Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

SKU: 9781259370151-SOLUTIONS

2 Review and Applications of Algebra

Exercise 2.1

Basic Problems

1. $(-p) + (-3p) + 4p = -p - 3p + 4p = \underline{0}$
2. $(5s - 2t) - (2s - 4t) = 5s - 2t - 2s + 4t = \underline{3s + 2t}$
3. $4x^2y + (-3x^2y) - (-5x^2y) = 4x^2y - 3x^2y + 5x^2y = \underline{6x^2y}$
4. $1 - (7e^2 - 5 + 3e - e^3) = 1 - 7e^2 + 5 - 3e + e^3 = \underline{e^3 - 7e^2 - 3e + 6}$
5. $(6x^2 - 3xy + 4y^2) - (8y^2 - 10xy - x^2) = 6x^2 - 3xy + 4y^2 - 8y^2 + 10xy + x^2$
   $= \underline{7x^2 - 4y^2 + 7xy}$
6. $6a - 3a - 2(2b - a) = 6a - 3a - 4b + 2a = \underline{5a - 4b}$
7. $\frac{3y}{1.2} + 6.42y - 4y + 7 = 2.5y + 6.42y - 4y + 7 = \underline{4.92y + 7}$
8. $13.2 + 7.4t - 3.6 + \frac{2.8t}{0.4} = 13.2 + 7.4t - 3.6 + 7t = \underline{14.4t + 9.6}$

Intermediate Problems

9. $4a(3ab - 5a + 6b) = \underline{12a^2b - 20a^2 + 24ab}$
10. $9k(4 - 8k + 7k^2) = \underline{36k - 72k^2 + 63k^3}$
11. $-5xy(2x^2 - xy - 3y^2) = \underline{-10x^3y + 5x^2y^2 + 15xy^3}$
12. $(3p^2 - 5p)(-4p + 2) = -12p^3 + 6p^2 + 20p^2 - 10p = \underline{-12p^3 + 26p^2 - 10p}$
13. $3(a - 2)(4a + 1) - 5(2a + 3)(a - 7) = 3(4a^2 + a - 8a - 2) - 5(2a^2 - 14a + 3a - 21)$
    $= 12a^2 - 21a - 6 - 10a^2 + 55a + 105$
    $= \underline{2a^2 + 34a + 99}$
14. $5(2x - y)(y + 3x) - 6x(x - 5y) = 5(2xy + 6x^2 - y^2 - 3xy) - 6x^2 + 30xy$
    $= -5xy + 30x^2 - 5y^2 - 6x^2 + 30xy$
    $= \underline{24x^2 + 25xy - 5y^2}$
15. $\frac{18x^2}{3x} = \underline{6x}$
16. $\frac{6a^2b}{-2ab^2} = \underline{\underline{-3\frac{a}{b}}}$
17. $\frac{x^2y - xy^2}{xy} = \underline{x - y}$
18. $\frac{-4x + 10x^2 - 6x^3}{-0.5x} = \underline{8 - 20x + 12x^2}$
19. $\frac{12x^3 - 24x^2 + 36x}{48x} = \underline{\underline{\frac{x^2 - 2x + 3}{4}}}$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.1 *(continued)*

20. $\dfrac{120(1+i)^2+180(1+i)^3}{360(1+i)} = \underline{\underline{\dfrac{2(1+i)+3(1+i)^2}{6}}}$

21. $3d^2 - 4d + 15 = 3(2.5)^2 - 4(2.5) + 15$
$= 18.75 - 10 + 15$
$= \underline{23.75}$

22. $15g - 9h + 3 = 15(14) - 9(15) + 3 = \underline{78}$

23. $7x(4y - 8) = 7(3.2)(4 \times 1.5 - 8) = 22.4(6 - 8) = \underline{-44.8}$

24. $(1 + i)^m - 1 = (1 + 0.0225)^4 - 1 = \underline{0.093083}$

25. $I \div Pr = \dfrac{\$13.75}{\$500 \times 0.11} = \underline{0.250}$

26. $\dfrac{N}{1-d} = \dfrac{\$89.10}{1-0.10} = \underline{\$99.00}$

27. $P(1 + rt) = \$770\left(1+0.013\times\dfrac{223}{365}\right) = \$770(1.0079425) = \underline{\$776.12}$

28. $\dfrac{S}{1+rt} = \dfrac{\$2500}{1+0.085\times\frac{123}{365}} = \dfrac{\$2500}{1.028644} = \underline{\$2430.38}$

29. $P(1 + i)^n = \$1280(1 + 0.025)^3 = \underline{\$1378.42}$

30. $\dfrac{S}{(1+i)^n} = \dfrac{\$850}{(1+0.0075)^6} = \dfrac{\$850}{1.045852} = \underline{\$812.73}$

Advanced Problems

31. $\dfrac{2x+9}{4} - 1.2(x-1) = 0.5x + 2.25 - 1.2x + 1.2 = \underline{-0.7x + 3.45}$

32. $\dfrac{x}{2} - x^2 + \dfrac{4}{5} - 0.2x^2 - \dfrac{4}{5}x + \dfrac{1}{2} = 0.5x - x^2 + 0.8 - 0.2x^2 - 0.8x + 0.5$
$= \underline{-1.2x^2 - 0.3x + 1.3}$

33. $\dfrac{8x}{0.5} + \dfrac{5.5x}{11} + 0.5(4.6x - 17) = 16x + 0.5x + 2.3x - 8.5 = \underline{18.8x - 8.5}$

34. $\dfrac{2x}{1.045} - \dfrac{2.016x}{3} + \dfrac{x}{2} = 1.9139x - 0.6720x + 0.5x = \underline{1.7419x}$

35. $R\left[\dfrac{(1+i)^n - 1}{i}\right] = \$550\left(\dfrac{1.085^3 - 1}{0.085}\right) = \$550\left(\dfrac{0.2772891}{0.085}\right) = \underline{\$1794.22}$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.1 *(continued)*

36. $$R\left[\frac{(1+i)^n-1}{i}\right](1+i) = \$910\left(\frac{1.1038129^4-1}{0.1038129}\right)(1.1038129)$$
$$= \$910\left(\frac{0.4845057}{0.1038129}\right)(1.1038129)$$
$$= \underline{\$4687.97}$$

37. $$\frac{R}{i}\left[1-\frac{1}{(1+i)^n}\right] = \frac{\$630}{0.115}\left(1-\frac{1}{1.115^2}\right) = \underline{\$1071.77}$$

Exercise 2.2

Basic Problems

1. $I = Prt$
$\$6.25 = P(0.05)0.25$
$\$6.25 = 0.0125P$
$$P = \frac{\$6.25}{0.0125} = \underline{\$500.00}$$

2. $$PV = \frac{PMT}{i}$$
$$\$150{,}000 = \frac{\$900}{i}$$
$\$150{,}000i = \$900$
$$i = \frac{\$900}{\$150{,}000} = \underline{0.00600}$$

3. $S = P(1 + rt)$
$\$3626 = P(1 + 0.004\times 9)$
$\$3626 = 1.036P$
$$P = \frac{\$3626}{1.036} = \underline{\$3500.00}$$

4. $N = L(1 - d)$
$\$891 = L(1 - 0.10)$
$\$891 = 0.90L$
$$L = \frac{\$891}{0.90} = \underline{\$990.00}$$

5. $N = L(1 - d)$
$\$410.85 = \$498(1 - \mathrm{d})$
$$\frac{\$410.85}{\$498} = 1 - d$$
$0.825 = 1 - d$
$d = 1 - 0.825 = \underline{0.175}$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.2 *(continued)*

6. $S = P(1 + rt)$

$\$5100 = \$5000(1 + 0.0025t)$

$\$5100 = \$5000 + \$12.5t$

$\$5100 - \$5000 = \$12.5t$

$$t = \frac{\$100}{\$12.5} = \underline{8.00}$$

7. $NI = (CM)X - FC$

$\$15{,}000 = CM(5000) - \$60{,}000$

$\$15{,}000 + \$60{,}000 = 5000CM$

$$CM = \frac{\$75{,}000}{5000} = \underline{\$15.00}$$

8. $NI = (CM)X - FC$

$-\$542.50 = (\$13.50)X - \$18{,}970$

$\$18{,}970 - \$542.50 = (\$13.50)X$

$$X = \frac{\$18{,}427.50}{\$13.50} = \underline{1365}$$

9. $N = L(1-d_1)(1-d_2)(1-d_3)$

$\$1468.80 = L(1 - 0.20)(1 - 0.15)(1 - 0.10)$

$\$1468.80 = L(0.80)(0.85)(0.90)$

$$L = \frac{\$1468.80}{0.6120} = \underline{\$2400.00}$$

10. $$c = \frac{V_f - V_i}{V_i}$$

$$0.12 = \frac{V_f - \$6700}{\$6700}$$

$0.12(\$6700) = V_f - \$6700$

$\$804 + \$6700 = V_f$

$V_f = \underline{\$7504.00}$

11. $$c = \frac{V_f - V_i}{V_i}$$

$$0.07 = \frac{\$1850 - V_i}{V_i}$$

$0.07V_i = \$1850 - V_i$

$0.07V_i + V_i = \$1850$

$1.07V_i = \$1850$

$$V_i = \frac{\$1850}{1.07}$$

$V_i = \underline{\$1728.97}$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.2 *(continued)*

Intermediate Problems

12. $a^2 \times a^3 = \underline{a^5}$
13. $(x^6)(x^4) = \underline{x^2}$
14. $b^{10} \div b^6 = b^{10-6} = \underline{b^4}$
15. $h^7 \div h^{-4} = h^{7-(-4)} = \underline{h^{11}}$
16. $(1 + i)^4 \times (1 + i)^9 = \underline{(1 + i)^{13}}$
17. $(1 + i) \times (1 + i)^n = \underline{(1 + i)^{n+1}}$
18. $(x^4)^7 = x^{4x7} = \underline{x^{28}}$
19. $(y^3)^3 = \underline{y^9}$
20. $\left(t^6\right)^{\frac{1}{3}} = \underline{t^2}$
21. $(n^{0.5})^8 = \underline{n^4}$
22. $\dfrac{\left(x^5\right)\left(x^6\right)}{x^9} = x^{5+6-9} = \underline{x^2}$
23. $\dfrac{\left(x^5\right)^6}{x^9} = x^{5\times6-9} = \underline{x^{21}}$
24. $\left[2(1+i)\right]^2 = \underline{4(1+i)^2}$
25. $\left(\dfrac{1+i}{3i}\right)^3 = \underline{\dfrac{(1+i)^3}{27i^3}}$
26. $8^{4/3} = \left(8^{1/3}\right)^4 = 2^4 = \underline{16}$
27. $-27^{2/3} = -\left(27^{1/3}\right)^2 = \underline{-9}$
28. $\left(\dfrac{2}{5}\right)^3 = 0.4^3 = \underline{0.064}$
29. $5^{-3/4} = 5^{-0.75} = \underline{0.299070}$
30. $(0.001)^{-2} = \underline{1{,}000{,}000}$
31. $0.893^{-1/2} = 0.893^{-0.5} = \underline{1.05822}$
32. $(1.0085)^5(1.0085)^3 = 1.0085^8 = \underline{1.07006}$
33. $(1.005)^3(1.005)^{-6} = 1.005^{-3} = \underline{0.985149}$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.2 *(continued)*

34. $\sqrt[3]{1.03} = 1.03^{0.\overline{3}} = \underline{\underline{1.00990}}$

35. $\sqrt[6]{1.05} = \underline{\underline{1.00816}}$

Advanced Problems

36. $\dfrac{4r^5t^6}{(2r^2t)^3} = \dfrac{4r^5t^6}{8r^6t^3} = \dfrac{r^{5-6}t^{6-3}}{2} = \underline{\underline{\dfrac{t^3}{2r}}}$

37. $\dfrac{(-r^3)(2r)^4}{(2r^{-2})^2} = \dfrac{-r^3(16r^4)}{4r^{-4}} = -4r^{3+4-(-4)} = \underline{\underline{-4r^{11}}}$

38. $\dfrac{(3x^2y^3)^5}{(xy^2)^3} = \dfrac{243x^{10}y^{15}}{x^3y^6} = 243x^{10-3}y^{15-6} = \underline{\underline{243x^7y^9}}$

39. $\dfrac{6(-3xy)^4}{(-3x^{-3})^2} = \dfrac{6(81x^4y^4)}{9x^{-6}} = \dfrac{486x^4y^4}{9x^{-6}} = 54x^{4-(-6)}y^4 = \underline{\underline{54x^{10}y^4}}$

40. $(4^4)(3^{-3})\left(-\dfrac{3}{4}\right)^3 = \dfrac{4^4}{3^3}\left(-\dfrac{3^3}{4^3}\right) = \underline{\underline{-4}}$

41. $\left[\left(-\dfrac{3}{4}\right)^2\right]^{-2} = \left(-\dfrac{3}{4}\right)^{-4} = \left(-\dfrac{4}{3}\right)^4 = \dfrac{256}{81} = \underline{\underline{3.16049}}$

42. $\left(\dfrac{2}{3}\right)^3\left(-\dfrac{3}{2}\right)^2\left(-\dfrac{3}{2}\right)^{-3} = \left(\dfrac{2}{3}\right)^3\left(\dfrac{3}{2}\right)^2\left(-\dfrac{2}{3}\right)^3 = \dfrac{2}{3}\left(-\dfrac{2}{3}\right)^3 = -\dfrac{16}{81} = \underline{\underline{-0.197531}}$

43. $\dfrac{1.03^{16} - 1}{0.03} = \underline{\underline{20.1569}}$

44. $\dfrac{1 - 1.0225^{-20}}{0.0225} = \dfrac{0.3591835}{0.0225} = \underline{\underline{15.9637}}$

45. $(1 + 0.055)^{1/6} - 1 = \underline{0.00896339}$

Exercise 2.3

Basic Problems

1. $10a + 10 = 12 + 9a$
   $10a - 9a = 12 - 10$
   $a = \underline{\underline{2}}$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.3 *(continued)*

2. $29 - 4y = 2y - 7$
$36 = 6y$
$y = \underline{\underline{6}}$

3. $0.5\,(x - 3) = 20$
$x - 3 = 40$
$x = \underline{\underline{43}}$

4. $\frac{1}{3}(x - 2) = 4$
$x - 2 = 12$
$x = \underline{\underline{14}}$

5. $y = 192 + 0.04y$
$y - 0.04y = 192$
$y = \dfrac{192}{0.96} = \underline{\underline{200}}$

6. $x - 0.025x = 341.25$
$0.975x = 341.25$
$x = \dfrac{341.25}{0.975} = \underline{\underline{350}}$

7. $12x - 4(2x - 1) = 6(x + 1) - 3$
$12x - 8x + 4 = 6x + 6 - 3$
$-2x = -1$
$x = \underline{\underline{0.5}}$

8. $3y - 4 = 3(y + 6) - 2(y + 3)$
$= 3y + 18 - 2y - 6$
$2y = 16$
$y = \underline{\underline{8}}$

9. $8 - 0.5(x + 3) = 0.25(x - 1)$
$8 - 0.5x - 1.5 = 0.25x - 0.25$
$-0.75x = -6.75$
$x = \underline{\underline{9}}$

10. $5(2 - c) = 10(2c - 4) - 6(3c + 1)$
$10 - 5c = 20c - 40 - 18c - 6$
$-7c = -56$
$c = 8$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.3 *(continued)*

Intermediate Problems

11.
$$x - y = 2 \quad ①$$
$$3x + 4y = 20 \quad ②$$
① × 3: $3x - 3y = 6$
Subtract: $7y = 14$
$$y = 2$$

Substitute into equation ①:
$$x - 2 = 2$$
$$x = 4$$
$$(x, y) = \underline{(4, 2)}$$

Check: LHS of ② = 3(4) + 4(2) = 20 = RHS of ②

12.
$$y - 3x = 11 \quad ①$$
$$-4y + 5x = -30 \quad ②$$
① × 4: $4y - 12x = 44$
Add: $-7x = 14$
$$x = -2$$

Substitute into equation ①:
$$y - 3(-2) = 11$$
$$y = 11 - 6 = 5$$
$$(x, y) = \underline{(-2, 5)}$$

Check: LHS of ② = $-4(5) + 5(-2) = -30$= RHS of ②

13.
$$7p - 3q = 23 \quad ①$$
$$-2p - 3q = 5 \quad ②$$
Subtract: $9p = 18$
$$p = 2$$

Substitute into equation ①:
$$7(2) - 3q = 23$$
$$3q = -23 + 14$$
$$q = -3$$
$$(p, q) = \underline{(2, -3)}$$

Check: LHS of ② = $-2(2) - 3(-3) = 5$ = RHS of ②

14.
$$y = 2x \quad ①$$
$$7x - y = 35 \quad ②$$
Add: $7x = 2x + 35$
$$5x = 35$$
$$x = 7$$

Substitute into ①:
$$y = 2(7) = 14$$
$$(x, y) = \underline{(7, 14)}$$

Check: LHS of ② = 7(7) – 14 = 49 – 14 = 35 = RHS of ②

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.3 *(continued)*

15. $-3c + d = -500$ ①
$0.7c + 0.2d = 550$ ②

To eliminate d,

① × 0.2: $-0.6c + 0.2d = -100$
②: $0.7c + 0.2d = 550$
Subtract: $-1.3c + 0 = -650$
$c = 500$

Substitute into ①: $d = 3(500) - 500 = 1000$
$(c, d) = \underline{(500, 1000)}$

Check: LHS of ② = 0.7(500) + 0.2(1000) = 550 = RHS of ②

16. $0.03x + 0.05y = 51$ ①
$0.8x - 0.7y = 140$ ②

To eliminate y,

① × 0.7: $0.021x + 0.035y = 35.7$
② × 0.05: $0.04x - 0.035y = 7$
Add: $0.061x + 0 = 42.7$
$x = 700$

