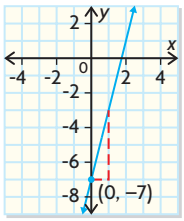
Answers

Chapter 1

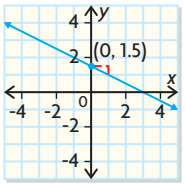
Getting Started, page 4

1. **a)** i **b)** iii, v, iv **c)** ii **d)** vii **e)** vi

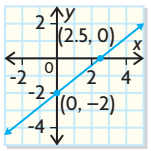
2. **a)** $y = 4x - 7$



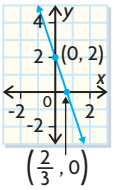
b) $y = -0.5x + 1.5$



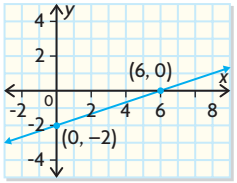
3. **a)** $4x - 5y = 10$



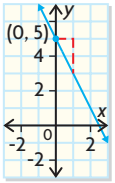
b) $y = 2 - 3x$



4. **a)** $x - 3y = 6$



b) $y = 5 - 2x$



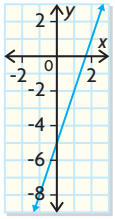
5. **a)** $2x + 22$ **b)** $12x + 20$ **c)** $-10x + 4$ **d)** $5x + 1$ **e)** $6x - 21$ **f)** $15x - 8$

6.

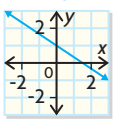
	$Ax + By + C = 0$ Form	$y = mx + b$ Form
a)	$3x + 4y - 6 = 0$	$y = -\frac{3}{4}x + \frac{3}{2}$
b)	$2x - y - 5 = 0$	$y = 2x - 5$
c)	$4x - 7y - 3 = 0$	$y = \frac{4}{7}x - \frac{3}{7}$
d)	$4x + 6y + 5 = 0$	$y = -\frac{2}{3}x - \frac{5}{6}$

7. **a)** slope: 3; y-intercept: -5 **b)** slope: $-\frac{2}{3}$; y-intercept: 1

$y = 3x - 5$

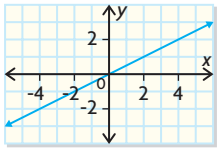


$y = -\frac{2}{3}x + 1$



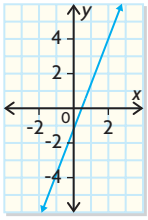
c) slope: 0.5; y-intercept: 0

$y = 0.5x$



d) slope: 2.6; y-intercept: -1.2

$y = 2.6x - 1.2$



8. The relation in part c) is a direct relation because it is a straight line that passes through the origin; the value of b in $y = mx + b$ is 0. The relations in parts a), b), and d) are partial variations because they are straight lines that do not pass through the origin; the value of b in $y = mx + b$ is not 0.

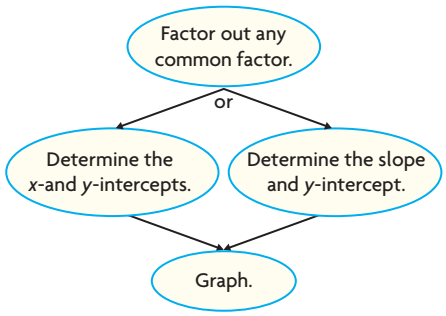
9. **a)** 4.5 km **b)** 18 km/h

10. **a)** linear; it is degree 1
b) linear; the first differences are constant
c) nonlinear; it is degree 2
d) nonlinear; the first differences are not constant

11. **a)** $x = 7$ **b)** $x = -4$ **c)** $x = 9$ **d)** $x = 7$ **e)** $x = 10$ **f)** $x = -2$

12. **a)** -4.8 **b)** about 2.01

13. **a)** Answers may vary, e.g.,



b) Answers may vary, e.g., I would determine the x- and y-intercepts because I think it's easier.

Lesson 1.1, page 12

1. **a)** on the graph because if $x = 10$, $y = 0$
b) not on the graph because if $x = -3$, $y = 6.5$ not 7
c) on the graph because if $x = 6$, $y = 2$
d) on the graph because if $x = 0$, $y = 5$
e) on the graph because if $x = 12$, $y = -1$

2. **a)**

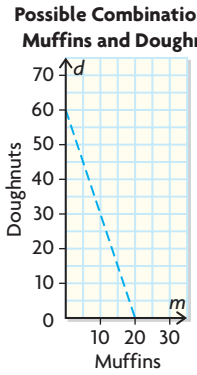
Muffins		Doughnuts		
Number	Cost ($)	Number	Cost ($)	Total Cost ($)
0	0.00	60	15.00	15.00
4	3.00	48	12.00	15.00
8	6.00	36	9.00	15.00
12	9.00	24	6.00	15.00
16	12.00	12	3.00	15.00
20	15.00	0	0.00	15.00

b) 20

c) 60

d) Answers may vary, e.g., $0.75x + 0.25y = 15$; x represents number of muffins bought, and y represents number of doughnuts bought.

e)



3. Answers may vary, e.g., I think the table of values is more useful because it clearly lists some of Jacob's options.

4. Answers may vary, e.g.,

a) (0, −1), (1, 4); (2, 5)

b) (8, 0), (0, −6); (10, 2)

c) (0, 10), (2, −40); (2, −50)

d) (2, 10), (6, 0); (0, 0)

5. **a)** Let x represent the number of hours at the day job per week, and let y represent the number of hours at the night job per week; $x + y = 40$

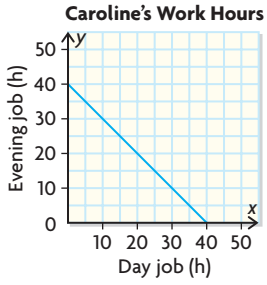
b) Let x represent the number of hours at the day job per week, and let y represent the number of hours at the night job per week; $15x + 11y = 540$

c) Let x represent sales per week, and let y represent earnings per week; $y = 500 + 0.06x$

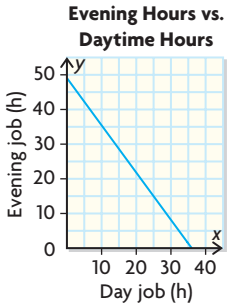
d) Let x represent sales per week, and let y represent earnings per week; $y = 800 + 0.04x$

e) Let x represent the number of nickels, and let y represent the number of dimes; $0.05x + 0.10y = 5.25$

6. **a)**



b)

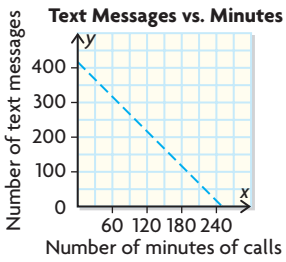


7. No. Using the equations from question 5, Justin will earn $1580 per week at the first job and $1520 per week at the second job.

