$, $x - y = 3$

b) $y = 2x$, $y = x - 4$ 2. a) $x + y = 256$ b) $5x + 2y = 767$

3. a) $p + r = 295$, $p = r + 11$ b) $l = w + 6$, $l + w = 46$