Substitute into ②:

$0.8(700) - 0.7y = 140$
$-0.7y = -420$
$y = 600$
$(x, y) = \underline{(700, 600)}$

Check: LHS of ① = 0.03(700) + 0.05(600) = 51 = RHS of ①

17. $2v + 6w = 1$ ①
$10v - 9w = 18$ ②

To eliminate v,

①× 10: $20v + 60w = 10$
② × 2: $20v - 18w = 36$
Subtract: $0 + 78w = -26$
$w = -\frac{1}{3}$

Substitute into ①:

$2v + 6\left(-\frac{1}{3}\right) = 1$
$2v = 1 + 2$
$v = \frac{3}{2}$
$(v, w) = \underline{\underline{\left(\frac{3}{2}, -\frac{1}{3}\right)}}$

Check: LHS of ② = $10\left(\frac{3}{2}\right) - 9\left(-\frac{1}{3}\right) = 18$ = RHS of ②

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.3 *(continued)*

18.
$$2.5a + 2b = 11 \quad ①$$
$$8a + 3.5b = 13 \quad ②$$

To eliminate b,

$① \times 3.5$: $8.75a + 7b = 38.5$

$② \times 2$: $16a + 7b = 26$

Subtract: $-7.25a + 0 = 12.5$

$$a = -1.724$$

Substitute into ①:

$$2.5(-1.724) + 2b = 11$$
$$2b = 11 + 4.31$$
$$b = 7.655$$
$$(a, b) = \underline{(-1.72, 7.66)}$$

Check: LHS of ② = 8(–1.724) + 3.5(7.655) = 13.00 = RHS of ②

19.
$$37x - 63y = 235 \quad ①$$
$$18x + 26y = 468 \quad ②$$

To eliminate x,

$① \times 18$: $666x - 1134y = 4230$

$② \times 37$: $\underline{666x + 962y = 17{,}316}$

Subtract: $0 - 2096y = -13{,}086$

$$y = 6.243$$

Substitute into ①:

$$37x - 63(6.243) = 235$$
$$37x = 628.3$$
$$x = 16.98$$
$$(x, y) = \underline{(17.0, 6.24)}$$

Check: LHS of ② = 18(16.98) + 26(6.243) = 468.0 = RHS of ②

20.
$$68.9n - 38.5m = 57 \quad ①$$
$$45.1n - 79.4m = -658 \quad ②$$

To eliminate n,

$① \times 45.1$: $3107n - 1736.4m = 2571$

$② \times 68.9$: $\underline{3107n - 5470.7m = -45{,}336}$

Subtract: $0 + 3734.3m = 47{,}907$

$$m = 12.83$$

Substitute into ①:

$$68.9n - 38.5(12.83) = 57$$
$$68.9n = 551.0$$
$$n = 7.996$$
$$(m, n) = \underline{(12.8, 8.00)}$$

Check: LHS of ② = 45.1(7.996) – 79.4(12.83) = –658.1 = RHS of ②

Advanced Problems

21.
$$\frac{x}{1.1^2} + 2x(1.1)^3 = \$1000$$
$$0.8264463x + 2.622x = \$1000$$
$$3.488446x = \$1000$$
$$x = \underline{\$286.66}$$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.3 *(continued)*

22. $\dfrac{3x}{1.025^6} + x(1.025)^8 = \$2641.35$

$2.586891x + 1.218403x = \$2641.35$

$x = \underline{\$694.13}$

23. $\dfrac{2x}{1.03^7} + x + x\left(1.03^{10}\right) = \$1000 + \dfrac{\$2000}{1.03^4}$

$1.626183x + x + 1.343916x = \$1000 + \$1776.974$

$3.970099x = \$2776.974$

$x = \underline{\$699.47}$

24. $x(1.05)^3 + \$1000 + \dfrac{x}{1.05^7} = \dfrac{\$5000}{1.05^2}$

$1.157625x + 0.7106813x = \$4535.147 - \$1000$

$x = \underline{\$1892.17}$

25. $x\left(1 + 0.095 \times \dfrac{84}{365}\right) + \dfrac{2x}{1 + 0.095 \times \frac{108}{365}} = \$1160.20$

$1.021863x + 1.945318x = \$1160.20$

$2.967181x = \$1160.20$

$x = \underline{\$391.01}$

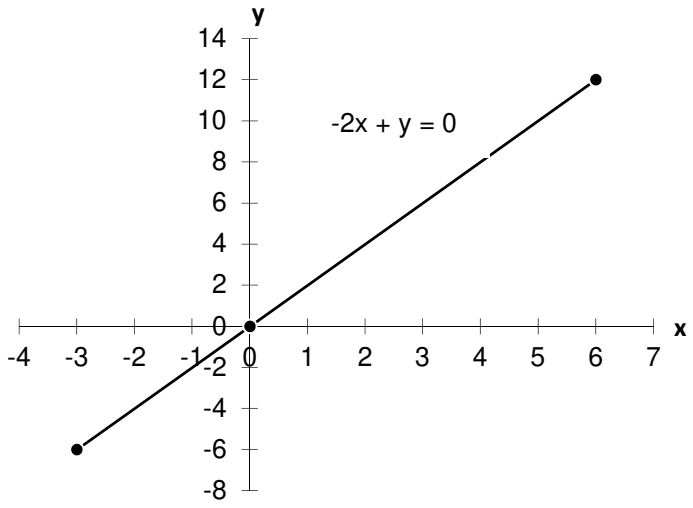
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.4

Basic Problems

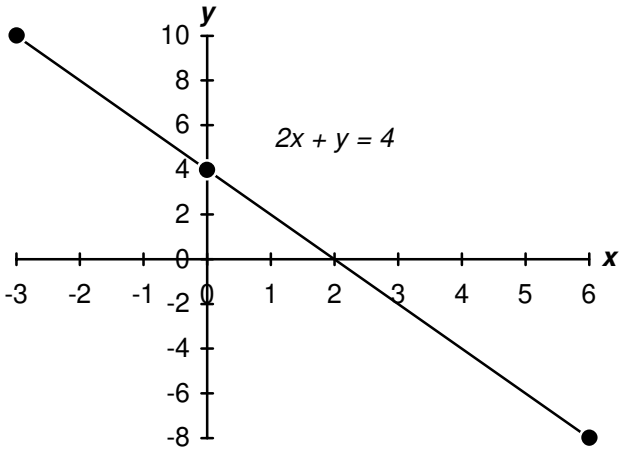
1.

x:	–3	0	6
y:	–6	0	12



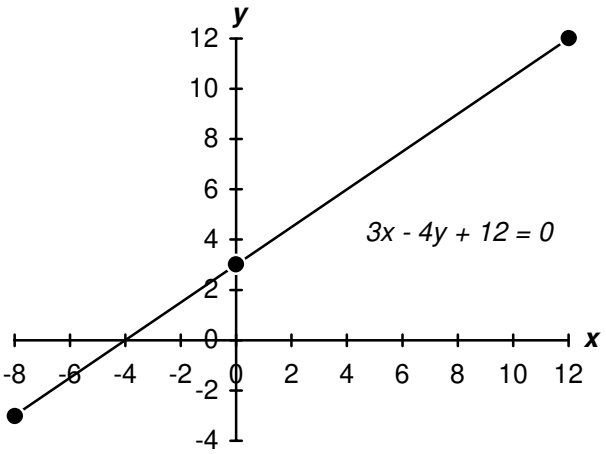
2.

x:	–3	0	6
y:	10	4	–8



3.

x:	–8	0	12
y:	–3	3	12

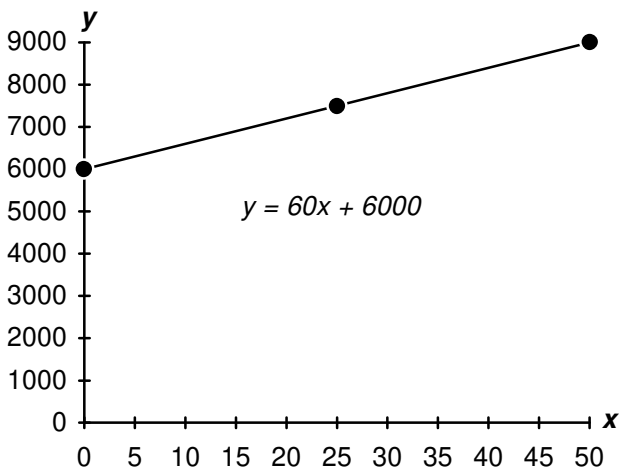


Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.4 *(continued)*

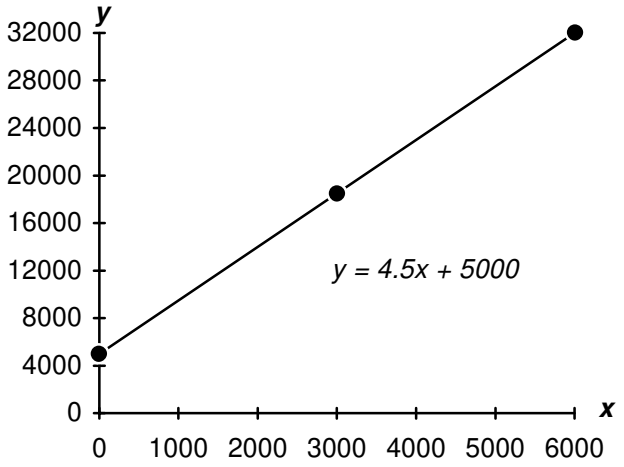
4.

x:	0	25	50
y:	6000	7500	9000



5.

x:	0	3000	6000
y:	5000	18,500	32,000



6. In each part, rearrange the equation to render it in the form $y = mx + b$

a. $2x = 3y + 4$

$3y = 2x - 4$

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

The slope is $m = \frac{2}{3}$ and the *y*-intercept is $b = -\frac{4}{3}$.

b. $8 - 3x = 2y$

$2y = -3x + 8$

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

The slope is $m = -\frac{3}{2}$ and the *y*-intercept is $b = 4$ *(continued)*

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.4 *(continued)*

6. *c.* $8x - 2y - 3 = 0$

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

$$y = 4x - \tfrac{3}{2}$$

The slope is $m = 4$ and the y-intercept is $b = -\tfrac{3}{2}$.

d. $6x = 9y$

$$y = \tfrac{6}{9}x = \tfrac{2}{3}x$$

$$y = \tfrac{2}{3}x$$

The slope is $m = \tfrac{2}{3}$ and the y-intercept is $b = 0$.

Intermediate Problems

7. The plumber charges a \$100 service charge plus 4(\$20) = \$80 per hour

Then $C = \$100 + \$80H$

Expressing this equation in the form $y = mx + b$

$$C = \$80H + \$100$$

On a plot of C vs. H, slope = \$80 and C-intercept = \$100.

8. Ehud earns \$1500 per month plus 5% of sales. Then gross earnings

$$E = \$1500 + 0.05R$$

Expressing this equation in the form $y = mx + b$

$$E = 0.05R + \$1500$$

On a plot of E vs. R, slope = 0.05 and E-intercept = \$1500.

9. *a.* Comparing the equation $F = \tfrac{9}{5}C + 32$ to $y = mx + b$,

we can conclude that a plot of F vs. C will have

slope = $\tfrac{9}{5}$ and F-intercept = 32 .

b. $\text{Slope} = \dfrac{\text{Change in F}}{\text{Change in C}}$

Therefore, (Change in F) = Slope(Change in C) = $\tfrac{9}{5}$(10 Celsius) = 18 Fahrenheit

c. $F = \tfrac{9}{5}C + 32$

$$\tfrac{9}{5}C = F - 32$$

$$C = \tfrac{5}{9}F - \tfrac{5}{9}(32) = \tfrac{5}{9}F - 17\tfrac{7}{9}$$

On a plot of C vs. F, slope = $\tfrac{5}{9}$ and C-intercept = $-17\tfrac{7}{9}$.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.4 *(continued)*

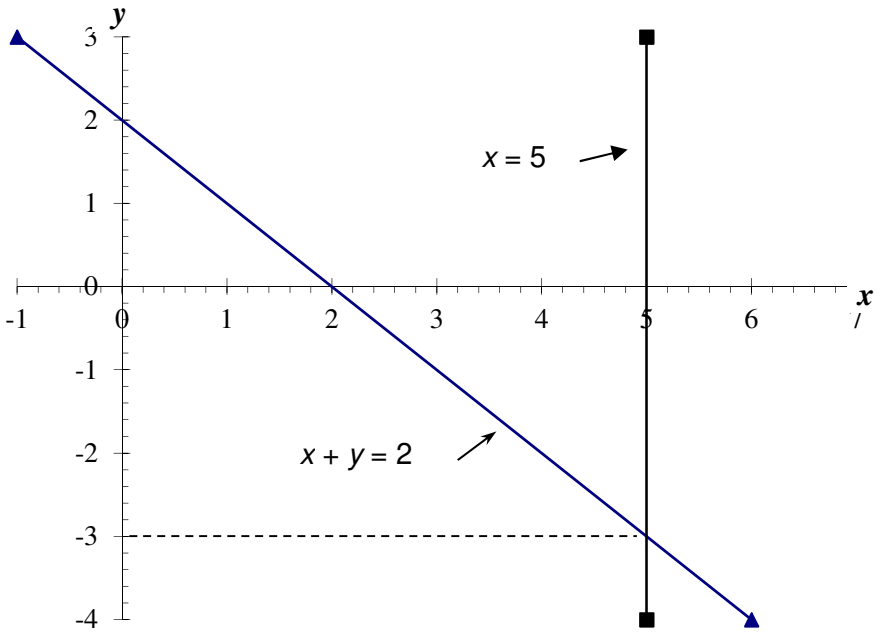
10. $x + y = 2$

x:	–1	6
y:	3	– 4

$x = 5$

x:	5	5
y:	3	– 4

The solution is
$(x, y) = (5, -3)$.



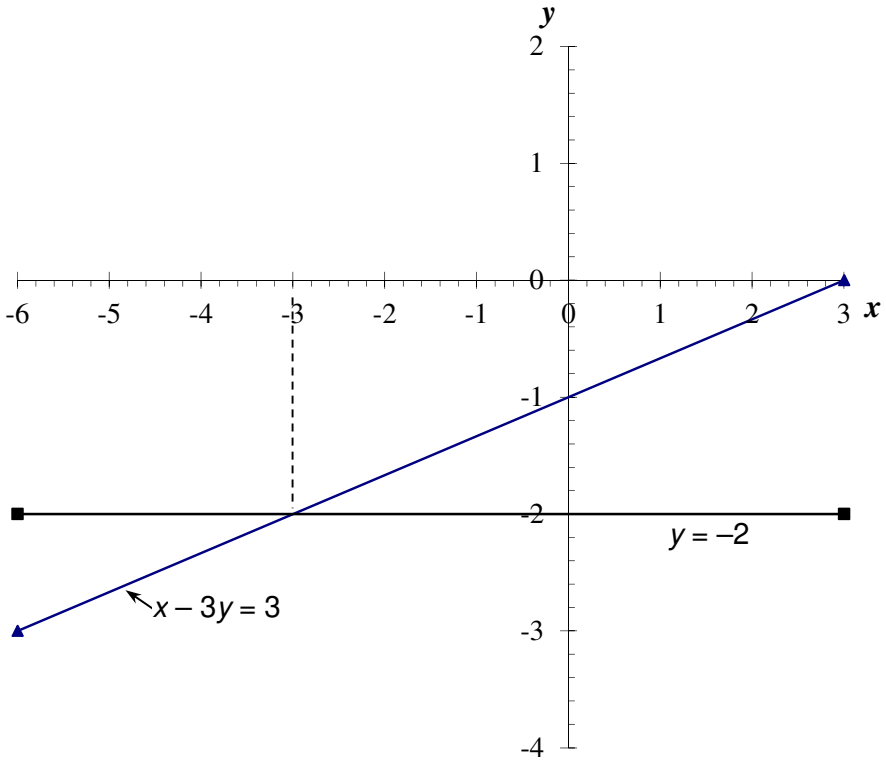
11. $x - 3y = 3$

x:	–6	3
y:	–3	0

$y = -2$

x:	–6	3
y:	–2	–2

The solution is
$(x, y) = (-3, -2)$.



Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.4 *(continued)*

12.

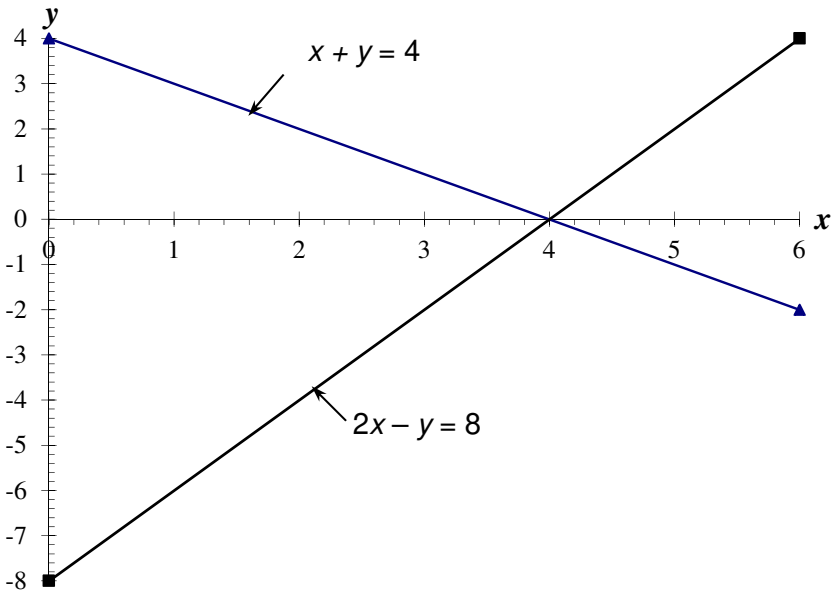
$x + y = 4$

x:	0	6
y:	4	–2

$2x - y = 8$

x:	0	6
y:	–8	4

The solution is $(x, y) = (4, 0)$.