8. **a)**

Telephone Calls		Text Messages		
Minutes	Cost ($)	Number	Cost ($)	Total Cost ($)
250	25.00	0	0.00	25.00
190	19.00	100	6.00	25.00
130	13.00	200	12.00	25.00
70	7.00	300	18.00	25.00
10	1.00	400	24.00	25.00
0	0.00	416	24.96	24.96

b)



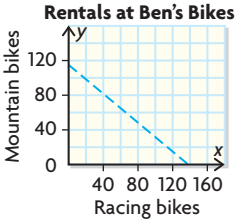
9. **a)** Let x represent sales, and let y represent earnings; $y = 1200 + 0.035x$

b) Yes. Substituting $x = 96\,174$ into the equation in part a) gives $y = 4566.09$

10. **a)** 138

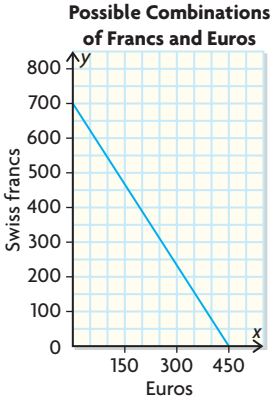
b) 115

c) Let x represent the number of racing bikes rented, and let y represent the number of mountain bikes rented; $25x + 30y = 3450$



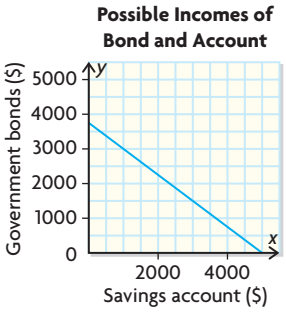
11. Answers may vary, e.g. let x represent euros, and let y represent Swiss francs. Possible combinations are solutions to the equation $1.40x + 0.90y = 630$; these can be shown in a graph or in a table of values.

Euros (x)	Swiss Francs (y)
0	700
90	560
180	420
270	280
360	140
450	0



12. **a)** Let x represent the amount invested in the savings account, and let y represent the amount invested in government bonds; $0.03x + 0.04y = 150$

b)



13. Let x represent the registration fee, and let y represent the monthly fee; $x + 5y = 775$

14. **a)** Answers may vary, e.g.,

Characteristics:
- degree 1
- constant first differences
- straight line graph

Methods of Representation:
- equation
- table of values
- graph

Linear Relation

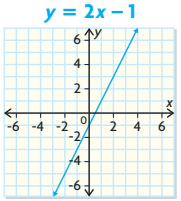
Examples:

$y = 3x + 14$

For $y = 2x$,

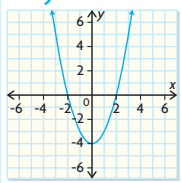
x	1	2	3	4	5
y	2	4	6	8	10

$y = 2x - 1$



Non-examples:

$y = x^2 - 4$



$y = 3x^2 + 3x + 8$

For $y = x^2$,

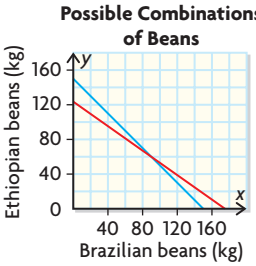
x	1	2	3	4	5
y	1	4	9	16	25

b) Answers may vary, e.g.,

Method	Advantages	Disadvantages	Situations to Use
equation	• can be used to determine any values of x or y	• requires arithmetic to determine answer	• when an exact number (such as one with several decimal places) is needed
table of values	• shows possible combinations at a glance	• does not list all values • may not show a pattern clearly	• when several possible combinations are needed quickly
graph	• shows information visually	• may not be accurate or clear enough to determine exact values	• when showing intercepts of two different relations

15. **a)** Answers may vary, e.g., you have $4.65 in dimes and quarters.
b) Answers may vary, e.g., you are paid a base salary of $900 and a 2.5% commission on sales.

16. Let x represent the amount of Brazilian beans, and let y represent the amount of Ethiopian beans; $x + y = 150$, $12x + 17y = 14 \times 150$

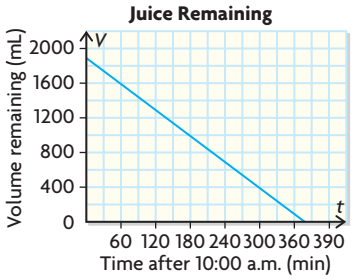


Lesson 1.2, page 18

1. Answers may vary, e.g.,
a) about $125
b) about 200 km; about 350 km; about 150 km

2. **a)** Let C represent the cost, and let d represent the distance;
$C = 50 + \frac{3}{20}d$
b) **i)** $125
ii) 200 km; about 333.33 km; about 166.67 km
c) Using an equation gave more accurate answers.

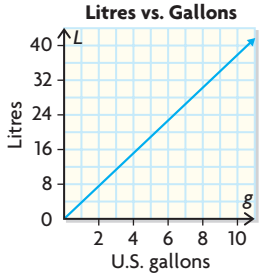
3. **a)** Let t represent the time in minutes after 10:00 a.m., and let V represent the volume, in millilitres, remaining in the container; $V = 1890 - 5t$



b) 12:58 p.m.

4. **a)** A banquet for 160 people will cost $5700 at this hall.
b) about $7000
c) Answers may vary, e.g., let C represent the cost, and let n represent the number of people; $C = 32.5n + 500$
d) 80, 120, and 138
e) Answers may vary, e.g., the data are discrete because the x-value must be an integer.

5. **a)**



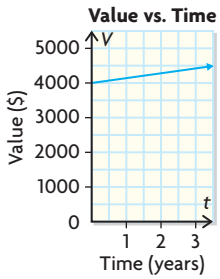
b) Answers may vary, e.g., about 23 L
c) Answers may vary, e.g., about 3.5 gallons

6. 4:59 p.m.

