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

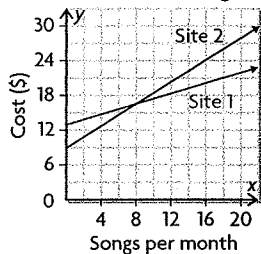**b) Possible Combinations of Pears and Apples**
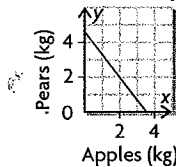
Apples (kg)

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


Songs per month

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

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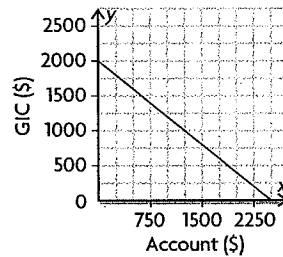
b) Answers may vary, e.g., about $625
c) $240

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)
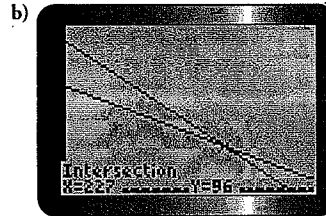
96 non-students

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?
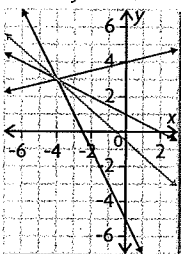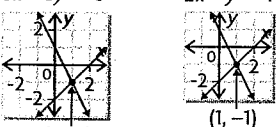
Lesson 1.4, page 38

1. a) $y = 10x - 1$ **c)** $x = 20 - 2y$
b) $x = \dfrac{1}{4}y - \dfrac{3}{4}$ **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)** $v = 3 - \dfrac{3}{7}u$ **e)** $y = 2x - 4$
b) $r = \dfrac{3}{2} - \dfrac{1}{2}s$ **d)** $x = 6 + y$ **f)** $x = 15 - \dfrac{3}{2}y$

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

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) $x = -2, y = 3$
d) $x = \dfrac{3}{8}, y = \dfrac{13}{8}$

b) $a = 2, b = 1$
e) $c = -4, d = -6$

c) $m = 13, n = -35$
f) $x = -\dfrac{42}{5}, y = -\dfrac{13}{15}$

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)
$y = \dfrac{3}{4}$ (Solve for y.)
$x = 8 - 4\left(\dfrac{3}{4}\right)$ (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) $\left(-\dfrac{13}{7}, -\dfrac{9}{7}\right)$
iii) $(2, -3)$

ii) $(5, 3)$
iv) $\left(\dfrac{4}{3}, \dfrac{4}{3}\right)$

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

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) $10x + 15y = 25; \left(\dfrac{5}{2}, 0\right)$ and $\left(0, \dfrac{5}{3}\right)$

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)

$-x + 4y = 16$
$3x + 6y = 6$
$7x + 8y = -4$
$-4x - 2y = 10$

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) $8x + 4y = 4$
$3x - 3y = 6$

$(1, -1)$

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

$(1, -1)$

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) $\left(\dfrac{1}{2}, 2\right)$
b) $2\left(\dfrac{1}{2}\right) + 11(2) = 23$
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. $4x = 12, 6y = -4; \left(3, -\dfrac{2}{3}\right)$

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.

$y = 4x - 22$

$y = -\frac{1}{3} - \frac{1}{3}x$
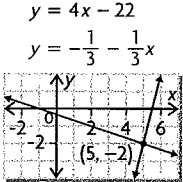
8. a) Let x represent the distance walked by Lori, and let y represent the distance walked by Nicholas; $x + y = 72.7, x - y = 8.9$
   b) $x = 40.8, y = 31.9$
9. a) Let l represent the length, and let w represent the width; $2l + 2w = 54, l - w = 9$
   b) $l = 18, w = 9$
10. about 276 g of the 99% cocoa, 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
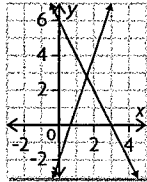
1. Answers may vary, e.g.,
   a) $y = 3x - 2$
      $y = 3x - 10$
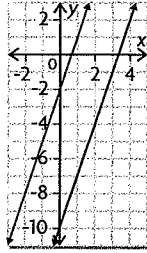
   c) $y = 3x - 2$
      $3y = 9x - 6$
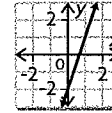
   b) $y = 3x - 2$
      $y = -2x + 6$

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