13.

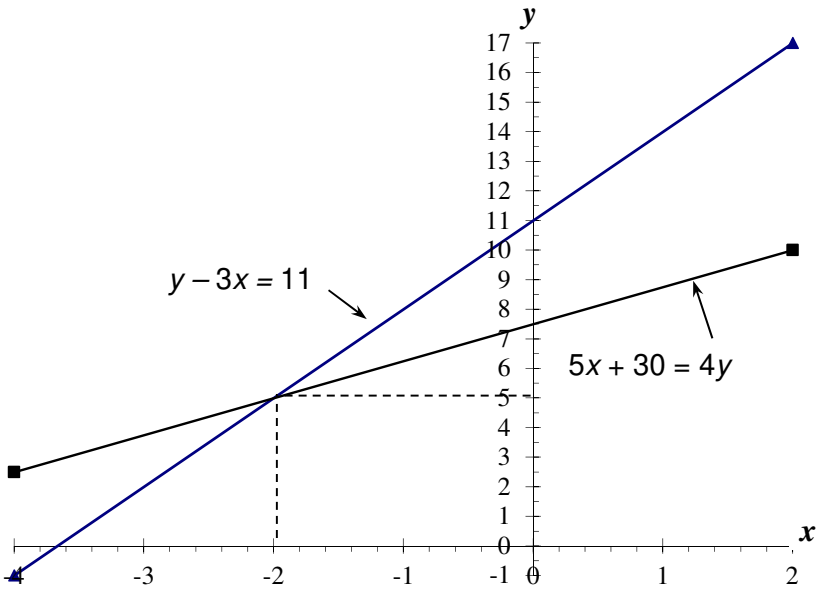
$y - 3x = 11$

x:	– 4	2
y:	–1	17

$5x + 30 = 4y$

x:	– 4	2
y:	2.5	10

The solution is $(x, y) = (–2, 5)$.



Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.4 *(continued)*

Advanced Problem

14. *a.* Given: $TR = \$6X$

On a plot of TR vs. X, slope = \$6 and TR-intercept = \$0.

b. $TC = \$2X + \$80{,}000$

On a plot of TC vs. X, slope = \$2 and TC-intercept = \$80,000.

c. $NI = \$4X - \$80{,}000$

On a plot of NI vs. X, slope = \$4 and NI-intercept = – \$80,000.

d. The steepest line is the one with the largest slope.

Therefore, the *TR* line is steepest.

e. The increase in NI per pair of sunglasses sold is the "change in NI" divided by the "change in X". This is just the slope of the NI vs. X line. Therefore, NI increases by \$4 for each pair of sunglasses sold.

f. The coefficient of X in the *TR* equation is the unit selling price, which is unchanged.

Therefore, the slope remains unchanged.

The coefficient of X in the *TC* equation is the unit cost.

Therefore, the slope decreases (from \$2 to \$1.75).

The coefficient of X in the *NI* equation equals

(Unit selling price) – (Unit cost)

Therefore, the slope increases (from \$4 to \$4.25).

Exercise 2.5

Basic Problems

1. Step 2: Hits last month = 2655 after the $\frac{2}{7}$ increase.

Let the number of hits 1 year ago be n.

Step 3: Hits last month = Hits 1 year ago + $\frac{2}{7}$(Hits 1 year ago)

Step 4: $2655 = n + \frac{2}{7}n$

Step 5: $2655 = \frac{9}{7}n$

Multiply both sides by $\frac{7}{9}$.

$n = 2655 \times \frac{7}{9} = 2065$

The Web site had 2065 hits in the same month 1 year ago.

2. Step 2: Retail price = \$712; Markup = 60% of wholesale of cost.
Let the wholesale cost be C.
Step 3: Retail price = Cost + 0.60(Cost)
Step 4: $712 = C + 0.6C$
Step 5: $712 = 1.6C$

$C = \frac{\$712}{1.6} = \$445.00$. The wholesale cost is \$445.00.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.5 *(continued)*

3. Step 2: Tag price = $39.95 (including 13% HST). Let the plant's pretax price be P.
   Step 3: Tag price = Pretax price + HST

   Step 4: $39.95 = P + 0.13P

   Step 5: $39.95 = 1.13P

   $$P = \frac{\$39.95}{1.13} = \$35.35$$

   The amount of HST is $39.95 – $35.35 = $\underline{\$4.60}$

4. Step 2: Commission rate = 2.5% on the first $5000 and 1.5% on the remainder
   Commission amount = $227. Let the transaction amount be x.

   Step 3: Commission amount = 0.025($5000) + 0.015(Remainder)

   Step 4: $227 = $125.00 + 0.015(x – $5000)

   Step 5: $102 = 0.015x – $75.00
   $102 + $75 = 0.015x

   $$x = \frac{\$177}{0.015} = \underline{\$11{,}800.00}$$

   The amount of the transaction was $11,800.00.

5. Step 2: Let the basic price be P. First 20 meals at P.
   Next 20 meals at P – $2. Additional meals at P – $3.

   Step 3: Total price for 73 meals = $1686

   Step 4: 20P + 20(P – $2) + (73 – 40)(P – $3) = $1686

   Step 5: 20P + 20P – $40 + 33P – $99 = $1686
   73P = $1686 + $99 + $40

   $$P = \frac{\$1825}{73} = \underline{\$25.00}$$

   The basic price per meal is $25.00.

6. Step 2: Rental Plan 1: $295 per week + $0.15 × (Distance in excess of 1000 km)
   Rental Plan 2: $389 per week
   Let d represent the distance at which the costs of both plans are equal.

   Step 3: Cost of Plan 1 = Cost of Plan 2

   Step 4: $295 + $0.15($d$ – 1000) = $389

   Step 5: $295 + 0.15d$ – $150 = $389
   0.15d$ = $244
   d = $\underline{1627 \text{ km}}$

   To the nearest kilometre, the unlimited driving plan will be cheaper if you drive more than 1627 km in the one-week interval.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.5 *(continued)*

7. Step 2: Tax rate = 38%; Overtime hourly rate = 1.5($23.50) = $35.25
   Cost of canoe = $2750
   Let h represent the hours of overtime Alicia must work.

   Step 3: Gross overtime earnings − Income tax = Cost of the canoe

   Step 4: $\$35.25h - 0.38(\$35.25h) = \$2750$

   Step 5: $\$21.855h = \$2750$
   $h = 125.83$ hours

   Alicia must work 125¾ hours of overtime to earn enough money to buy the canoe.

8. Let x represent the number of units of product X and
   y represent the number of units of product Y. Then

$$x + y = 93 \quad ①$$
$$0.5x + 0.75y = 60.5 \quad ②$$

   ① × 0.5: $0.5x + 0.5y = 46.5$

   Subtract: $0 + 0.25y = 14$
   $y = 56$

   Substitute into ①: $x + 56 = 93$
   $x = 37$

   Therefore, 37 units of X and 56 units of Y were produced last week.

9. Let the price per litre of milk be m and the price per dozen eggs be e. Then

$$5m + 4e = \$19.51 \quad ①$$
$$9m + 3e = \$22.98 \quad ②$$

   To eliminate e,

   ① × 3: $15m + 12e = \$58.53$

   ② × 4: $36m + 12e = \$91.92$

   Subtract: $-21m + 0 = -\$33.39$
   $m = \$1.59$

   Substitute into ①: $5(\$1.59) + 4e = \$19.51$
   $e = \$2.89$

   Milk costs $1.59 per litre and eggs cost $2.89 per dozen.

10. Let M be the number of litres of milk and J be the number of cans of orange juice per week.

$$\$1.50M + \$1.30J = \$57.00 \quad ①$$
$$\$1.60M + \$1.39J = \$60.85 \quad ②$$

   To eliminate M,

   ① × 1.60: $\$2.40M + \$2.08J = \$91.20$

   ② × 1.50: $\$2.40M + \$2.085J = \$91.275$

   Subtract: $0 - 0.005J = -\$0.075$
   $J = 15$

   Substitution of J = 15 into either equation will give M = 25. Hence 25 litres of milk and 15 cans of orange juice are purchased each week.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.5 *(continued)*

Intermediate Problems

11. Step 2: Number of two-bedroom homes = 0.4(Number of three-bedroom homes)
Number of two-bedroom homes = 2(Number of four-bedroom homes)
Total number of homes = 96
Let h represent the number of two-bedroom homes

Step 3: # 2-bedroom homes + # 3-bedroom homes + # 4-bedroom homes = 96

Step 4: $h + \frac{h}{0.4} + \frac{h}{2} = 96$

Step 5: $h + 2.5h + 0.5h = 96$
$4h = 96$
$h = 24$

There should be 24 two-bedroom homes, 2.5(24) = 60 three-bedroom homes, and 0.5(24) = 12 four-bedroom homes.

12. Step 2: Cost of radio advertising = 0.5(Cost of internet advertising)
Cost of TV advertising = 0.6(Cost of radio advertising)
Total advertising budget = $160,000
Let r represent the amount allocated to radio advertising

Step 3: Radio advertising + TV advertising + Internet advertising = $160,000

Step 4: $r + 0.6r + \frac{r}{0.5} = \$160{,}000$

Step 5: $3.6r = \$160{,}000$
$r = \$44{,}444.44$

The advertising budget allocations should be:
$44,444 to radio advertising,
0.6($44,444.44) = $26,667 to TV advertising, and
2($44,444.44) = $88,889 to internet advertising.

13. Step 2: By-laws require: 5 parking spaces per 100 square meters,
4% of spaces for customers with physical disabilities
In remaining 96%, # regular spaces = 1.4(# small car spaces)
Total area = 27,500 square meters
Let s represent the number of small car spaces.

Step 3: Total # spaces = # spaces for customers with physical disabilities + # regular spaces + # small spaces

Step 4: $\frac{27{,}500}{100} \times 5 = 0.04 \times \frac{27{,}500}{100} \times 5 \ + s + 1.4s$

Step 5: $1375 = 55 + 2.4s$
$s = 550$

The shopping centre must have 55 parking spaces for customers with physical disabilities, 550 small-car spaces, and 770 regular parking spaces.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.5 *(continued)*

14. Step 2: Overall portfolio's rate of return = 1.1%, equity fund's rate of return = –3.3%, bond fund's rate of return = 7.7%.
Let e represent the fraction of the portfolio initially invested in the equity fund.

Step 3: Overall rate of return = Weighted average rate of return
= (Equity fraction)(Equity return) + (Bond fraction)(Bond return)

Step 4: $1.1\% = e(-3.3\%) + (1 - e)(7.7\%)$

Step 5: $1.1 = -3.3e + 7.7 - 7.7e$
$-6.6 = -11.0e$
$e = 0.600$

Therefore, 60.0% of Erin's original portfolio was invested in the equity fund.

15. Step 2: Pile A steel is 5.25% nickel; pile B steel is 2.84% nickel.
We want a 32.5-tonne mixture from A and B averaging 4.15% nickel.
Let A represent the tonnes of steel required from pile A.

Step 3: Wt. of nickel in 32.5 tonnes of mixture
= Wt. of nickel in steel from pile A + Wt. of nickel in steel from pile B
= (% nickel in pile A)(Amount from A) + (% nickel in pile B)(Amount from B)

Step 4: $0.0415(32.5) = 0.0525A + 0.0284(32.5 - A)$

Step 5: $1.34875 = 0.0525A + 0.9230 - 0.0284A$
$0.42575 = 0.0241A$
$A = 17.67$ tonnes

The recycling company should mix 17.67 tonnes from pile A with 14.83 tonnes from pile B.

16. Step 2: Total options = 100,000
# of options to an executive = 2000 + # of options to an engineer
# of options to an engineer = 1.5(# of options to a technician)
There are 3 executives, 8 engineers, and 14 technicians.
Let t represent the number of options to each technician.

Step 3: Total options = Total options to engineers
+ Total options to technicians + Total options to executives

Step 4: $100{,}000 = 8(1.5t) + 14t + 3(2000 + 1.5t)$
Step 5: $= 12t + 14t + 6000 + 4.5t$
$94{,}000 = 30.5t$
$t = 3082$ options

Each technician will receive 3082 options,
each engineer will receive 1.5(3082) = 4623 options,
and each executive will receive 2000 + 4623 = 6623 options.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.5 *(continued)*

17. Step 2: Plan A: 20 cents/minute for local calls and 40 cents/minute for long distance calls
Plan B: 35 cents/minute any time
Let d represent the fraction of long-distance usage at which costs are equal.

Step 3: Cost of Plan A = Cost of plan B

Step 4: Pick any amount of usage in a month—say 1000 minutes.
$d(1000)\$0.40 + (1 - d)(1000)\$0.20 = 1000(\$0.35)$

Step 5:
$$400d + 200 - 200d = 350$$
$$200d = 150$$
$$d = 0.75$$

If long distance usage exceeds 75% of overall usage, plan B will be cheaper.

18. Step 2: Raisins cost \$3.75 per kg; peanuts cost \$2.89 per kg.
Cost per kg of ingredients in 50 kg of "trail mix" is to be \$3.20.
Let p represent the weight of peanuts in the mixture.

Step 3: Cost of 50 kg of trail mix = Cost of p kg peanuts + Cost of $(50 - p)$ kg of raisins

Step 4: $50(\$3.20) = p(\$2.89) + (50 - p)(\$3.75)$

Step 5:
$$\$160.00 = \$2.89p + \$187.50 - \$3.75p$$
$$-\$27.50 = -\$0.86p$$
$$p = 31.98 \text{ kg}$$

32.0 kg of peanuts should be mixed with 18.0 kg of raisins.

19. Step 2: Total bill = \$3310. Total hours = 41.
Hourly rate = \$120 for CGA
= \$50 for clerk.
Let x represent the CGA's hours.

Step 3: Total bill = (CGA hours x CGA rate) + (Clerk hours x Clerk rate)

Step 4: $\$3310 = x(\$120) + (41 - x)\$50$
$1260 = 70x$
$x = 18$

Step 5: $\$3310 = \$120x + \$2050 - \$50x$

The CGA worked 18 hours and the clerk worked $41 - 18 = 23$ hours.

20. Step 2: Total investment = \$32,760
Sue's investment = 1.2(Joan's investment)
Joan's investment = 1.2(Stella's investment)
Let L represent Stella's investment.

Step 3: Sue's investment + Joan's investment + Stella's investment = Total investment

Step 4: Joan's investment = 1.2L
Sue's investment = 1.2(1.2L) = 1.44L
1.44L + 1.2L + L = \$32,760

Step 5:
$$3.64L = \$32{,}760$$
$$L = \frac{\$32{,}760}{3.64} = \$9000$$

(continued)

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Stella will contribute $9000, Joan will contribute 1.2($9000) = $10,800, and Sue will contribute 1.2($10,800) = $12,960

21. Step 2: Sven receives 30% less than George (or 70% of George's share).
Robert receives 25% more than George (or 1.25 times George's share).
Net income = $88,880
Let G represent George's share.

Step 3: George's share + Robert's share + Sven's share = Net income

Step 4: G + 1.25G + 0.7G = $88,880

Step 5: 2.95G = $88,880
G = $30,128.81
George's share is $30,128.81, Robert's share is 1.25($30,128.81) = $37,661.02, and Sven's share is 0.7($30,128.81) = $21,090.17.

22. Step 2: Time to make X is 20 minutes.
Time to make Y is 30 minutes.
Total time is 47 hours. Total units = 120. Let Y represent the number of units of Y.

Step 3: Total time = (Number of X) × (Time for X) + (Number of Y) × (Time for Y)

Step 4: 47 × 60 = (120 – Y)20 + Y(30)

Step 5: 2820 = 2400 – 20Y + 30Y
420 = 10Y
Y = 42
Forty-two units of product Y were manufactured.

23. Step 2: Price of blue ticket = $19.00. Price of red ticket = $25.50.
Total tickets = 4460. Total revenue = $93,450.
Let the number of tickets in the red section be R.

Step 3: Total revenue = (Number of red × Price of red) + (Number of blue × Price of blue)

Step 4: $93,450 = R($25.50) + (4460 – R)$19.00

Step 5: 93,450 = 25.5R + 84,740 – 19R
6.5R = 8710
R = 1340
1340 seats were sold in the red section and 4460 – 1340 = 3120 seats were sold in the blue section.

24. Step 2: Regal owns a 58% interest in a mineral claim. Yukon owns the remainder (42%).
Regal sells one fifth of its interest for $1.2 million.
Let the V represent the implied value of the entire mineral claim.

Step 3: $\frac{1}{5}$ (or 20%) of a 58% interest is worth $1.2 million

Step 4: 0.20(0.58)V = $1,200,000

Step 5: $V = \dfrac{\$1{,}200{,}000}{0.20 \times 0.58} = \$10{,}344{,}828$

The implied value of Yukon's interest is
0.42V = 0.42 × $10,344,828 = $4,344,828

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.5 *(continued)*

25. Step 2: $\frac{5}{7}$ of entrants complete Level 1. $\frac{2}{9}$ of Level 1 completers fail Level 2.
587 students completed Level 2 last year.
Let the N represent the original number who began Level 1.
Step 3: $\frac{7}{9}$ of $\frac{5}{7}$ of entrants will complete Level 2.
Step 4: $\frac{7}{9} \times \frac{5}{7} N = 587$
Step 5: $N = \frac{9 \times 7}{7 \times 5} \times 587 = 1056.6$
1057 students began Level 1.