7. **a)** $15 500
b) Let E represent earnings, and let s represent sales; $E = 280 + 0.04s$, $900 = 280 + 0.04(15\,500)$

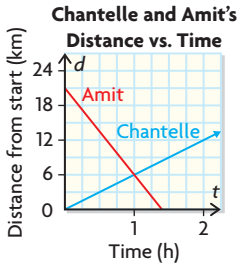
8. **a)** 346 square feet **b)** 7.5 square feet

9. **a)** Let V represent the value, and let t represent the time in years; $V = 4000 + (4000)(0.035)(t)$
b) Answers may vary, e.g., about $4280
c) 2.75 years or 2 years 9 months



10. about 208 km

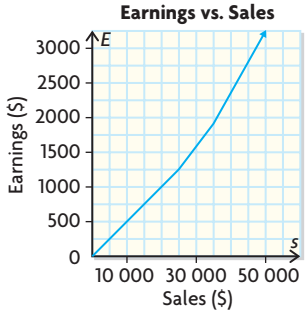
11. **a)** Write equations, make a table of values, or draw a graph.
b) If Cam has more than $12 000 in sales per week, he should stay at his first job as he will earn more money there. Otherwise, he should take the new job.

12. 

They will meet at 10:00 a.m.

13. Graphically, I would look along the horizontal line representing $y = 5$ until it intersected the line representing $2x - 3y = 6$. Algebraically, I would substitute $y = 5$ into the equation and solve for x.

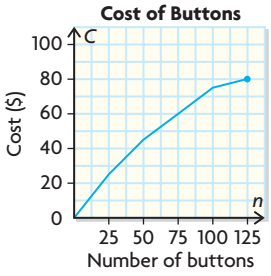
14. once

15. 

about $38 333

16. **a)**

Number of Buttons	Cost ($)
0	0
25	25
50	45
75	60
100	75
125	80



b) Answers may vary, e.g., 100 buttons cost $75, and 101 buttons cost $75.20. I would tell them to buy several extra now, while the buttons are only $0.20 each. Then, if they needed more later, they would not have to buy them at $1.00 each. This pricing structure encourages people to buy more buttons since the more they buy, the cheaper the price is per button.

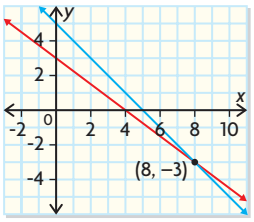
c) Let C represent the cost in dollars, and let n represent the number of buttons.
For n from 1 to 25, $C = n$.
For n from 26 to 50, $C = 25 + 0.8(n - 25)$.
For n from 51 to 100, $C = 45 + 0.6(n - 50)$.
For n from 101 or more, $C = 75 + 0.2(n - 100)$.

Lesson 1.3, page 26

1. **a)** yes **b)** no **c)** yes **d)** no

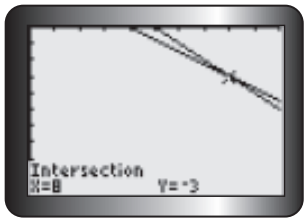
2. **a)** **i)** $(-4, -2)$ **ii)** $-4 = 2(-2)$; $3(-4) + (-2) = -14$
b) **i)** $(6, 5)$ **ii)** $6 - 5 = 1$; $6 + 3(5) = 21$
c) **i)** $(5, -4)$ **ii)** $2(5) - 5(-4) = 30$; $5 + (-4) = 1$

3. **a)** $x + y = 5$, $3x + 4y = 12$



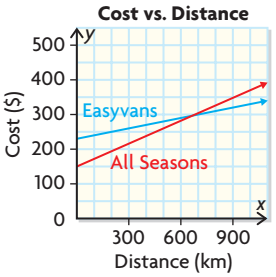
b) $(8, -3)$

c)



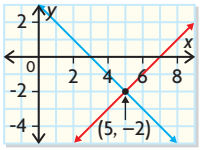
4. **a)** Let x represent the distance driven, and let y represent the total cost in dollars; for Easyvans: $y = 230 + 0.10x$; for All Seasons: $y = 150 + 0.22x$

b)

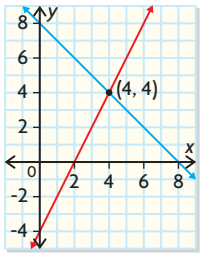


c) I would recommend Easyvans if Alex was planning to drive more than 667 km, because it would be cheaper. Otherwise, I would recommend All Seasons because it would be cheaper.

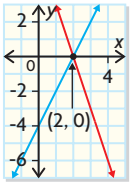
5. **a)** $x - y = 7$, $x + y = 3$



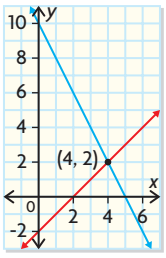
b) $x + y = 8$, $4x - 2y = 8$



c) $3x + y = 6$, $y = 2x - 4$

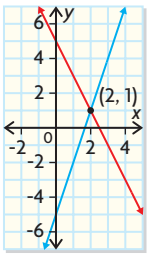


d) $2x + y = 10$, $y = x - 2$

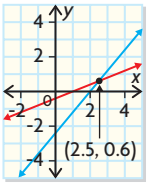


Answers

e) $y = 3x - 5$, $y = -2x + 5$



f) $6x - 5y - 12 = 0$, $-2x + 5y + 2 = 0$

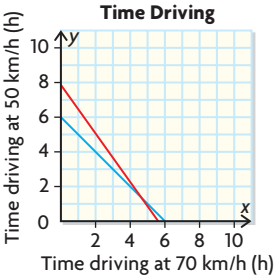


6. **a)** $x + y = 80$, $18x + 10y = 1000$
b) 25 kg of pineapple mix, 55 kg of banana mix

7. 80 kg of Brazilian beans, 120 kg of Ethiopian beans

8. **a)** Let x represent the time driving at 70 km/h, and let y represent the time driving at 50 km/h; $x + y = 6$, $70x + 50y = 393$

b)



c) 1.35 h at 50 km/h is 67.5 km

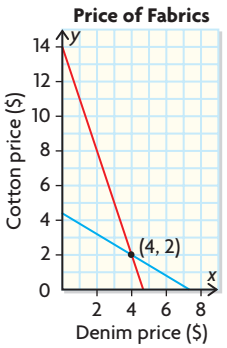
9. **a)** Let y represent earnings, and let x represent sales; $y = 1500 + 0.025x$ for Phoenix, $y = 1250 + 0.055x$ for Styles by Rebecca
b) about $8333
c) Joanna should take the job at Phoenix Fashions if she expects to have monthly sales less than $8333 because it would pay more. Otherwise, she should take the job at Styles by Rebecca because it would pay more.

10. Answers may vary, e.g., at a fundraiser barbecue, hamburgers cost $3 and hotdogs cost $2. Martha is in charge of buying lunch for her class of 25 students. Each student wants either a hot dog or a hamburger. If Martha has collected $60 to spend, how many of each should she buy?

11. $11.01

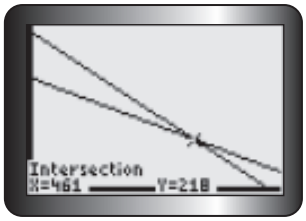
12. **a)** Let x represent the price of denim fabric, and let y represent the price of cotton fabric per metre; $3x + 5y = 22$, $6x + 2y = 28$

b)

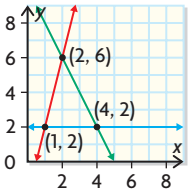


c) $42

13. **a)** Let x represent the number of student tickets, and let y represent the number of non-student tickets; $x + y = 679$, $4x + 7y = 3370$
b) 218



14. **a)**

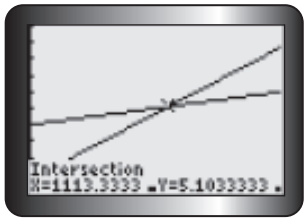


$y = 2$
$y = 4x - 2$
$y = -2x + 10$

b) 6 square units

15. **a)** Let C represent the cost, and let t represent the time of use; for a regular bulb, $C = 0.65 + 0.004t$; for a fluorescent bulb, $C = 3.99 + 0.001t$

b)

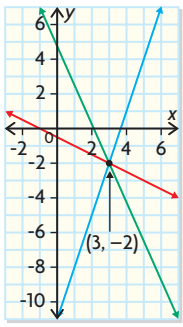


c) about 1113 h
d) The fluorescent bulb costs $22.94 less.

16. Answers may vary, e.g.,
- Read the problem, and determine what you need to find.
- Write two equations that describe the situation in the problem.
- Choose the best strategy to graph each equation.
- Graph both equations on the same set of axes.
- Label the graph.
- Determine the coordinates of the point of intersection.
- Verify the solution by substituting into both equations.

17. **a)** $(3, -2)$

b)



$3x - y - 11 = 0$
$x + 2y + 1 = 0$
$9x + 4y - 19 = 0$

c) $c = 2$, $d = 3$

18. $(-2, -5)$

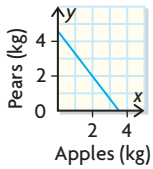
19. **a)** $(1, 2)$, $(-2.5, 12.5)$
b) about $(2.618, 1.618)$

Mid-Chapter Review, page 32

1. **a)** Answers may vary, e.g.,

Apples		Pears		
Mass (kg)	Cost ($)	Mass (kg)	Cost ($)	Total Cost ($)
0.00	0.00	4.58	9.98	9.98
1.00	2.84	3.28	7.15	9.99
2.00	5.68	1.98	4.32	10.00
3.00	8.52	0.67	1.46	9.98
3.52	10.00	0.00	0.00	10.00

b) **Possible Combinations of Pears and Apples**

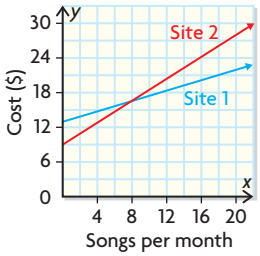


c) Let x represent the mass of apples, and let y represent the mass of pears; $2.84x + 2.18y = 10.00$

2.

Songs per Month	Cost for Site 1 ($)	Cost for Site 2 ($)
0	12.95	8.99
5	15.20	13.74
10	17.45	18.49
15	19.70	23.24
20	21.95	27.99

Cost of Downloading Songs

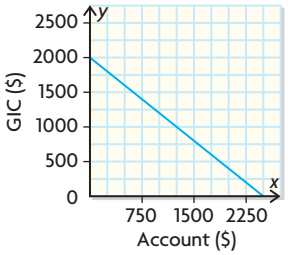


3. **a)** If she has $1500 in sales, she will earn $360.
b) Answers may vary, e.g., about $425
c) Answers may vary, e.g., about $3700
d) Let y represent earnings, and let x represent sales; $y = 300 + 0.04x$; for part b), $y = 428$; for part c), $x = \$3750$

4. **a)** Answers may vary, e.g., let P represent the perimeter, and let x represent the length; $P = 2x + 2(x - 8)$
b) 80 cm

5. **a)** Let x represent the amount in the account, and let y represent the amount in the GIC; $0.04x + 0.05y = 100$

Possible Combinations of GIC and Account Contributions



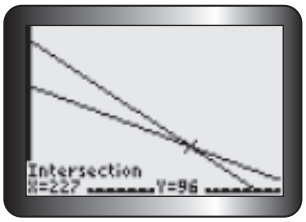
b) Answers may vary, e.g., about $625
c) $240

6. **a)** $(-1, 3)$ **b)** $(1.5, -1)$ **c)** $(1, 0)$ **d)** $(2, 0)$

7. **a)** $(2.2, 3)$ **b)** $(2.5, -3)$ **c)** $(4, 1.25)$ **d)** $(0.2, 0.5)$

8. **a)** Let x represent student tickets, and let y represent non-student tickets; $x + y = 323$, $2x + 3.50y = 790$

b)



96 non-students

9. Yes. Answers may vary, e.g., the solution is $(m + n, 3m + 2n)$. Since m could be any integer and n could be any integer, the solution could have a positive or negative x-value and a positive or negative y-value. Therefore, the solution could be in any quadrant.

10. Answers may vary, e.g., Dan and Heidi are playing table tennis against each other. After 17 points, Heidi is ahead by 7. How many points has each player scored?