26. Step 2: $\frac{4}{7}$ of inventory was sold at cost.
$\frac{3}{7}$ inventory was sold to liquidators at 45% of cost, yielding $6700.
Let C represent the original cost of the entire inventory.
Step 3: $\frac{3}{7}$ of inventory was sold to liquidators at 45% of cost, yielding $6700.
Step 4: $\frac{3}{7}(0.45C) = \$6700$
Step 5: $C = \frac{7 \times \$6700}{3 \times 0.45} = \$34{,}740.74$
a. The cost of inventory sold to liquidators was
$\frac{3}{7}(\$34{,}740.74) = \$14{,}888.89$
b. The cost of the remaining inventory sold in the bankruptcy sale was
$\$34{,}740.74 - \$14{,}888.89 = \$19.851.85$

27. Let r represent the number of regular members and s the number of student members.

Then	$r +$	s	$= 583$	①
Total revenue:	$\$2140r +$	$\$856s$	$= \$942{,}028$	②
① × \$856:	$\$856r +$	$\$856s$	$= \$499{,}048$	
Subtract:	$\$1284r +$	0	$= \$442{,}980$	
			$r = 345$	
Substitute into ①:			$345 + s = 583$	
			$s = 238$	

The club had 238 student members and 345 regular members.

28. Let a represent the adult airfare and c represent the child airfare.

Mrs. Ramsey's cost:	$a +$	$2c$	$= \$610$	①
Chudnowskis' cost:	$2a +$	$3c$	$= \$1050$	②
① × 2:	$2a +$	$4c$	$= \$1220$	
Subtract:	$0 +$	$-c$	$= -\$170$	
Substitute c = \$170 into ①:	$a +2(\$170)$		$= \$610$	
			$a = \$610 - \$340 = \$270$	

The airfare is \$270 per adult and \$170 per child.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.5 *(continued)*

29. Let h represent the rate per hour and k represent the rate per km.

Vratislav's cost: $2h + 47k = \$\ 54.45$ ①
Bryn's cost: $5h + 93k = \$127.55$ ②

To eliminate h,

$① \times 5$: $10h + 235k = \$272.25$ ①
$② \times 2$: $10h + 186k = \$255.10$ ②
Subtract: $0 + 49k = \$\ 17.15$
$k = \$0.35$ per km

Substitute into ①:

$2h + 47(\$0.35) = \$54.45$
$2h = \$54.45 - \$16.45$
$h = \$19.00$ per hour

Budget Truck Rentals charged $19.00 per hour plus $0.35 per km.

Advanced Problems

30. Step 2: Each of 4 children receive 0.5(Wife's share).
Each of 13 grandchildren receive $0.\overline{3}$ (Child's share).
Total distribution = \$759,000. Let w represent the wife's share.

Step 3: Total amount = Wife's share + 4(Child's share) + 13(Grandchild's share)

Step 4: $\$759{,}000 = w + 4(0.5w) + 13\left(0.\overline{3}\right)(0.5w)$

Step 5: $\$759{,}000 = w + 2w + 2.1\overline{6}w$
$= 5.1\overline{6}w$
$w = \$146{,}903.226$

Each child will receive $0.5(\$146{,}903.226) = \$73{,}451.61$
and each grandchild will receive $0.\overline{3}\ (\$73{,}451.61) = \$24{,}483.87$.

31. Step 2: Stage B workers = 1.6(Stage A workers)
Stage C workers = 0.75(Stage B workers)
Total workers = 114. Let A represent the number of Stage A workers.

Step 3: Total workers = A workers + B workers + C workers

Step 4: $114 = A + 1.6A + 0.75(1.6A)$

Step 5: $114 = 3.8A$
$A = 30$
30 workers should be allocated to Stage A, $1.6(30) = 48$ workers to Stage B,
and $114 - 30 - 48 = 36$ workers to Stage C.

32. Step 2: Hillside charge = 2(Barnett charge) – \$1000
Westside charge = Hillside charge + \$2000
Total charges = \$27,600. Let B represent the Barnett charge.

Step 3: Total charges = Barnett charge + Hillside charge + Westside charge

Step 4: $\$27{,}600 = B + 2B - \$1000 + 2B - \$1000 + \$2000$

Step 5: $\$27{,}600 = 5B$
$B = \$5520$
Hence, the Westside charge is $2(\$5520) - \$1000 + \$2000 = \$12{,}040$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.6

Basic Problems

1. $c = \dfrac{V_f - V_i}{V_i} \times 100 = \dfrac{\$100 - \$95}{\$95} \times 100 = \underline{5.26\%}$

2. $c = \dfrac{V_f - V_i}{V_i} \times 100 = \dfrac{35\,\text{kg} - 135\,\text{kg}}{135\,\text{kg}} \times 100 = \underline{-74.07\%}$

3. $c = \dfrac{V_f - V_i}{V_i} \times 100 = \dfrac{0.13 - 0.11}{0.11} \times 100 = \underline{18.18\%}$

4. $c = \dfrac{V_f - V_i}{V_i} \times 100 = \dfrac{0.085 - 0.095}{0.095} \times 100 = \underline{-10.53\%}$

5. $V_f = V_i(1+c) = \$134.39[1+(-0.12)] = \$134.39(0.88) = \underline{\$118.26}$

6. $V_f = V_i(1+c) = 112\text{g}(1+1.12) = \underline{237.44\text{g}}$

7. $V_i = \dfrac{V_f}{1+c} = \dfrac{\$75}{1+2.00} = \underline{\$25.00}$

8. $V_i = \dfrac{V_f}{1+c} = \dfrac{\$75}{1+(-0.50)} = \underline{\$150.00}$

9. Given: V_i = \$90, V_f = \$100

$$c = \frac{\$100 - \$90}{\$90} \times 100 = \underline{11.11\%}$$

\$100 is 11.11% more than \$90.

10. Given: V_i = \$110, V_f = \$100

$$c = \frac{V_f - V_i}{V_i} \times 100 = \frac{\$100 - \$110}{\$110} \times 100 = \underline{-9.09\%}$$

\$100 is 9.09% less than \$110.

11. Given: c = 25%, V_f = \$100

$$V_i = \frac{V_f}{1+c} = \frac{\$100}{1+0.25} = \underline{\$80.00}$$

\$80.00 increased by 25% equals \$100.00.

12. Given: V_f = \$75, c = 75%

$$V_i = \frac{V_f}{1+c} = \frac{\$75}{1+0.75} = \underline{\$42.86}$$

\$75 is 75% more than \$42.86.

13. Given: V_i = \$759.00, V_f = \$754.30

$$c = \frac{V_f - V_i}{V_i} \times 100 = \frac{\$754.30 - \$759.00}{\$759.00} \times 100 = \underline{-0.62\%}$$

\$754.30 is <u>0.62% less</u> than \$759.00.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.6 *(continued)*

14. Given: V_i = \$75, c = 75%

$$V_f = V_i(1 + c) = \$75(1 + 0.75) = \underline{\$131.25}$$

\$75.00 becomes \$131.25 after an increase of 75%.

15. Given: V_f = \$100, c = – 10%

$$V_i = \frac{V_f}{1+c} = \frac{\$100}{1+(-0.10)} = \underline{\underline{\$111.11}}$$

\$100.00 is 10% less than \$111.11.

16. Given: V_f = \$100, c = – 20%

$$V_i = \frac{V_f}{1+c} = \frac{\$100}{1+(-0.20)} = \underline{\underline{\$125.00}}$$

\$125 after a reduction of 20% equals \$100.

17. Given: V_i = \$900, c = –90%

$$V_f = V_i(1 + c) = \$900[1 + (-0.9)] = \underline{\$90.00}$$

\$900 after a decrease of 90% is \$90.00.

18. Given: c = 0.75%, V_i = \$10,000

$$V_f = V_i(1 + c) = \$10{,}000(1 + 0.0075) = \underline{\$10{,}075.00}$$

\$10,000 after an increase of $\frac{3}{4}$% is \$10,075.00.

19. Given: c = 210%, V_f = \$465

$$V_i = \frac{V_f}{1+c} = \frac{\$465}{1+2.1} = \underline{\$150.00}$$

\$150.00 after being increased by 210% equals \$465.

Intermediate Problems

20. Let the retail price be p. Then

$$p + 0.13p = \$281.37$$

$$p = \frac{\$281.37}{1.13} = \underline{\$249.00}$$

The jacket's retail price was \$249.00.

21. Let the number of students enrolled in September, 2014 be s. Then

$$s + 0.0526s = 1200$$

$$1.0526s = 1200$$

$$s = \frac{1200}{1.0526} \approx \underline{\underline{1140}}$$

Rounded to the nearest person, the number of students enrolled in September, 2014 was 1140.

22. Let next year's sales be n. Then

$$n = \$18{,}400(1 + 0.12)$$

$$n = \underline{\$20{,}608}$$

Nykita is expecting next year's sales to be \$20,608.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.6 *(continued)*

23. Given: V_i = \$285,000, V_f = \$334,000

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{\$334{,}000 - \$285{,}000}{\$285{,}000} \times 100\% = \underline{17.19\%}$$

The value of Amir's real estate investment grew by 17.19%.

24. Let Jamal's earnings this year be e. Then

$$e = \$87{,}650(1 - 0.065)$$
$$e = \$81{,}952.75$$

Rounded to the nearest dollar, Jamal's earnings this year were \$81,953.

25. Let the population figure on July 1, 2011 be p. Then

$$p + 0.0439p = 35{,}851{,}800$$
$$p = \frac{35{,}851{,}800}{1.0439} \approx 34{,}344{,}094$$

Rounded to the nearest 1000, the population on July 1, 2011 was 34,344,000.

26. *a.* Given: V_i = 32,400, V_f = 27,450

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{27{,}450 - 32{,}400}{32{,}400} \times 100\% = \underline{-15.28\%}$$

The number of hammers sold declined by 15.28%.

b. Given: V_i = \$15.10, V_f = \$15.50

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{\$15.50 - \$15.10}{\$15.10} \times 100\% = \underline{2.65\%}$$

The average selling price increased by 2.65%.

c. Year 1 revenue = 32,400(\$15.10) = \$489,240
Year 2 revenue = 27,450(\$15.50) = \$425,475

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{\$425{,}475 - \$489{,}240}{\$489{,}240} \times 100\% = \underline{-13.03\%}$$

The revenue decreased by 13.03%.

27. *a.* Given: V_i = \$0.55, V_f = \$1.55

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{\$1.55 - \$0.55}{\$0.55} \times 100\% = \underline{181.82\%}$$

The share price rose by 181.82% in the first year.

b. Given: V_i = \$1.55, V_f = \$0.75

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{\$0.75 - \$1.55}{\$1.55} \times 100\% = \underline{-51.61\%}$$

The share price declined by 51.61% in the second year.

c. Given: V_i = \$0.55, V_f = \$0.75

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{\$0.75 - \$0.55}{\$0.55} \times 100\% = \underline{36.36\%}$$

The share price rose by 36.36% over 2 years.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.6 *(continued)*

28. Initial unit price = $\frac{\$5.49}{1.65\,l}$ = \$3.327 per litre

Final unit price = $\frac{\$7.98}{2.2\,l}$ = \$3.627 per litre

The percent increase in the unit price is

$$c = \frac{V_f - V_i}{V_i} \times 100\% = \frac{\$3.627 - \$3.327}{\$3.327} \times 100\% = \underline{9.02\%}$$

29. Initial unit price = $\frac{1098 \text{ cents}}{700 \text{ g}}$ = 1.5686 cents per g

Final unit price = $\frac{998 \text{ cents}}{600 \text{ g}}$ = 1.6633 cents per g

The percent increase in unit price is

$$c = \frac{V_f - V_i}{V_i} \times 100 = \frac{1.6633 - 1.5686}{1.5686} \times 100 = \underline{6.04\%}$$

30. Given: V_f = \$348,535, $c = -1.8\%$

$$V_i = \frac{V_f}{1+c} = \frac{\$348{,}535}{0.982} \approx \underline{\$354{,}900}$$

Rounded to the nearest \$100, the average price one month ago was \$354,900.

31. Given: V_f = \$348.60, c = –0.30

$$V_i = \frac{V_f}{1+c} = \frac{\$348.60}{1+(-0.30)} = \frac{\$348.60}{0.70} = \underline{\$498.00}$$

The regular price of the boots is \$498.00.

32. Given: V_f = 231,200,000, c = 3.66%

$$V_i = \frac{V_f}{1+c} = \frac{231{,}200{,}000}{1+0.0366} = \frac{231{,}200{,}000}{1.0366} \approx \underline{223{,}037{,}000}$$

Rounded to the nearest 1000 units, Apple sold 223,037,000 iPhones in 2014.

33. Given: V_f = \$2,030,000,000, c = 241%

$$c = \frac{V_f - V_i}{V_i} \times 100$$

$$241 = \frac{\$2{,}030{,}000{,}000 - V_i}{V_i} \times 100$$

$$2.41 = \frac{\$2{,}030{,}000{,}000 - V_i}{V_i}$$

$$2.41V_i = \$2{,}030{,}000{,}000 - V_i$$

$$3.41V_i = \$2{,}030{,}000{,}000$$

$$V_i = \frac{\$2{,}030{,}000{,}000}{3.41} \approx \$595{,}308{,}000$$

Rounded to the nearest \$1000, Twitter's 2013 advertising revenues were \$595,308,000.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.6 *(continued)*

34. The fees to Fund A will be
$$\frac{(\text{Fees to Fund A})-(\text{Fees to Fund B})}{(\text{Fees to Fund B})}\times 100\% = \frac{2.38\%-1.65\%}{1.65\%}\times 100\% = \underline{44.24\%}$$
more than the fees to Fund B.

35. Percent change in the GST rate
$$= \frac{(\textit{Final GST rate})-(\textit{Initial GST rate})}{(\textit{Initial GST rate})}\times 100\% = \frac{5\%-6\%}{6\%}\times 100\% = \underline{\underline{-16.67\%}}$$
The GST paid by consumers was reduced by 16.67%.

36. Given: V_f = \$0.45, c = 76%
$$V_i = \frac{V_f}{1+c} = \frac{\$0.45}{1+(-0.76)} = \$1.88$$
Price decline = $V_i - V_f$ = \$1.88 – \$0.45 = \$1.43
The share price dropped by \$1.43.

37. If the Canadian dollar is worth 1.5% less than the US dollar,
Canadian dollar = (1 – 0.015)(US dollar) = 0.985(US dollar)
Hence, US dollar = $\frac{\text{Canadian dollar}}{0.985}$ = 1.0152(Canadian dollar)
Therefore, the US dollar is worth 1.52% more than the Canadian dollar.

38. Current unit price = $\frac{115 \text{ cents}}{100 \text{ g}}$ = 1.15 cents per g
New unit price = 1.075(1.15 cents per g) = 1.23625 cents per g
Price of an 80-g bar = (80 g) × (1.23625 cents per g) = 98.9 cents = \$0.99

39. Canada's exports to US exceeded imports from the US by 14.1%.
That is, Exports = 1.141(Imports)

Therefore, Imports = $\frac{\text{Exports}}{1.141}$ = 0.8764(Exports)
That is, Canada's imports from US (= US exports to Canada) were
1 – 0.8764 = 0.1236 = 12.36%
less than Canada's exports to US (= US imports from Canada.)

40. Given: 2014 sales revenues were 14.2% less than 2013 sales revenues
Hence, (Sales for 2014) = (1 – 0.142)(Sales for 2013) = 0.858(Sales for 2013)
Therefore, (Sales for 2013) = $\frac{(\text{Sales for 2014})}{0.858}$ = 1.1655(Sales for 2014)
That is, sales revenues for 2013 were 116.55% of sales revenues for 2014.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.6 *(continued)*

Advanced Problems

41. Given: For the appreciation, V_i = Purchase price, c = 140%, V_f = List price
For the price reduction, V_i = List price, c = –10%, V_f = \$172,800

List price = $\dfrac{V_f}{1+c} = \dfrac{\$172{,}800}{1+(-0.1)} = \$192{,}000$

Original purchase price = $\dfrac{V_f}{1+c} = \dfrac{\$192{,}000}{1+1.4} = \underline{\underline{\$80{,}000}}$

The owner originally paid \$80,000 for the property.

42. Given: For the markup, V_i = Cost, c = 22%, V_f = List price
For the markdown, V_i = List price, c = –10%, V_f = \$17,568

List price = $\dfrac{V_f}{1+c} = \dfrac{\$17{,}568}{1+(-0.10)} = \$19{,}520$

Cost (to dealer) = $\dfrac{V_f}{1+c} = \dfrac{\$19{,}520}{1+0.22} = \underline{\underline{\$16{,}000}}$

The dealer paid \$16,000 for the car.

43. Next year there must be 15% fewer students per teacher.
With the same number of students,

$$\frac{\text{Students}}{\text{Teachers next year}} = 0.85\left(\frac{\text{Students}}{\text{Teachers now}}\right)$$

Therefore, Teachers next year = $\dfrac{\text{Teachers now}}{0.85}$ = 1.1765(Teachers now)

That is, if the number of students does not change, the number of teachers must be <u>increased by 17.65%</u>.

44. Use ppm as the abbreviation for "pages per minute".
Given: Lightning printer prints 30% more ppm than the Reliable printer.
That is, the Lightning's printing speed is 1.30 times the Reliable's printing speed.
Therefore, the Reliable's printing speed is

$\dfrac{1}{1.3}$ = 0.7692 = 76.92% of the Lightning's printing speed

Therefore, the Reliable's printing speed is
100% – 76.92% = 23.08% less than the Lighting's speed.
The Lightning printer will require <u>23.08% less time</u> than the Reliable for a long printing job.

45. Given: Euro is worth 32% more than the Canadian dollar.
That is, Euro = 1.32(Canadian dollar)

Therefore, Canadian dollar = $\dfrac{\text{Euro}}{1.32}$ = 0.7576(Euro) = 75.76% of a Euro.