Lesson 1.4, page 38

1. **a)** $y = 10x - 1$ **c)** $x = 20 - 2y$
b) $x = \frac{1}{4}y - \frac{3}{4}$ **d)** $y = 2x - 12$

2. Let x represent the number of cars, and let y represent the number of vans.
a) $x + y = 53$
b) $6x + 8y = 382$
c) Answers may vary, e.g., $x = 53 - y$
d) Answers may vary, e.g., $6(53 - y) + 8y = 382$; $y = 32$
e) Answers may vary, e.g., $x + 32 = 53$; 21 cars and 32 vans

3. **a)** $(-4, 3)$
b) $(2, 0)$

4. **a)** $b = 4 - 8a$ **c)** $v = 3 - \frac{3}{7}u$ **e)** $y = 2x - 4$
b) $r = \frac{3}{2} - \frac{1}{2}s$ **d)** $x = 6 + y$ **f)** $x = 15 - \frac{3}{2}y$

5. **a)** $(7, 2)$ **c)** $(5, 4)$ **e)** $(4, -3)$
b) $(5, 1)$ **d)** $(4, 1)$ **f)** $\left(-\frac{8}{3}, \frac{4}{3}\right)$

6. registration fee: $120; monthly charge: $75

7. number of 500 g jars: 235; number of 250 g jars: 276

8. 33°, 44°, 103°

9. **a)** $x = -2, y = 3$
b) $a = 2, b = 1$
c) $m = 13, n = -35$
d) $x = \frac{3}{8}, y = \frac{13}{8}$
e) $c = -4, d = -6$
f) $x = -\frac{42}{5}, y = -\frac{13}{15}$

10. If Dan uses more than 12 cheques per month, then Save-A-Lot Trust charges less. If he uses less than 12 cheques per month, then Maple Leaf Savings charges less.

11. about 8.57 g of 80% silver, about 21.43 g of 66% silver

12. 35 lawns

13. 40 chairs, 5 tables

14. about 320.988 g of soy milk, about 345.679 g of vegetables

15. Nicole should accept the job at High Tech if she thinks she will make less than $4000 per week in sales, because she will earn more. Otherwise, she should accept the job at Best Computers because she will earn more there.

16. **a)** In the second step, she incorrectly expanded $-(4x - 10)$ as $-4x - 10$. When solving for y, she calculated the value of $4(-7)$, but did not subtract 10.
b) $x = 3, y = 2$; I substituted $y = 4x - 10$ into $2x - y = 4$ and solved for x: $2x - (4x - 10) = 4$, $2x - 4x + 10 = 4$, $-2x + 10 = 4$, $x = 3$; then I substituted $x = 3$ into $y = 4x - 10$ and solved for y: $y = 4(3) - 10$, $y = 2$.

17. 15 nickels, 27 dimes, 7 quarters

18. Answers may vary, e.g., I think this strategy is called substitution because it involves two substitutions: the first substitution to obtain an equation in only one variable, and the second substitution to solve for the other variable.
$x + 4y = 8$ (equation 1)
$3x - 16y = 3$ (equation 2)
$x = 8 - 4y$ (Isolate x using equation 1.)
$3(8 - 4y) - 16y = 3$ (first substitution)
$y = \frac{3}{4}$ (Solve for y.)
$x = 8 - 4\left(\frac{3}{4}\right)$ (second substitution)
$x = 5$ (Solve for x.)

19. $160 000 in stocks, $100 000 in bonds, $40 000 in a savings account

Lesson 1.5, page 46

1. **a)** $3x - 2y = -3, -x - 4y = 7$
b) $3x + 2y = 21, -x - 4y = -17$
c) $4x - y = 11, 2x + 3y = -5$
d) $3x = 4, 5x + 4y = 12$

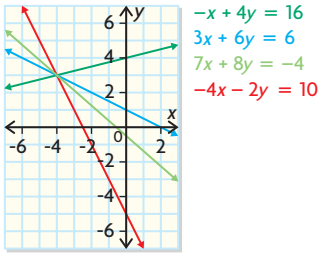
2. **a)** **i)** $\left(-\frac{13}{7}, -\frac{9}{7}\right)$
ii) $(5, 3)$
iii) $(2, -3)$
iv) $\left(\frac{4}{3}, \frac{4}{3}\right)$
b) **i)** $3\left(-\frac{13}{7}\right) - 2\left(-\frac{9}{7}\right) = -3, -\left(-\frac{13}{7}\right) - 4\left(-\frac{9}{7}\right) = 7$
ii) $3(5) + 2(3) = 21, -(5) - 4(3) = -17$
iii) $4(2) - (-3) = 11, 2(2) + 3(-3) = -5$
iv) $3\left(\frac{4}{3}\right) = 4, 5\left(\frac{4}{3}\right) + 4\left(\frac{4}{3}\right) = 12$

3. **a)** $(4, -1)$
b) $3x + y = 11, -x - 5y = 1$
c) $3(4) + (-1) = 11, -(4) - 5(-1) = 1$

4. Answers may vary, e.g.,
a) $3x - 6y = 18$
b) $(6, 0)$ and $(0, -3)$
c) $10x + 15y = 25$; $\left(\frac{5}{2}, 0\right)$ and $\left(0, \frac{5}{3}\right)$

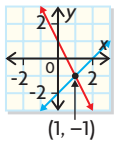
5. **a)** $(-1, 5)$
b) $5x - y = -10, 3x + 3y = 12$
c) $5(-1) - (5) = -10, 3(-1) + 3(5) = 12$

6. **a)** $3x + 6y = 6, -4x - 2y = 10$
b) $-x + 4y = 16, 7x + 8y = -4$
c)

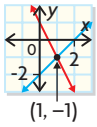


7. **a)** $(4, 2)$
b) $6x - 15y = -6, -5x + 15y = 10$
c) $x = 4, 11x - 30y = -16$
d) $6(4) - 15(2) = -6, -5(4) + 15(2) = 10,$ $(4) = 4, 11(4) - 30(2) = -16$

8. **a)** Answers may vary, e.g., I don't think it would affect the graph because dividing by a non-zero constant is similar to multiplying by its reciprocal, which is dividing by the non-zero constant. Multiplying by a non-zero constant results in a proportional increase for each term if the constant is greater than 1 and a proportional decrease for each term if the constant is less than 1.
b) $8x + 4y = 4$
$3x - 3y = 6$



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



Dividing the equations had no effect on the graph.
d) $3x = 3, -x - 2y = 1$
e) $3(1) = 3, -(1) - 2(-1) = 1$; they are equivalent.

9. **a)** $\left(\frac{1}{2}, 2\right)$ **b)** $2\left(\frac{1}{2}\right) + 11(2) = 23$ **c)** $a = 2, b = -3$

10. Answers may vary, e.g.,
a) $2x - 5y = 9, 4x - 3y = -3; 6x - 8y = 6, x + y = -6$
b) $2(-3) - 5(-3) = 9, 4(-3) - 3(-3) = -3;$ $6(-3) - 8(-3) = 6, (-3) + (-3) = -6$

11. Answers may vary, e.g.,
a) because either the x term or the y term will be eliminated
b) $4x - 3y = 10$
$-4x - 2y = 3$
c) $4x - 3y = 10$
$7x - 3y = 12$

12. $4x = 12, 6y = -4; \left(3, -\frac{2}{3}\right)$

13. **a)** $x + y = 33, x - y = 57$
b) $2x = 90, 2y = -24$
c) 45 and -12

14. **a)** Let x represent the number of chicken dinners, and let y represent the number of fish dinners; $x + y = 200, 20x + 18y = 3880$
b) $20x + 20y = 4000, 2y = 120$
c) 140 chicken and 60 fish

15. **a)** Yes. $3(-2) - 2(-4) = 2$, $-10(-2) + 3(-4) = 8$, $-7(-2) + (-4) = 10$, $13(-2) - 5(-4) = -6$
b) Answers may vary, e.g., $6x - 4y = 4$, $-14x + 2y = 20$

16. Answers may vary, e.g.,
a) Equivalent systems of linear equations are systems that have the same solution.
b) You can add them, subtract them, or multiply either one by a non-zero constant.
c) This can sometimes help you solve the original system, by cancelling out one of the variables.

17. **a)** $9x = -18$, $-9y = -45$; $(-2, 5)$
b) $23x = 46$, $-23y = 138$; $(2, -6)$

18. **a)** no
b) There are an infinite number of solutions.
c) The graphs are the same.

19. **a)** no
b) There is no ordered pair that represents a solution.
c) They are parallel and do not intersect at a point.

Lesson 1.6, page 54

1. **a)** subtract **b)** subtract **c)** subtract **d)** add

2. **a)** I would multiply the first equation by 3 and the second equation by 4. Then I would subtract one from the other.
b) I would subtract one from the other.

3. welder's rate: \$30/h; apprentice's rate: \$17/h

4. **a)** 2 and 1 **b)** 8 and 7 **c)** 5 and 3 **d)** 1 and 2

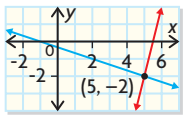
5. **a)** 3 and 4 **b)** 5 and 3 **c)** 1 and 2 **d)** 1 and 3

6. **a)** $(-2, 4)$ **c)** $(3, 7)$ **e)** $(-5, 12)$
b) $(6, -1)$ **d)** $(0.5, 1)$ **f)** $(-0.2, 2.8)$

7. $(5, -2)$; My graph verifies my solution.

$y = 4x - 22$

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



8. **a)** Let x represent the distance walked by Lori, and let y represent the distance walked by Nicholas; $x + y = 72.7$, $x - y = 8.9$
b) $x = 40.8$, $y = 31.9$

9. **a)** Let l represent the length, and let w represent the width; $2l + 2w = 54$, $l - w = 9$
b) $l = 18$, $w = 9$

10. about 276 g of the 99% cocoa, about 224 g of the 70% cocoa

11. **a)** $(0.5, 3)$; $4(0.5) + 7(3) = 23$, $6(0.5) - 5(3) = -12$
b) $(22, 32)$; $\frac{22}{11} - \frac{32}{8} = -2$, $\frac{22}{2} - \frac{32}{4} = 3$
c) $(6, 5)$; $0.5(6) - 0.3(5) = 1.5$, $0.2(6) - 0.1(5) = 0.7$
d) $(4, -1)$; $\frac{4}{2} - 5(-1) = 7$, $3(4) + \frac{(-1)}{2} = \frac{23}{2}$
e) $\left(1, \frac{1}{3}\right)$; $5(1) - 12\left(\frac{1}{3}\right) = 1$, $13(1) + 9\left(\frac{1}{3}\right) = 16$
f) $(18, 0)$; $\frac{18}{9} + \frac{0 - 3}{3} = 1$, $\frac{18}{2} - (0 + 9) = 0$

12. 30 g of mandarin orange, 40 g of tomato

13. 3 km

14. $\frac{2}{3}$ and $\frac{3}{4}$

15. \$2500 at 3%, \$4000 at 4%

16. **a)** 45 **b)** 195

17. **a)** $A + 8 = B + 2$, $\frac{A}{2} + 18 = B + 9$
b) $A = 6$, $B = 12$

18. Answers may vary, e.g., eliminating a variable means creating an equation with the same solution, which has one less variable than the original system.
$3x + 7y = 31$ (equation 1)
$5x - 8y = 91$ (equation 2)
Multiply equation 1 by 5 and equation 2 by 3, and subtract.
$15x + 35y = 155$
$15x - 24y = 273$
$59y = -118$
Multiply equation 1 by 8 and equation 2 by 7, and add.
$24x + 56y = 248$
$35x - 56y = 637$
$59x = 885$

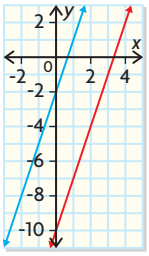
19. -5 and -7

20. $x = \frac{7}{5}$, $y = \frac{5}{2}$

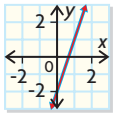
21. **a)** $x = \frac{de - bf}{ad - bc}$, $y = \frac{ce - af}{bc - ad}$ **b)** $ad \neq bc$

Lesson 1.7, page 59

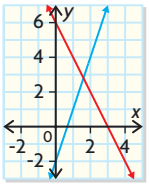
1. Answers may vary, e.g.,
a) $y = 3x - 2$
$y = 3x - 10$



c) $y = 3x - 2$
$3y = 9x - 6$



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

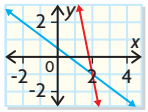


2. Answers may vary, e.g.,
a) **i)** $3x + 4y = -3$
ii) $5x + y = 9$
iii) $6x + 8y = 4$
b) **i)** Subtracting equations gives $0 = 5$, which has no solution.