That is, the Canadian dollar is worth 100% – 75.76% = <u>24.24% less</u> than the Euro.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exercise 2.6 *(continued)*

46. Let us use OT as an abbreviation for "overtime".
The number of OT hours permitted by this year's budget is

$$\text{OT hours (this year)} = \frac{\text{OT budget (this year)}}{\text{OT hourly rate (this year)}}$$

The number of overtime hours permitted by next year's budget is

$$\text{OT hours (next year)} = \frac{\text{OT budget (next year)}}{\text{OT hourly rate (next year)}} = \frac{1.03[\text{OT budget (this year)}]}{1.05[\text{OT hourly rate (this year)}]}$$

$$= 0.98095\frac{\text{OT budget (this year)}}{\text{OT hourly rate (this year)}}$$

= 98.10% of this year's OT hours

The number of OT hours must be reduced by 100% − 98.10% = <u>1.90%</u>.

Review Problems

Basic Problems

1. *a.* $2(7x - 3y) - 3(2x - 3y) = 14x - 6y - 6x + 9y =$ <u>$8x + 3y$</u>

   b. $15x - (4 - 10x + 12) = 15x - 4 + 10x - 12 =$ <u>$25x - 16$</u>

2. Given: $NI = \$200{,}000$, $CM = \$8$, $X = 40{,}000$

$$NI = (CM)X - FC$$
$$\$200{,}000 = \$8(40{,}000) - FC$$
$$\$200{,}000 - \$320{,}000 = -FC$$
$$-\$120{,}000 = -FC$$
$$FC = \underline{\$120{,}000}$$

3. Given: $S = \$1243.75$, $P = \$1200$, $t = \frac{7}{12}$

$$S = P(1 + rt)$$
$$\$1243.75 = \$1200\left[1 + r\left(\tfrac{7}{12}\right)\right]$$
$$\frac{\$1243.75}{\$1200} = 1 + r\left(\tfrac{7}{12}\right)$$
$$1.0365 - 1 = r\left(\tfrac{7}{12}\right)$$
$$0.0365 = 0.58\overline{3}\ r$$
$$r = \frac{0.0365}{0.58\overline{3}}$$
$$r = 0.0626 \times 100\% = \underline{6.26\%}$$

4. *a.* $3.1t + 145 = 10 + 7.6t$
$3.1t - 7.6t = 10 - 145$
$-4.5t = -135$
<u>$t = 30$</u>

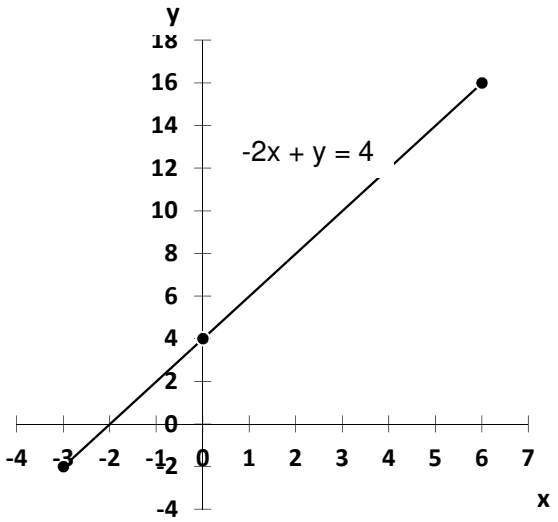
   b. $1.25y - 20.5 = 0.5y - 11.5$
$1.25y - 0.5y = -11.5 + 20.5$
$0.75y = 9$
<u>$y = 12$</u>

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

5.

x:	–3	0	6
y:	–2	4	16



6. In each part, rearrange the equation to render it in the form $y =$ (slope)$x +$ (intercept)

a. $2b + 3 = 5a$

$2b = 5a - 3$

$b = \frac{5}{2}a - \frac{3}{2}$

The slope is $\frac{5}{2}$ and the *b*-intercept is $-\frac{3}{2}$.

b. $3a - 4b = 12$

$-4b = -3a + 12$

$b = \frac{3}{4}a - 3$

The slope is $\frac{3}{4}$ and the *b*-intercept is –3 .

c. $7a = -8b$

$8b = -7a$

$b = -\frac{7}{8}a$

The slope is $-\frac{7}{8}$ and the *b*-intercept is 0 .

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

7. Step 2: Total revenue for the afternoon: $240.75
Total number of swimmers for the afternoon: 126
Adult price: $3.50
Child price: $1.25
Let A represent the number of adults and C represent the number of children.

Step 3: Total number of swimmers = Number of adults + Number of children
Total revenue = Revenue from adults + Revenue from children

Step 4: $126 = A + C$ ①
$\$240.75 = \$3.50A + \$1.25C$ ②

Step 5: Rearrange ①: $A = 126 - C$
Substitute into ②: $\$240.75 = \$3.50(126 - C) + \$1.25C$
Sove: $\$240.75 = \$441 - \$3.50C + \$1.25C$
$\$240.75 = \$441 - \$2.25C$
$\$240.75 - \$441 = -\$2.25C$
$-\$200.25 = -\$2.25C$
$C = -\$200.25/-\$2.25 = 89$

There were 89 children and 126 – 89 = 37 adults who swam during the afternoon.

8. Step 2: Total kilometres paved = 11.5.
There were 4.25 more kilometres paved on day two than on day one.
Let the number of kilometres paved on day one be X.
Then the number of kilometres paved on day two is (X + 4.25)

Step 3: Total Kms paved = Kms paved on day one + Kms paved on day two

Step 4: 11.5 = X + (X + 4.25)

Step 5: 11.5 = 2X + 4.25
2X = 11.5 – 4.25
2X = 7.25
X = 7.25/2 = 3.625

3.625 kilometres were paved on day one and 3.625 + 4.25 =7.875 kilometres were paved on day two.

9. *a.* Given: $c = 17.5\%$, $V_i = \$29.43$
$V_f = V_i(1 + c) = \$29.43(1.175) = \underline{\underline{\$34.58}}$
$34.58 is 17.5% more than $29.43.

b. Given: $V_f = \$100$, $c = -80\%$

$$V_i = \frac{V_f}{1+c} = \frac{\$100}{1-0.80} = \underline{\underline{\$500.00}}$$

80% off $500 leaves $100.

c. Given: $V_f = \$100$, $c = -15\%$

$$V_i = \frac{V_f}{1+c} = \frac{\$100}{1-0.15} = \underline{\underline{\$117.65}}$$

$117.65 reduced by 15% equals $100.

(continued)

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

9. *d.* Given: V_i = \$47.50, c = 320%
$V_f = V_i(1 + c)$ = \$47.50(1 + 3.2) = \$199.50
\$47.50 after an increase of 320% is \$199.50.

e. Given: c = – 62%, V_f = \$213.56

$$V_i = \frac{V_f}{1+c} = \frac{\$213.56}{1-0.62} = \$562.00$$

\$562 decreased by 62% equals \$213.56.

f. Given: c = 125%, V_f = \$787.50

$$V_i = \frac{V_f}{1+c} = \frac{\$787.50}{1+1.25} = \$350.00$$

\$350 increased by 125% equals \$787.50.

g. Given: c = – 30%, V_i = \$300

$$V_f = V_i(1+c) = \$300(1-0.30) = \$210.00$$

\$210 is 30% less than \$300.

Intermediate Problems

10. $$\frac{9y-7}{3} - 2.3(y-2) = 3y - 2.\overline{3} - 2.3y + 4.6 = 0.7y + 2.2\overline{6}$$

11. $4(3a + 2b)(2b – a) – 5a(2a – b) = 4(6ab – 3a^2 + 4b^2 – 2ab) – 10a^2 + 5ab$
$= – 22a^2 + 21ab + 16b^2$

12. *a.* $L(1 – d_1)(1 – d_2)(1 – d_3)$ = \$340(1 – 0.15)(1 – 0.08)(1 – 0.05) = \$252.59

b. $$\frac{R}{i}\left[1-\frac{1}{(1+i)^n}\right] = \frac{\$575}{0.085}\left[1-\frac{1}{(1+0.085)^3}\right] = \$6764.706(1-0.7829081) = \$1468.56$$

13. $$N = L(1-d_1)(1-d_2)(1-d_3)$$
\$324.30 = \$498(1 – 0.20)(1 – d_2)(1 – 0.075)
\$324.30 = \$368.52(1 – d_2)
$$\frac{\$324.30}{\$368.52} = (1 - d_2)$$
d_2 = 1 – 0.8800 = 0.120 = 12.0%

14. *a.* $6(4y – 3)(2 – 3y) – 3(5 – y)(1 + 4y) = 6(8y – 12y^2 – 6 + 9y) – 3(5 + 20y – y – 4y^2)$
$= – 60y^2 + 45y – 51$

b. $$\frac{5b-4}{4} - \frac{25-b}{1.25} + \frac{7}{8}b = 1.25b - 1 - 20 + 0.8b + 0.875b = 2.925b - 21$$

c. $$\frac{96nm^2 - 72n^2m^2}{48n^2m} = \frac{4m - 3nm}{2n} = \frac{4m}{2n} - \frac{3nm}{2n} = 2\frac{m}{n} - 1.5m$$

15. $$\frac{(-3x^2)^3(2x^{-2})}{6x^5} = \frac{(-27x^6)(2x^{-2})}{6x^5} = -\frac{9}{x}$$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

16. *a.* $1.0075^{24} = \underline{1.19641}$

b. $(1.05)^{1/6} - 1 = \underline{0.00816485}$

c. $\dfrac{(1+0.0075)^{36} - 1}{0.0075} = \underline{41.1527}$

17. *a.* $4a - 5b = 30$ ①

$2a - 6b = 22$ ②

To eliminate a,

① × 1: $4a - 5b = 30$

② × 2: $\underline{4a - 12b} = \underline{44}$

Subtract: $7b = -14$

$b = -2$

Substitute into ①: $4a - 5(-2) = 30$

$4a = 30 - 10$

$a = 5$

Hence, $\underline{(a, b)} = \underline{(5, -2)}$

b. $76x - 29y = 1050$ ①

$-13x - 63y = 250$ ②

To eliminate x,

① × 13: $988x - 377y = 13{,}650$

② × 76: $-\underline{988x - 4788y} = \underline{19{,}000}$

Add: $-5165y = 32{,}650$

$y = -6.321$

Substitute into ①: $76x - 29(-6.321) = 1050$

$76x = 1050 - 183.31$

$x = 11.40$

Hence, $\underline{(x, y) = (11.40, -6.32)}$

18. $3x + 5y = 11$ ①

$2x - y = 16$ ②

To eliminate y,

①: $3x + 5y = 11$

② × 5: $\underline{10x - 5y} = \underline{80}$

Add: $13x + 0 = 91$

$x = 7$

Substitute into equation ②: $2(7) - y = 16$

$y = -2$

Hence, $\underline{(x, y)} = \underline{(7, -2)}$

19. The homeowner pays \$28 per month plus \$2.75 per cubic metre of water used.

Then $B = \$28 + \$2.75C$

Expressing this equation in the form $y = mx + b$

$B = \$2.75C + \$28$

On a plot of *B* vs. *C*, <u>slope = \$2.75</u> and <u>*B*-intercept = \$28</u>.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

20.

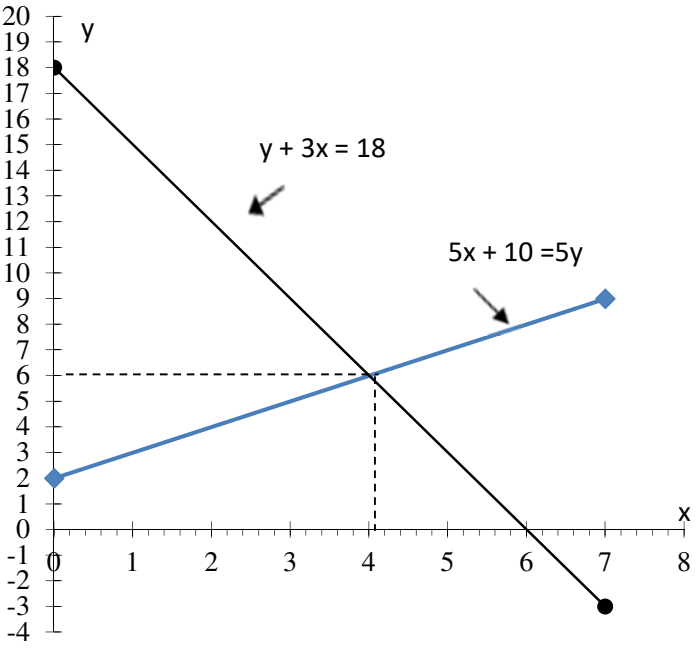
$y + 3x = 18$

x:	0	7
y:	18	-3

$5x + 10 = 5y$

x:	0	7
y:	2	9

The solution is $(x, y) = (4,6)$.



21. Given: Grace's share = 1.2(Kajsa's share); Mary Anne's share = $\frac{5}{8}$ (Grace's share)

Total allocated = $36,000
Let K represent Kajsa's share.
(Kajsa's share) + (Grace's share) + (Mary Anne's share) = $36,000

$$K + 1.2K + \frac{5}{8}(1.2K) = \$36{,}000$$

$$2.95\,K = \$36{,}000$$

$$K = \$12{,}203.39$$

Kajsa should receive $12,203.39. Grace should receive 1.2K = $14,644.07.
Mary Anne should receive $\frac{5}{8}$ ($14,644.07) = $9152.54.

22. Given: Total initial investment = $7800; Value 1 year later = $9310
Percent change in ABC portion = 15%
Percent change in XYZ portion = 25%
Let X represent the amount invested in XYZ Inc.
The solution "idea" is:

(Amount invested in ABC)1.15 + (Amount invested in XYZ)1.25 = $9310

Hence,

$$(\$7800 - X)1.15 + (X)1.25 = \$9310$$

$$\$8970 - 1.15X + 1.25X = \$9310$$

$$0.10X = \$9310 - \$8970$$

$$X = \$3400$$

Rory invested $3400 in XYZ Inc. and $7800 – $3400 = $4400 in ABC Ltd.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

23. Let R represent the price per kg for red snapper and
let L represent the price per kg for lingcod. Then

$$370R + 264L = \$2454.20 \quad ①$$
$$255R + 304L = \$2124.70 \quad ②$$

To eliminate R,

① ÷ 370: $R + 0.71351L = \$6.6330$
② ÷ 255: $R + 1.19216L = \$8.3322$
Subtract: $-0.47865L = -\$1.6992$
$L = \$3.55$

Substitute into ①: $370R + 264(\$3.55) = \$2454.20$
$370R = \$1517.00$
$R = \$4.10$

Nguyen was paid $3.55 per kg for lingcod and $4.10 per kg for red snapper.

24. Given:

	Year 1 value (V_i)	Year 2 *value* (V_f)
Gold produced:	34,300 oz.	23,750 oz.
Average price:	$1160	$1280

a. Percent change in gold production $= \dfrac{23{,}750 - 34{,}300}{34{,}300} \times 100\% = -30.76\%$

b. Percent change in price $= \dfrac{\$1280 - \$1160}{\$1160} \times 100\% = 10.34\%$

c. Year 1 revenue, $V_i = 34{,}300(\$1160) = \$39.788$ million
Year 2 revenue, $V_f = 23{,}750(\$1280) = \$30.400$ million

Percent change in revenue $= \dfrac{\$30.400 - \$39.788}{\$39.788} \times 100\% = -23.60\%$

25. Given: For the first year, $V_i = \$3.40$, $V_f = \$11.50$.
For the second year, $V_i = \$11.50$, $c = -35\%$.

a. $c = \dfrac{V_f - V_i}{V_i} \times 100\% = \dfrac{\$11.50 - \$3.40}{\$3.40} \times 100\% = 238.24\%$

The share price increased by 238.24% in the first year.

b. Current share price, $V_f = V_i\,(1 + c) = \$11.50(1 - 0.35) = \$7.48$.

26. Given: For the first year, $c = 150\%$
For the second year, $c = -40\%$, $V_f = \$24$

The price at the beginning of the second year was

$$V_i = \frac{V_f}{1+c} = \frac{\$24}{1-0.40} = \$40.00 = V_f \text{ for the first year.}$$

The price at the beginning of the first year was

$$V_i = \frac{V_f}{1+c} = \frac{\$40.00}{1+1.50} = \$16.00$$

Barry bought the stock for $16.00 per share.

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

27. Given: Last year's revenue = \$2,347,000
Last year's expenses = \$2,189,000

a. Given: Percent change in revenue = 10%; Percent change in expenses = 5%
Anticipated revenues, $V_f = V_i(1 + c)$ = \$2,347,000(1.1) = \$2,581,700
Anticipated expenses = \$2,189,000(1.05) = \$2,298,450
Anticipated profit = \$283,250
Last year's profit = \$2,347,000 – \$2,189,000 = \$158,000

$$\text{Percent increase in profit} = \frac{\$283{,}250 - \$158{,}000}{\$158{,}000} \times 100\% = \underline{\underline{79.27\%}}$$

b. Given: c(revenue) = –10%; c(expenses) = – 5%
Anticipated revenues = \$2,347,000(1 – 0.10) = \$2,112,300
Anticipated expenses = \$2,189,000(1 – 0.05) = \$2,079,550
Anticipated profit \$32,750

$$\text{Percent change in profit} = \frac{\$32{,}750 - \$158{,}000}{\$158{,}000} \times 100\% = \underline{\underline{-79.27\%}}$$

The operating profit will decline by 79.27%.