$3x + 4y = 2$
$3x + 4y = -3$

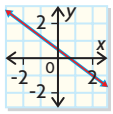
ii) $3(2) + 4(-1) = 2, 5(2) + (-1) = 9$

$3x + 4y = 2$
$5x + y = 9$

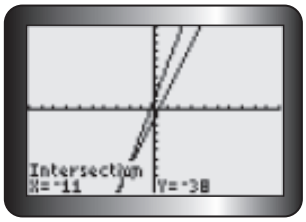


iii) Subtracting the second equation from 2 times the first equation gives $0 = 0$.

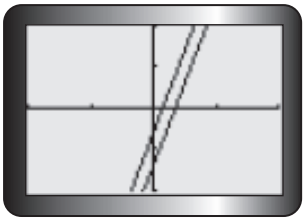
$3x + 4y = 2$
$6x + 8y = 4$



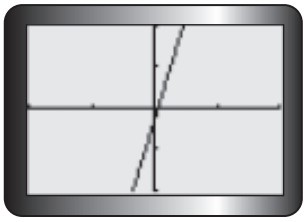
3. **a)** 1; $(-11, -38)$



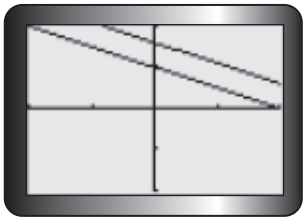
b) 0; no solution



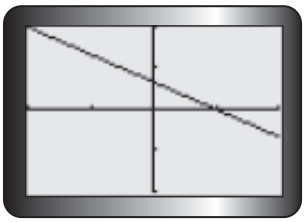
c) infinitely many; $y = 5x - 1.5$



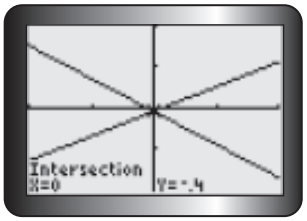
d) 0; no solution



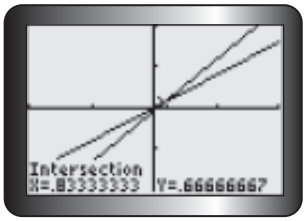
e) infinitely many; $2x + 3y = 10$



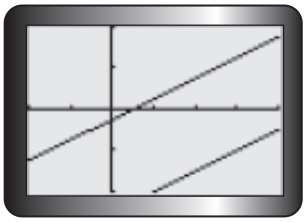
f) 1; $(0, -0.4)$



g) 1; $\left(\frac{5}{6}, \frac{2}{3}\right)$



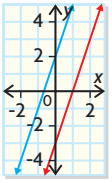
h) 0; no solution



4. Answers may vary, e.g.,

a) $y = 3x + 2, y = 3x - 3$; subtracting equation 2 from equation 1 gives $0 = 5$.

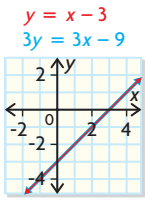
$y = 3x + 2$
$y = 3x - 3$



b) $y = 2x, 3y = 8x$; substitution gives $(0, 0)$.

$3y = 8x$
$y = 2x$

c) $y = x - 3$, $3y = 3x - 9$; substitution gives $0 = 0$.



5. Answers may vary, e.g., if the coefficients and constants in both equations are multiplied by the same amount, then there is an infinite number of solutions. If the coefficients and constants in both equations are not multiplied by the same amount, then there is one solution. If the coefficients in both equations are multiplied by the same amount but the constants are not, then there is no solution.

6. No. The linear system has no solution therefore the planes will not collide.

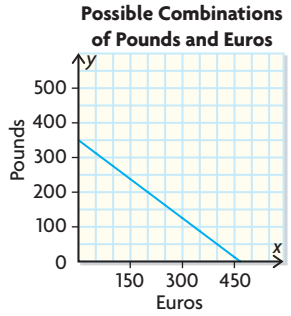
Chapter Review, page 62

1. Strategy 1:

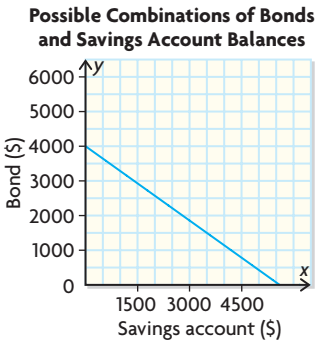
Euros		Pounds		
Amount	Cost ($)	Amount	Cost ($)	Total Cost ($)
0.00	0.00	350.00	700.00	700.00
200.00	300.00	200.00	400.00	700.00
400.00	600.00	50.00	100.00	700.00
466.67	700.00	0.00	0.00	700.00

Strategy 2: Let x represent the number of euros, and let y represent the number of pounds; $1.5x + 2y = 700$

Strategy 3:



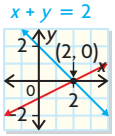
2. Let x represent the amount in the savings account, and let y represent the amount in the bond; $0.025x + 0.035y = 140$



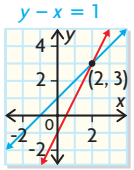
3. **a)** After 5 h, there was 25.5 L of fuel left.
b) Answers may vary, e.g., about 37 L
c) Answers may vary, e.g., about 3:45 p.m.

4. Make a table of values, write equations, draw a graph; if you are planning to drive more than about 333 km, then Bestcars is cheaper.

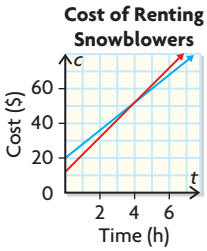
5. **a)** $x = 2y + 2$, $x + y = 2$



b) $2x - y = 1$, $y - x = 1$



6. **a)** Let C represent the cost, and let t represent the time; $C = 20 + 8t$
b) Let C represent the cost, and let t represent the time; $C = 12 + 10t$
c)



d) It represents the point where both companies charge the same amount.

7. **a)** $\left(-\frac{5}{2}, 4\right)$ **b)** (15, 10) **c)** (2, 4) **d)** (2, 1)

8. registration fee: $150; monthly fee: $55

9. **a)** Let l represent the length, and let w represent the width; $2l + 2w = 40$, $l = w + 2$
b) $l = 11$, $w = 9$
c) The rectangle is 11 m long and 9 m wide.