28. *a.* $\dfrac{\left(1.006\overline{6}\right)^{240} - 1}{0.006\overline{6}} = \dfrac{4.926802 - 1}{0.006\overline{6}} = \underline{\underline{589.020}}$

b. $(1 + 0.025)^{1/3} - 1 = \underline{\underline{0.00826484}}$

Advanced Problems

29. $$\left(-\frac{2x^2}{3}\right)^{-2}\left(\frac{5^2}{6x^3}\right)\left(-\frac{15}{x^5}\right)^{-1} = \left(\frac{3}{2x^2}\right)^2\left(\frac{25}{6x^3}\right)\left(-\frac{x^5}{15}\right) = \underline{\underline{-\frac{5}{8x^2}}}$$

30. *a.* $\dfrac{x}{1.08^3} + \dfrac{x}{2}(1.08)^4 = \$850$

$0.793832x + 0.680245x = \$850$

$x = \underline{\underline{\$576.63}}$

Check: $\dfrac{\$576.63}{1.08^3} + \dfrac{\$576.63}{2}(1.08)^4 = \$457.749 + \$392.250 = \$850.00$

b. $$2x\left(1 + 0.085 \times \frac{77}{365}\right) + \frac{x}{1 + 0.085 \times \frac{132}{365}} = \$1565.70$$

$2.03586x + 0.97018x = \$1565.70$

$x = \underline{\underline{\$520.85}}$

Check:

$$2(\$520.85)\left(1 + 0.085 \times \frac{77}{365}\right) + \frac{\$520.85}{1 + 0.085 \times \frac{132}{365}} = \$1060.38 + \$505.32 = \$1565.70$$

31. $P(1 + i)^n + \dfrac{S}{1 + rt} = \$2500(1.1025)^2 + \dfrac{\$1500}{1 + 0.09 \times \frac{93}{365}} = \$3038.766 + \$1466.374 = \underline{\underline{\$4505.14}}$

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Review Problems *(continued)*

32. *a.* $\dfrac{2x}{1+0.13\times\frac{92}{365}} + x\left(1+0.13\times\dfrac{59}{365}\right) = \$831$

$1.93655x + 1.02101x = \$831$

$2.95756x = \$831$

$x = \underline{\$280.97}$

b. $3x(1.03^5) + \dfrac{x}{1.03^3} + x = \dfrac{\$2500}{1.03^2}$

$3.47782x + 0.915142x + x = \$2356.49$

$x = \underline{\$436.96}$

33. 60% of a $\frac{3}{8}$ interest was purchased for \$65,000.

Let the V represent the implied value of the entire partnership.

Then $0.60 \times \dfrac{3}{8}\,V = \$65{,}000$

$V = \dfrac{8 \times \$65{,}000}{0.60 \times 3} = \underline{\$288{,}889}$

The implied value of the chalet was \$288,889.

34. Let b represent the base salary and r represent the commission rate. Then

$r(\$27{,}000) + b = \$2815.00$ ①

$\underline{r(\$35{,}500) + b} = \underline{\$3197.50}$ ②

Subtract: $-\$8500r = -\$382.50$

$r = 0.045$

Substitute into ①: $0.045(\$27{,}000) + b = \$2815$

$b = \$1600$

Deanna's base salary is \$1600 per month and her commission rate is 4.5%.

35. Let the regular season ticket prices be R for the red section and B for the blue section. Then

$2500R + 4500B = \$50{,}250$ ①

$2500(1.3R) + 4500(1.2B) = \$62{,}400$ ②

① × 1.2: $\underline{2500(1.2R) + 4500(1.2B)} = \underline{\$60{,}300}$

Subtract: $2500(0.1R) + 0 = \$2100$

$R = \$8.40$

Substitute into ①: $2500(\$8.40) + 4500B = \$50{,}250$

$B = \$6.50$

The ticket prices for the playoffs cost

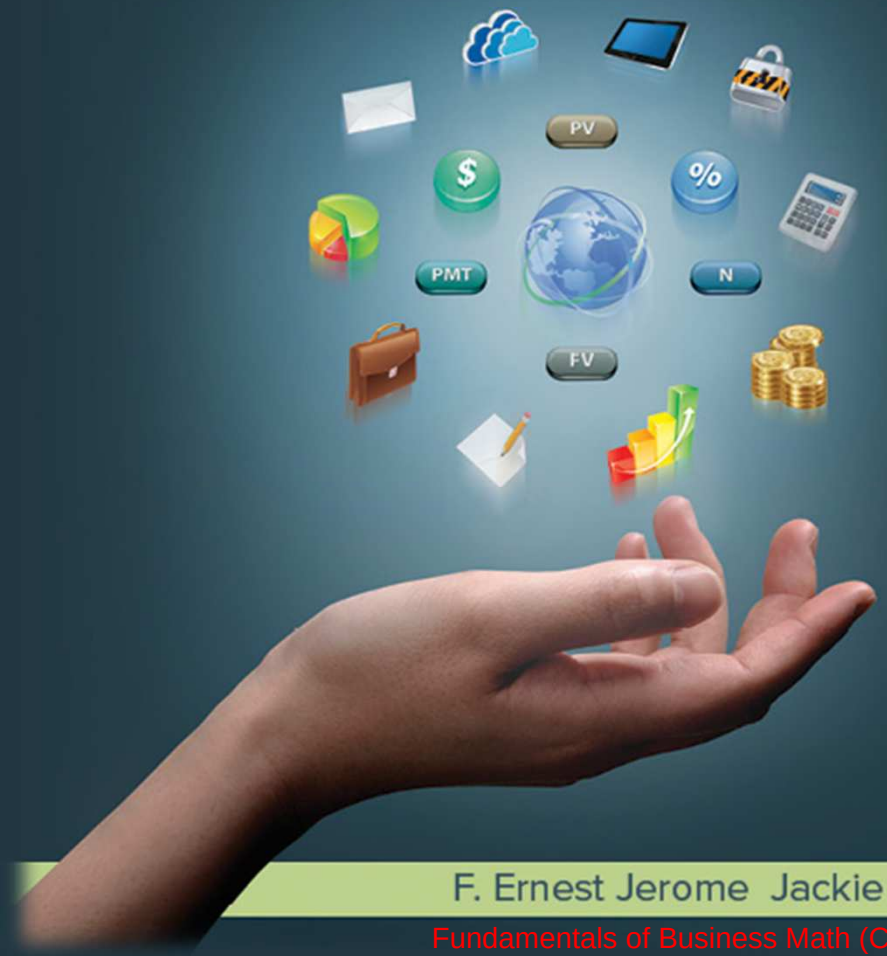
$1.3 \times \$8.40 = \underline{\$10.92}$ in the "reds"

and $1.2 \times \$6.50 = \underline{\$7.80}$ in the "blues".

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Third Edition

Fundamentals of
BUSINESS MATHEMATICS
in Canada



F. Ernest Jerome Jackie Shemko

Chapter 2
Review and Applications of Algebra

Prepared By Sarah Chan

© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Learning Objectives

- **LO1** Simplify algebraic expressions by extracting common factors and applying rules of exponents
- **LO2** Rearrange a formula or equation to isolate a particular variable
- **LO3** Solve a linear equation in one variable, and two linear equations in two variables
- **LO4** Graph a linear equation in two variables
- **LO5** Express a linear equation in slope-intercept form
- **LO6** Solve two equations in two unknowns by a graphical method
- **LO7** Solve "word problems" that lead to a linear equation in one unknown, or two linear equations in two unknowns
- **LO8** Solve problems involving percent change

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Definitions

An **algebraic expression** indicates the mathematical operations to be carried out on a combination of numbers and variables.

Example: $2x^2 - 3x + 1$

The components of an algebraic expression that are *separated by addition or subtraction signs* are called **terms.**

Example: $2x^2$ $-3x$ 1

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Definitions

A **monomial** is an algebraic expression with only *one* term.

Example: $2x^2$

A **binomial** is an algebraic expression with *two* terms.

Example: $2x^2 - 3x$

A **trinomial** is an algebraic expression with *three* terms.

Example: $2x^2 - 3x + 1$

A **polynomial** is *any* algebraic expression with *more than one* term.

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Definitions

The components of a term that are *separated by multiplication or division signs* are called **factors.**

Example of a Term: $-5xy$

The Term's Factors: -5 x y

The numerical factor is called the **numerical coefficient.**

-5

The variable factors, *together*, are called the **literal coefficient.**

xy

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Combining Like Terms

Terms that have the *same literal coefficient* are called **like terms.**

Like Terms: $\mathbf{-5xy}$ $\mathbf{8xy}$

Like terms can be **combined** by *adding their numerical coefficients*.

Combining Like Terms:

$$\mathbf{(-5+8)xy = 3xy}$$

Example: Simplify by combining like terms: $4x - 10x - 3y + 7y$

$$\mathbf{(4-10)x + (-3+7)y = -6x + 4y}$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Multiplying Polynomials

When multiplying two polynomials, *each term* in the first polynomial is multiplied by *every term* in the second polynomial.

Example: $(x-1)(-2x^2+4x-3)$

$$(x)(-2x^2)+(x)(4x)+(x)(-3)+(-1)(-2x^2)+(-1)(4x)+(-1)(-3)$$
$$=-2x^3+4x^2-3x+2x^2-4x+3$$

Then, *combine like terms*:

$$-2x^3+4x^2-3x+2x^2-4x+3$$
$$=-2x^3+(4+2)x^2+(-3-4)x+3$$
$$=-2x^3+6x^2-7x+3$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Dividing Polynomials

When dividing polynomials, first *identify the factors*.

Example: $\frac{48x^2-32xy}{8x}$

$$\frac{48x^2}{8x}-\frac{32xy}{8x}=\frac{48(x)(x)}{8(x)}-\frac{32(x)(y)}{8(x)}$$

Then, *cancel common factors* from the numerator and denominator:

$$\frac{48(\cancel{x})(x)}{8(\cancel{x})}-\frac{32(\cancel{x})(y)}{8(\cancel{x})}=\frac{48x}{8}-\frac{32y}{8}$$

Then, *divide the numerical coefficients*:

$$\frac{48x}{8}-\frac{32y}{8}=\left(\frac{48}{8}\right)x-\left(\frac{32}{8}\right)y=6x-4y$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Substitution

Substitution means assigning a numerical value to the variables in an algebraic expression. The expression is then evaluated by carrying out all the indicated operations. Example: $S = P(1 + rt)$

Substitute: $P = \$100, r = 0.09, t = \frac{7}{12}$

$$\boldsymbol{S = \$100\left(1 + 0.09\left(\frac{7}{12}\right)\right)}$$

Evaluate:

$$\boldsymbol{S = \$100\left(1 + 0.09\left(\frac{7}{12}\right)\right)}$$

$$\boldsymbol{S = \$100(1 + 0.0525)}$$

$$\boldsymbol{S = \$100(1.0525)}$$

$$\boldsymbol{S = \$105.25}$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Manipulating Equations

An **equation** is a statement that one algebraic expression *equals* another algebraic expression. When the equation has broad applications, it is often called a formula.

Equations can be manipulated as long as you adhere to the *all important rule*:

Both sides of an equation must be treated in exactly the same way

This means you are allowed to:

- ✓ **Add the same number or variable to both sides**
- ✓ **Subtract the same number or variable from both sides**
- ✓ **Multiply both sides by the same number or variable**
- ✓ **Divide both sides by the same number or variable**
- ✓ **Raise both sides to the same exponent**

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Manipulating Equations

Example: $S = P(1 + rt)$ where $S = \$112, P = \$100, r = 0.04, t = ?$

$$\$112 = \$100(1 + 0.04t)$$

$$\frac{\$112}{\$100} = \frac{\$100(1 + 0.04t)}{\$100}$$

Divide both sides by $100

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Manipulating Equations

Example: $S = P(1 + rt)$ $\quad where\ S = \$112, P = \$100, r = 0.04, t = ?$

$$\$112 = \$100(1 + 0.04t)$$

$$\frac{\$112}{\$100} = \frac{\$100(1 + 0.04t)}{\$100}$$

$$1.12 = 1 + 0.04t$$

$$1.12 - 1 = 1 - 1 + 0.04t$$

Subtract 1 from both sides

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Manipulating Equations

Example: $S = P(1 + rt)$ $\quad where\ S = \$112, P = \$100, r = 0.04, t = ?$

$$\$112 = \$100(1 + 0.04t)$$

$$\frac{\$112}{\$100} = \frac{\$100(1 + 0.04t)}{\$100}$$

$$1.12 = 1 + 0.04t$$

$$1.12 - 1 = 1 - 1 + 0.04t$$

$$0.12 = 0.04t$$

$$\frac{0.12}{0.04} = \frac{0.04t}{0.04}$$

Divide both sides by 0.04

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Manipulating Equations

Example: $S = P(1 + rt)$ $\quad where\ S = \$112, P = \$100, r = 0.04, t = ?$

$$\$112 = \$100(1 + 0.04t)$$

$$\frac{\$112}{\$100} = \frac{\$100(1 + 0.04t)}{\$100}$$

$$1.12 = 1 + 0.04t$$

$$1.12 - 1 = 1 - 1 + 0.04t$$

$$0.12 = 0.04t$$

$$\frac{0.12}{0.04} = \frac{0.04t}{0.04}$$

$$3 = t$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exponent Rules

The use of exponents allows us to write algebraic expressions in a more concise form. Example: $4^3 = 4 \times 4 \times 4 = 64$

The **base** is: $\mathbf{4}$

The **exponent** is: $\mathbf{3}$

The **power** is: $\mathbf{64}$

In summary: $\mathbf{base^{exponent} = power}$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exponent Rules

$a^m \times a^n =$	a^{m+n}	$x^2 \times x^3 =$	$x^{2+3} = x^5$
$\frac{a^m}{a^n} =$	a^{m-n}	$\frac{x^7}{x^5} =$	$x^{7-5} = x^2$
$a^m{}^n =$	$a^{m \times n}$	$x^4{}^5 =$	$x^{4 \times 5} = x^{20}$
	$a^n b^n$		$x^3 y^3$
$\left(\frac{a}{b}\right)^n =$	$\frac{a^n}{b^n}$	$\left(\frac{x}{y}\right)^2 =$	$\frac{x^2}{y^2}$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Exponent Rules

$a^0 =$	1	$x^0 =$	1
$a^{-n} =$	$1/a^n$	$x^{-2} =$	$1/x^2$
$a^{1\ n} =$	$\sqrt[n]{a}$	$x^{1\ 2} =$	$\sqrt[2]{x}$
$a^{m\ n} =$	$\sqrt[n]{a^m}$	$x^{3\ 2} =$	$\sqrt[2]{x^3}$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Linear Equations In One Unknown

A solution (or **root**) of an equation is any numerical value of the variable that makes the two sides of the equation equal. A linear equation in one variable has only one root. The process of determining the root (or roots) of an equation is called **solving.**

$$3x - 7 = 5 - 9x$$

Solve

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Linear Equations In One Unknown

A solution (or **root**) of an equation is any numerical value of the variable that makes the two sides of the equation equal. A linear equation in one variable has only one root. The process of determining the root (or roots) of an equation is called **solving.**

$$3x - 7 = 5 - 9x$$

$$3(1) - 7 = 5 - 9(1)$$

What if $x = 1$?

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

A solution (or **root**) of an equation is any numerical value of the variable that makes the two sides of the equation equal. A linear equation in one variable has only one root. The process of determining the root (or roots) of an equation is called **solving.**

$$3x - 7 = 5 - 9x$$

$$3(1) - 7 = 5 - 9(1)$$

$$3 - 7 = 5 - 9$$

$$-4 = -4$$

Both sides are equal!

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

A solution (or **root**) of an equation is any numerical value of the variable that makes the two sides of the equation equal. A linear equation in one variable has only one root. The process of determining the root (or roots) of an equation is called **solving.**

$$3x - 7 = 5 - 9x$$

$$3(1) - 7 = 5 - 9(1)$$

$$3 - 7 = 5 - 9$$

$$-4 = -4$$

$$\therefore x = 1$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

The steps required to solve a linear equation in one unknown are:

1. **Separate like terms, leaving terms containing the variable on one side and the remaining terms on the other side**
2. **Combine the like terms on each side of the equation**
3. **Obtain the root or solution by dividing both sides of the equation by the numerical coefficient of the variable**



© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Example: Solve $8x - 11 = 5x + 4$

$$8x - 11 = 5x + 4$$

$$8x - 5x - 11 + 11 = 5x - 5x + 4 + 11$$

Separate

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Example: Solve $8x - 11 = 5x + 4$

$$8x - 11 = 5x + 4$$

$$8x - 5x - 11 + 11 = 5x - 5x + 4 + 11$$

$$(8 - 5)x = (4 + 11)$$

$$3x = 15$$

Combine

© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Example: Solve $8x - 11 = 5x + 4$

$$8x - 11 = 5x + 4$$

$$8x - 5x - 11 + 11 = 5x - 5x + 4 + 11$$

$$(8 - 5)x = (4 + 11)$$

$$3x = 15$$

$$\frac{3x}{3} = \frac{15}{3}$$

$$x = 5$$

Obtain

© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Linear Equations In Two Unknowns

The solution to a *pair* of linear equations in *two* unknowns is the *pair* of numerical values of the variables that solve both equations simultaneously.

① $2x - 3y = -6$

② $x + y = 2$



© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Linear Equations In Two Unknowns

The solution to a *pair* of linear equations in *two* unknowns is the *pair* of numerical values of the variables that solve both equations simultaneously.

① $2x - 3y = -6$

② $x + y = 2$

① $2(0) - 3(2) = -6$

② $0 + 2 = 2$

What if $x = 0$ and $y = 2$?

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Linear Equations In Two Unknowns

The solution to a *pair* of linear equations in *two* unknowns is the *pair* of numerical values of the variables that solve both equations simultaneously.

① $2x - 3y = -6$

② $x + y = 2$

① $2(0) - 3(2) = -6$

② $0 + 2 = 2$

① $-6 = -6$

② $2 = 2$

Both equations solved!

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Linear Equations In Two Unknowns

The solution to a *pair* of linear equations in *two* unknowns is the *pair* of numerical values of the variables that solve both equations simultaneously.