10. **a)** A
b) Answers may vary, e.g., $x - 4y = 5$, $3x - 6y = 3$
c) Answers may vary, e.g., $4x - 10y = 8$, $-3x + 3y = 3$

11. Answers may vary, e.g.,
a) $x - 4y = 14$, $-5x - 2y = -4$; $-6x - 9y = 15$, $-3x + y = -9$
b) $(2) - 4(-3) = 14$, $-5(2) - 2(-3) = -4$; $-6(2) - 9(-3) = 15$, $-3(2) + (-3) = -9$; $-2(2) - 3(-3) = 5$, $3(2) - (-3) = 9$

12. **a)** (2, −3) **b)** (−3, −1) **c)** (−2, 3) **d)** (3, 12)

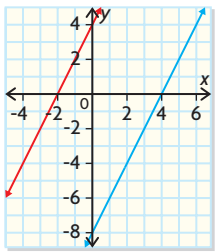
13. about 110 g of 99% cocoa, about 90 g of 70% cocoa

14. $150 in total; desk: $51, chalkboard: $99

15. $\left(\frac{34}{11}, \frac{37}{11}\right)$

16. 36 $5 bills, 40 $10 bills

17. Answers may vary, e.g.,
a)

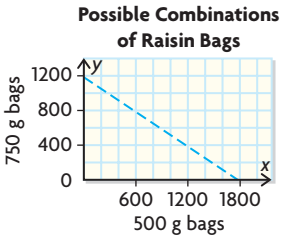


b) blue line: $y = 2x - 8$, $3y = 6x - 24$; red line: $y = 2x + 4$, $4y = 8x + 16$
c) The slopes are equal.

18. $a = 2.4$, $b = 4$

Chapter Self-Test, page 64

1. Let x represent the number of 500 g cartons, and let y represent the number of 750 g cartons; $0.5x + 0.75y = 887.5$



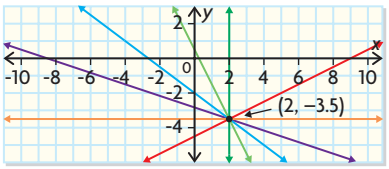
2. **a)** Let V represent the volume remaining, and let t represent the time after 8:30 a.m.; $V = 1500 - 4t$
b) Answers may vary, e.g., about 10:30 a.m.
c) 10:35 a.m.

3. **a)** $(-1.5, 2.5)$ **b)** $\left(\frac{-24}{7}, \frac{1}{7}\right)$ **c)** $(2, -3)$

4. about 13.33 g of 85% gold, about 6.67 g of 70% gold

5. Answers may vary, e.g., at the point (x, y), which represents a solution to a linear system, both sides of an equation in the system must be equal. Therefore, adding or subtracting these equations is the same as adding or subtracting constants to both sides of an equation: the solution will remain the same.

6. **a)** $4x + 2y = 1$, $2x + 6y = -17$; $x = 2$, $y = -3.5$
b) $4x + 2y = 1$, $2x + 6y = -17$, $x = 2$, $y = -3.5$, $3x + 4y = -8$, $x - 2y = 9$



7. 6 km

8. \$1500 in a savings account, \$2700 in bonds

9. Answers may vary, e.g., adding the first equation to 3 times the second equation and then simplifying gives $15 = 24$, which is not true.

Chapter 2

Getting Started, page 68

1. **a)** viii **b)** vii **c)** ii **d)** v **e)** iv **f)** vi **g)** i **h)** iii

2. **a)** 13 m
b) about 192.3 mm

3. **a)** $y = \frac{1}{3}x + \frac{14}{3}$
b) $y = -4x - 6$
c) $y = -5x + 17$

4. **a)** $-\frac{3}{2}$ **b)** $-\frac{3}{56}$ **c)** $\frac{35}{3}x$ **d)** $\frac{3}{8}y$ **e)** $\frac{23}{20}$ **f)** -1.4375

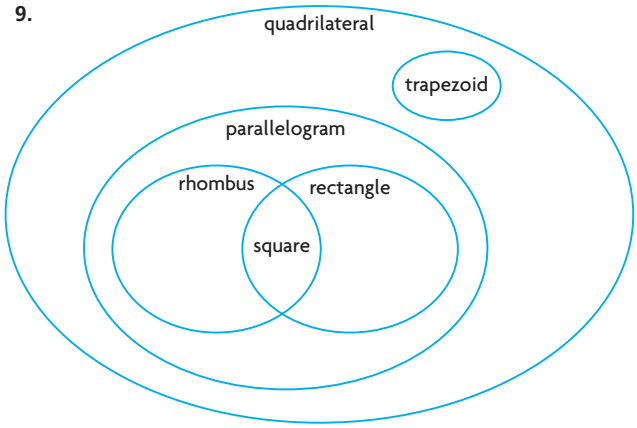
5. **a)** -2 **b)** -1 **c)** 8 **d)** 6 or -6 **e)** 3 or -3 **f)** 8 or -8

6. **a)** (1, 7) **b)** $\left(1, \frac{3}{2}\right)$

7. **a)** 6 **b)** $\frac{1}{4}$ **c)** 0.7

8. **a)** about 36.2 cm^2
b) about 57.0 cm^2, about 41.7 cm

9.

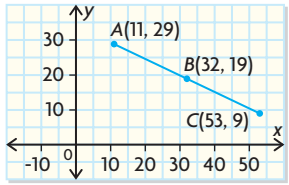


Lesson 2.1, page 78

1. **a)** (3, 5) **b)** $(-0.5, 3.5)$

2. **a)** (2, 3) **b)** (0.5, 1) **c)** $(4, -2)$

3. **a)**



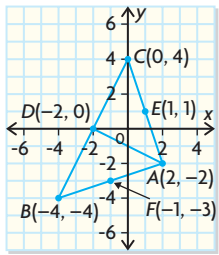
b) (32, 19)

4. **a)** (2, 5) **b)** (0.5, 3.5) **c)** $(2, -2)$ **d)** $(-0.5, 0.5)$ **e)** $(-1, -1)$ **f)** (0.25, 0.75)

5. $(0.75, -1)$

6. (5, 3); from P to M, run $= 4$ and rise $= 2$; the run and rise will be the same from M to Q, so Q has coordinates $(1 + 4, 1 + 2)$

7. **a), b)** $y = -\frac{1}{2}x - 1$



8. Answers may vary, e.g., $(-4, 4)$ and (2, 2) based on the assumption that the centre is at O, or (5, 1) and $(-1, 3)$ based on the assumption that the centre is at R