① $2x - 3y = -6$

② $x + y = 2$

① $2(0) - 3(2) = -6$

② $0 + 2 = 2$

① $-6 = -6$

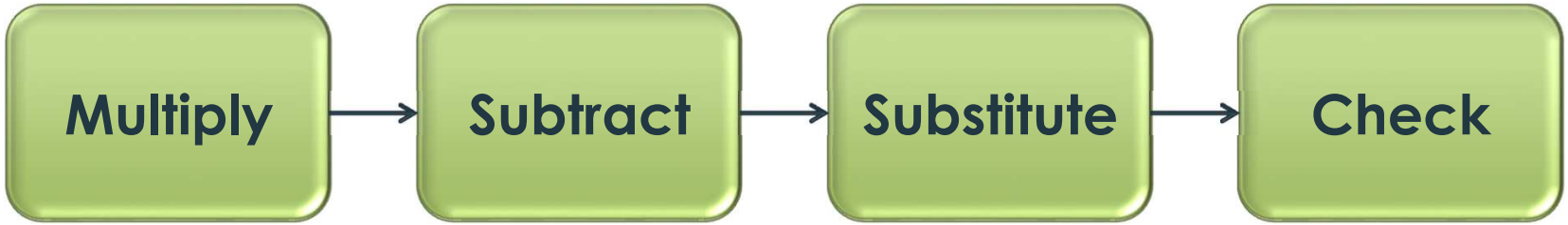
② $2 = 2$

$\therefore (x, y) = (0, 2)$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

The steps required to solve a pair of linear equations are:

1. **Multiply equation ① by the coefficient of x from equation ②**
2. **Multiply equation ② by the coefficient of x from equation ①**
3. **Subtract the two equations (this will eliminate x so you can find y)**
4. **Substitute the value you find for y into the first equation (this will allow you to now find x)**
5. **Check your solution by making sure it solves the second equation**



© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Linear Equations In Two Unknowns

① $6x - 3y = -9$

② $7x - y = 2$

Solve

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

①	$6x - 3y = -9$
②	$7x - y = 2$
①× 7	$42x - 21y = -63$
②× 6	$42x - 6y = 12$

Multiply

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

①	$6x - 3y = -9$
②	$7x - y = 2$
①$\times 7$	$42x - 21y = -63$
②$\times 6$	$42x - 6y = 12$
①$-$②	$-15y = -75$
	$y = 5$

Subtract to find y

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

①	$6x - 3y = -9$
②	$7x - y = 2$
①× 7	$42x - 21y = -63$
②× 6	$42x - 6y = 12$
①−②	$-15y = -75$
	$y = 5$
Sub in ①	$6x - 3(5) = -9$
	$6x = 6$
	$x = 1$

Substitute to find x

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

①	$6x - 3y = -9$
②	$7x - y = 2$
①× 7	$42x - 21y = -63$
②× 6	$42x - 6y = 12$
①−②	$-15y = -75$
	$y = 5$
Sub in ①	$6x - 3(5) = -9$
	$6x = 6$
	$x = 1$
Check in ②	$7(1) - 5 = 2$
	$2 = 2$

Check

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

①	$6x - 3y = -9$
②	$7x - y = 2$
①$\times 7$	$42x - 21y = -63$
②$\times 6$	$42x - 6y = 12$
①$-$②	$-15y = -75$
	$y = 5$
Sub in ①	$6x - 3(5) = -9$
	$6x = 6$
	$x = 1$
Check in ②	$7(1) - 5 = 2$
	$2 = 2$

$\therefore (x, y) = (1, 5)$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Graphing Linear Equations

A *single* linear equation in *two* unknowns has an *infinite* number of solutions. There are many (x, y) pairs that will make both sides of the equation equal.

Example: $y = 2x - 1$

Some Solutions:

$(1, 1)$	$1 = 2(1) - 1$	$1 = 1$
$(2, 3)$	$3 = 2(2) - 1$	$3 = 3$
$(3, 5)$	$5 = 2(3) - 1$	$5 = 5$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

When all the solutions are plotted on a Cartesian plane, and connected together, a straight line is formed. Therefore, the solution to a linear equation in two unknowns can be represented by a *graph of a line*. The steps required to create this graph are:

1. **Construct a table of values, consisting of pairs of (x, y) values that satisfy the equation**
2. **Construct and label the x-axis and the y-axis**
3. **Plot the (x, y) pairs from the table**
4. **Connect the plotted points with a straight line**

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Graphing Linear Equations

Example: Graph the equation $y = 2x - 1$ over the range $x = -3$ to $x = 3$

Step 1: Construct a table of values

x	
3	
1	
-1	
-3	



Choose values for x that include the endpoints of your range, and some points in the middle

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Example: Graph the equation $y = 2x - 1$ over the range $x = -3$ to $x = 3$

Step 1: Construct a table of values

x	
3	$2\ 3\ -1 = 5$
1	$2\ 1\ -1 = 1$
-1	$2\ -1\ -1 = -3$
-3	$2\ -3\ -1 = -7$



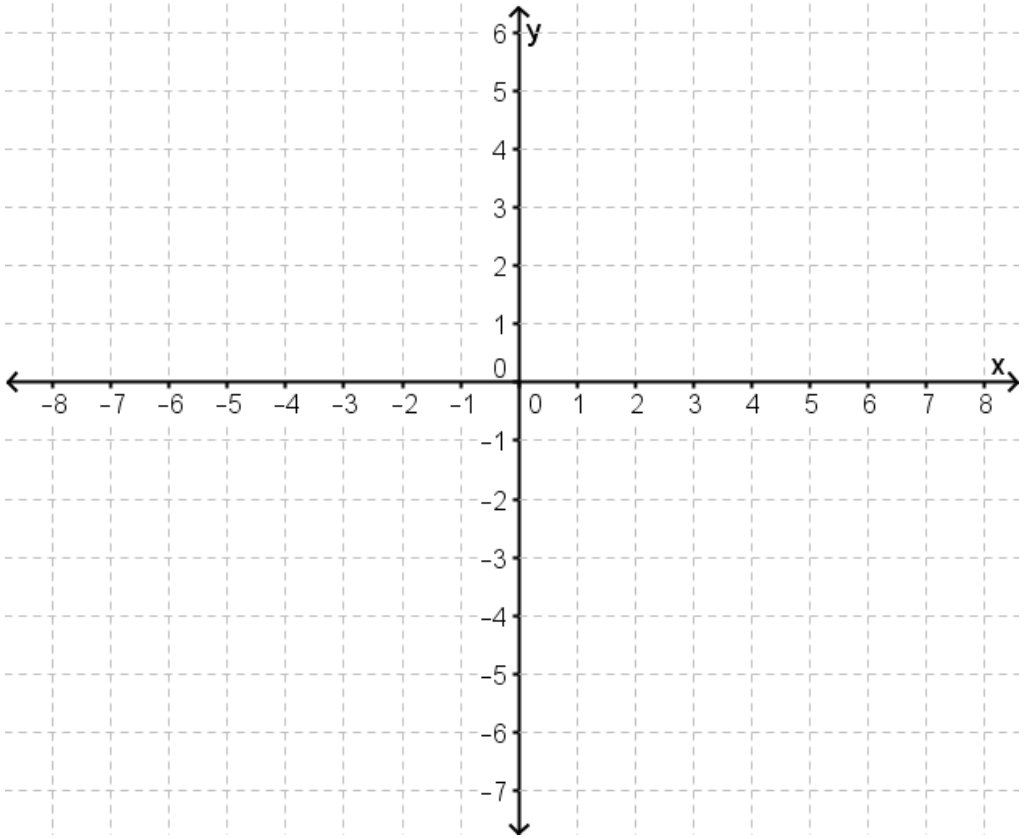
Substitute the x values into the equation to determine the y values

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Example: Graph the equation $y = 2x - 1$ over the range $x = -3$ to $x = 3$

Step 2: Construct and label the axes

x	y
3	5
1	1
−1	−3
−3	−7

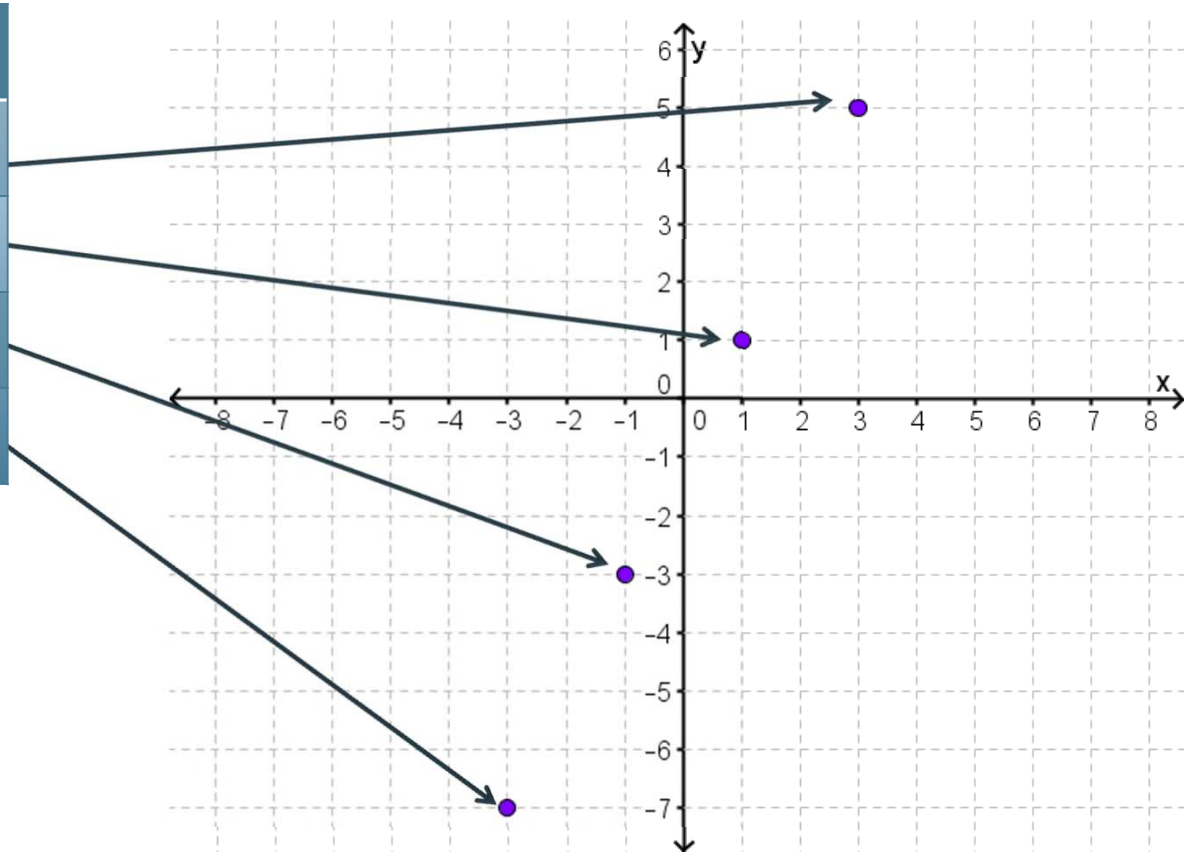


© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Example: Graph the equation $y = 2x - 1$ over the range $x = -3$ to $x = 3$

Step 3: Plot the pairs

x	y
3	5
1	1
−1	−3
−3	−7

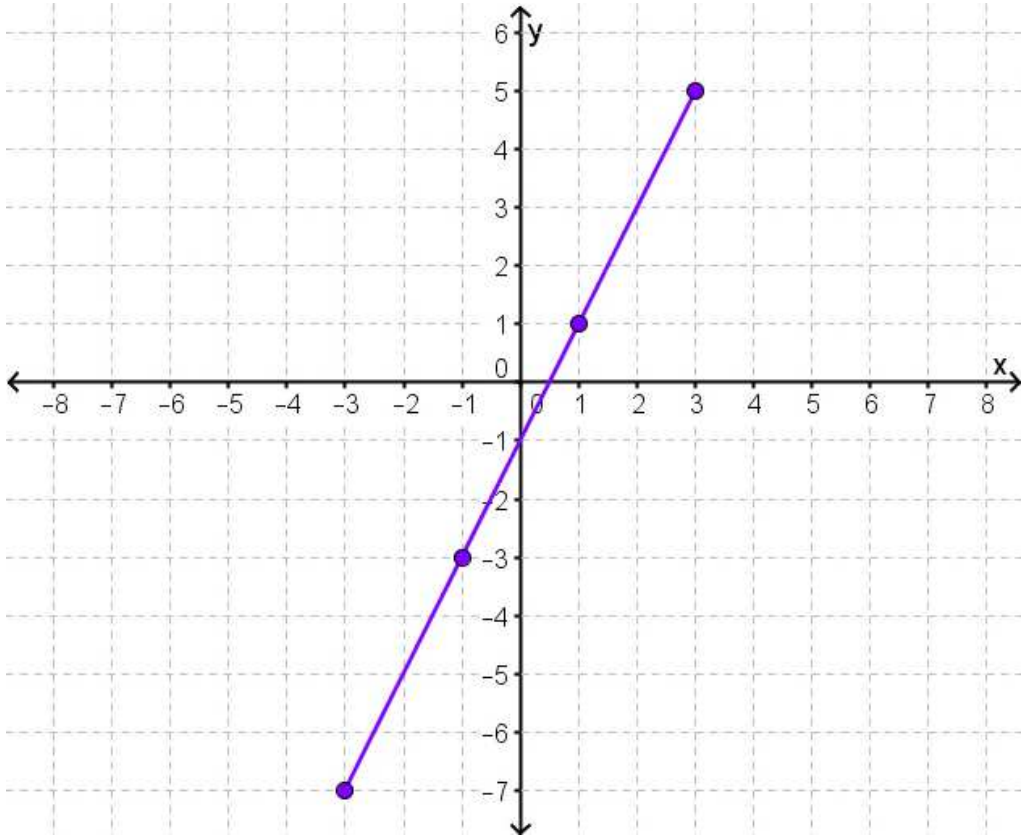


© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Example: Graph the equation $y = 2x - 1$ over the range $x = -3$ to $x = 3$

Step 4: Connect the points

x	y
3	5
1	1
−1	−3
−3	−7



© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Slope-Intercept Form

Straight lines have two useful properties. The y-intercept is the value at which the line crosses the y-axis. The slope is a measure of the line's steepness. It is the change in y-coordinate *per unit change* in the x-coordinate.

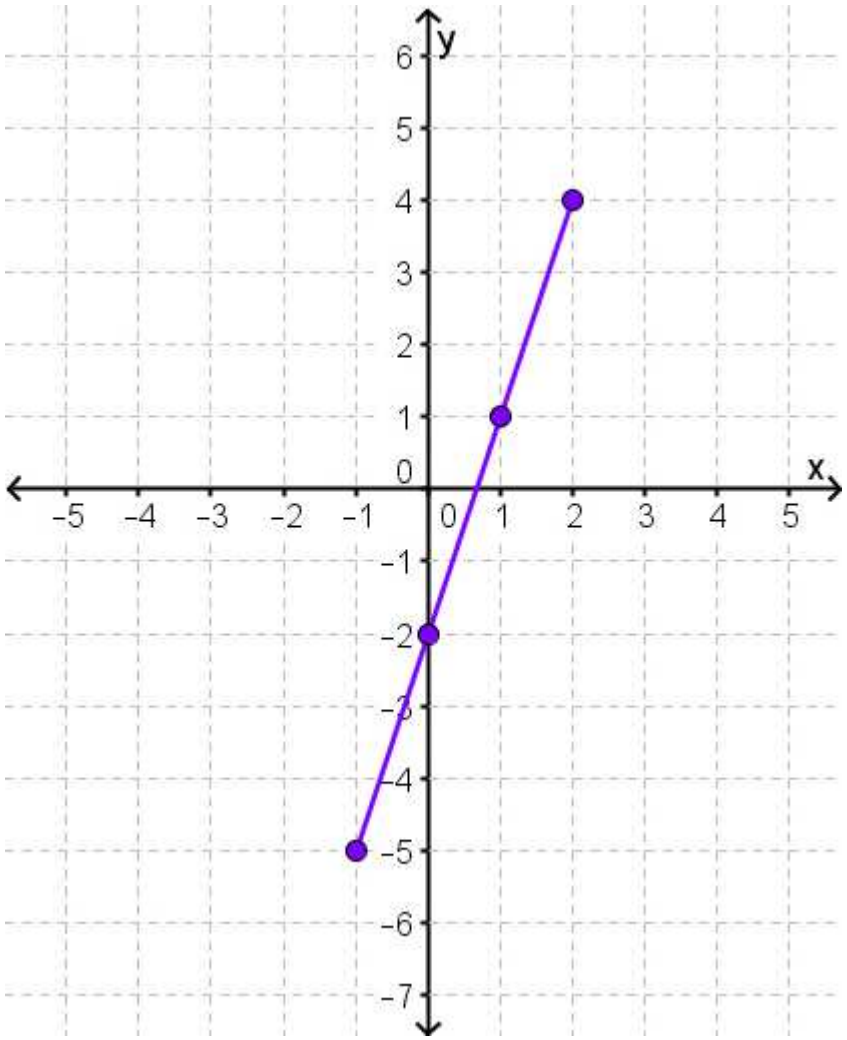
In general, when a linear equation is manipulated into the form $\boldsymbol{y = mx + b}$ where m and b are constants, then:

The slope will be: $\boldsymbol{m}$

The y-intercept will be: $\boldsymbol{b}$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Slope-Intercept Form Ex. 1



The line crosses the y-axis at -2
Therefore:

$$b = -2$$

When the x-coordinate increases by 1, the y-coordinate increases by 3
Therefore:

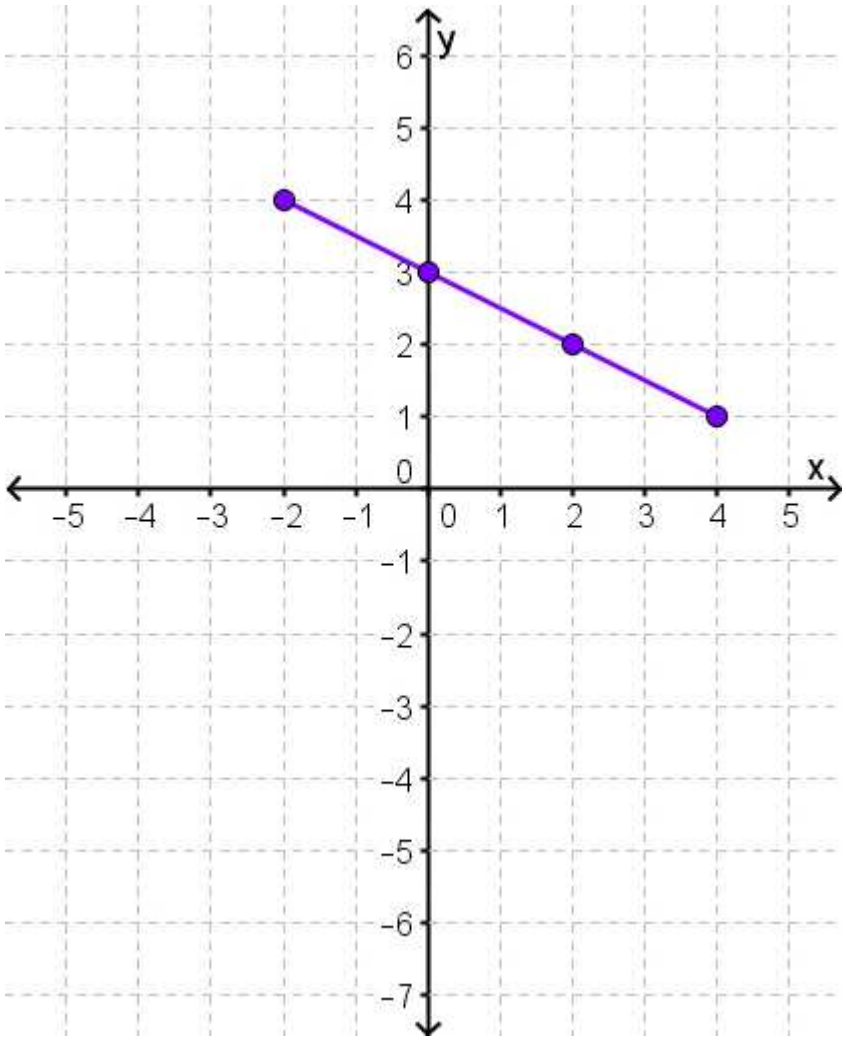
$$m = 3$$

The linear equation is:

$$y = 3x - 2$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Slope-Intercept Form Ex. 2



The line crosses the y-axis at 3
Therefore:

$$b = 3$$

When the x-coordinate increases by 1, the y-coordinate decreases by $\frac{1}{2}$
Therefore:

$$m = -\frac{1}{2}$$

The linear equation is:

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

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

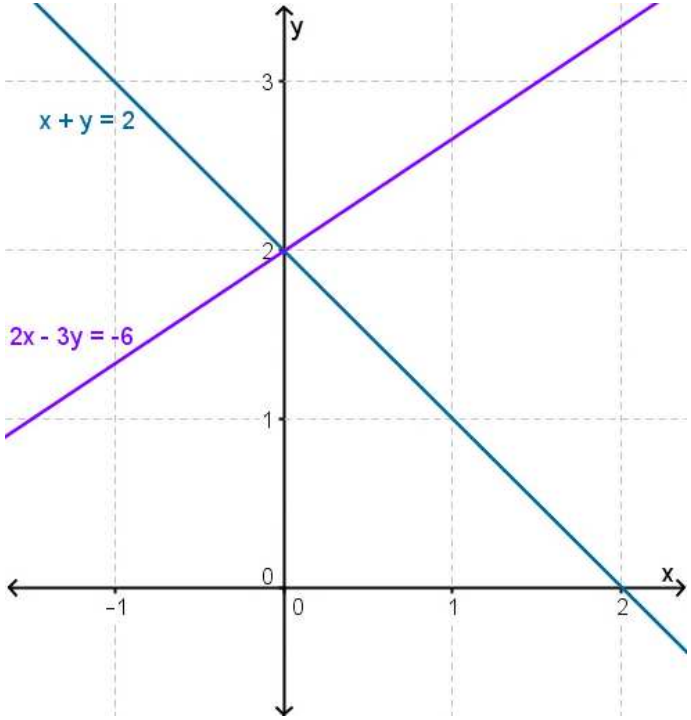
Recall: The solution to a pair of linear equations in two unknowns is the pair of numerical values of the variables that solve both equations simultaneously.

Alternatively: The solution to a pair of linear equations, *graphed as straight lines*, is the point where the two lines *intersect*.

① $x + y = 2$

② $2x - 3y = -6$

Graph the lines



© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Recall: The solution to a pair of linear equations in two unknowns is the pair of numerical values of the variables that solve both equations simultaneously

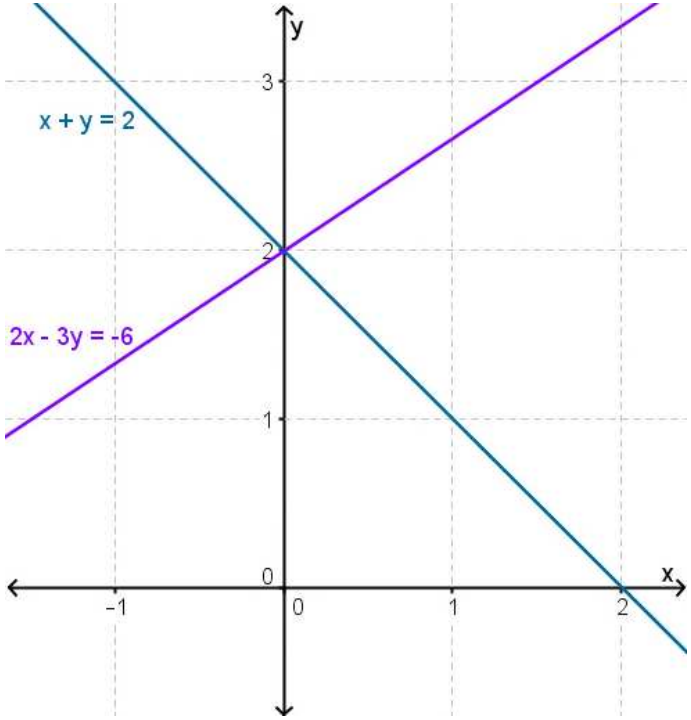
Alternatively: The solution to a pair of linear equations, *graphed as straight lines*, is the point where the two lines *intersect*

① $x + y = 2$

② $2x - 3y = -6$

The point of intersection is $(0, 2)$

Therefore, the solution is $(0, 2)$



© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

The steps required to solve two equations in two unknowns graphically are:

1. **Manipulate both equations into $y = mx + b$ form**
2. **Graph both equations (using a table of values or slope-intercept)**
3. **Locate the point of intersection**

Warning: This method is not as precise as finding the solution algebraically. The graphs must be drawn very carefully and accurately to find the correct point of intersection



© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

① $6x - 3y = -9$

② $7x - y = 2$

Original Equations

© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Solving Equations Graphically

① $6x - 3y = -9$

② $7x - y = 2$

① $y = \frac{-6x-9}{-3} = 2x + 3$

② $y = \frac{-7x+2}{-1} = 7x - 2$



© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

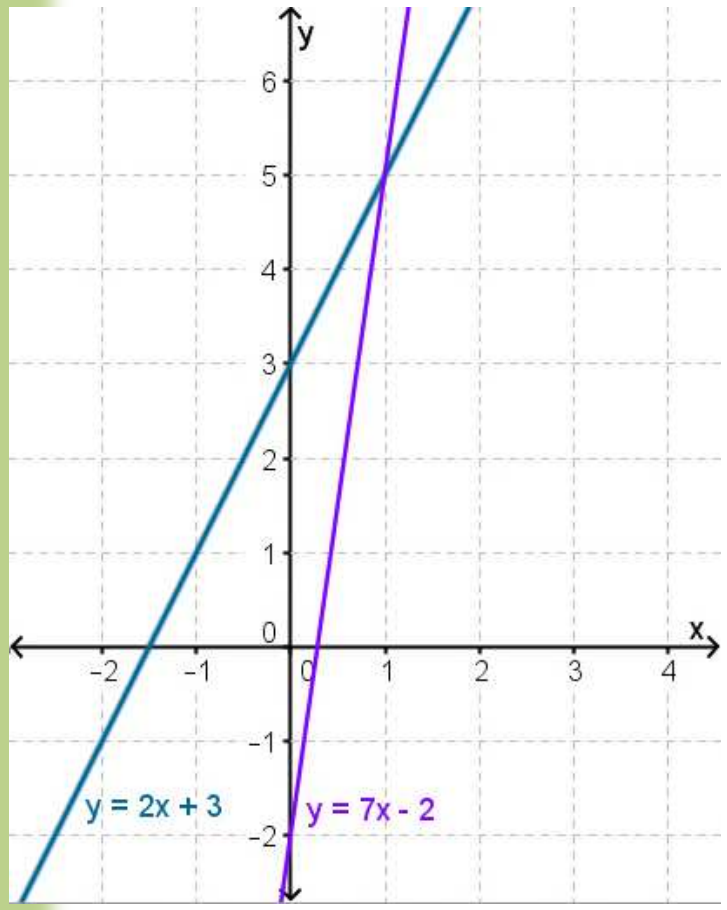
① $6x - 3y = -9$

② $7x - y = 2$

① $y = \frac{-6x-9}{-3} = 2x + 3$

② $y = \frac{-7x+2}{-1} = 7x - 2$

Graph



© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

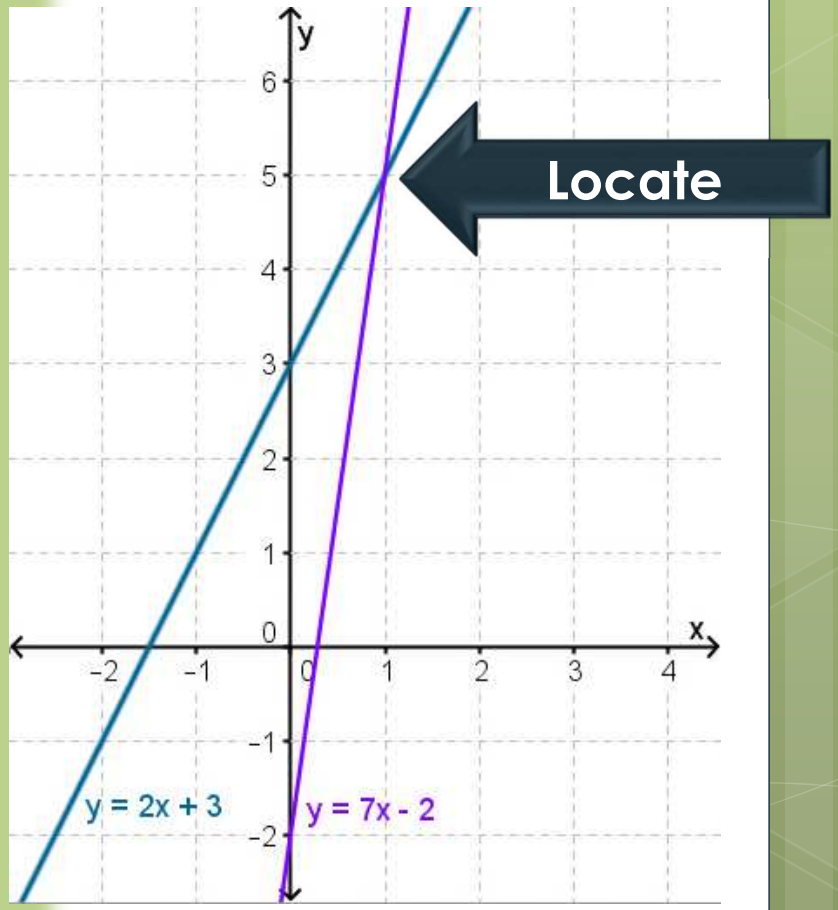
Solving Equations Graphically

① $6x - 3y = -9$

② $7x - y = 2$

① $y = \frac{-6x-9}{-3} = 2x + 3$

② $y = \frac{-7x+2}{-1} = 7x - 2$



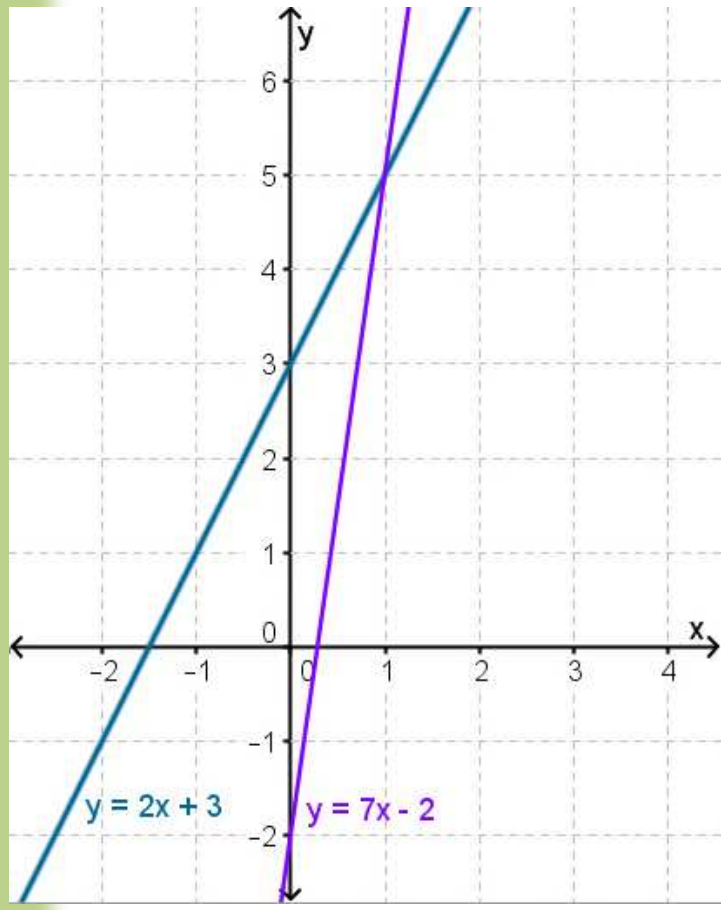
© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

① $6x - 3y = -9$

② $7x - y = 2$

① $y = \frac{-6x-9}{-3} = 2x + 3$

② $y = \frac{-7x+2}{-1} = 7x - 2$



The point of intersection is $(1, 5)$

Therefore, the solution is $(1, 5)$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems

Word problems require a transition from simply solving *given equations* to *creating equations* yourself based on what you read. The following steps are helpful:

1. **Read the entire problem**
2. **Extract and label the data. Identify the unknown quantity and specify its symbol. Draw and label a diagram if appropriate**
3. **Create a word equation that relates the given data to the unknown quantity**
4. **Convert the word equation to an algebraic equation**
5. **Solve the equation**

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 1

Barbie and Ken sell cars at Auto World. In April, Barbie sold twice as many cars as Ken. In total, they sold 15 cars that month. How many cars did Ken sell?

Step 1: Read the entire problem

Step 2: Extract and label the data

Barbie's sales = $2(Ken's\ sales)$

Total sales = 15

Ken's sales = x

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 1

Barbie and Ken sell cars at Auto World. In April, Barbie sold twice as many cars as Ken. In total, they sold 15 cars that month. How many cars did Ken sell?

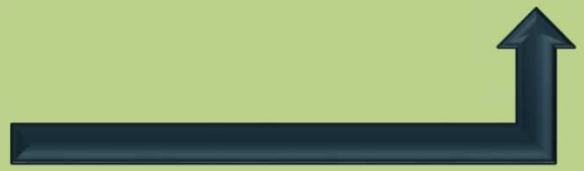
Step 1: Read the entire problem

Step 2: Extract and label the data

Barbie's sales = $2(Ken's\ sales) = 2x$

Total sales = 15

Ken's sales = x



© 2017 McGraw-Hill Education Limited

Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 1

Barbie and Ken sell cars at Auto World. In April, Barbie sold twice as many cars as Ken. In total, they sold 15 cars that month. How many cars did Ken sell?

Step 3: Create a word equation

Barbie's sales + Ken's sales = Total sales

Step 4: Convert to an algebraic equation

$$2x + x = 15$$

Step 5: Solve the equation

$$\therefore x = 5$$

Ken sold 5 cars (and Barbie sold 10)

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 2

A day care purchases the same amount of milk and orange juice each week. The price of milk increased from $1.50 to $1.60 per litre and the price of orange juice increased from $1.30 to $1.39 per can. Before the increase, the weekly bill was $57.00. Now the weekly bill is $60.85. How many litres of milk and cans of orange juice are purchased each week?

Step 1: Read the entire problem

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 2

A day care purchases the same amount of milk and orange juice each week. The price of milk increased from $1.50 to $1.60 per litre and the price of orange juice increased from $1.30 to $1.39 per can. Before the increase, the weekly bill was $57.00. Now the weekly bill is $60.85. How many litres of milk and cans of orange juice are purchased each week?

Step 2: Extract and label the data

Price of milk per litre before = $\$1.50$, after = $\$1.60$

Price of orange juice per can before = $\$1.30$, after = $\$1.39$

Weekly bill before = $\$57.00$, after = $\$60.85$

# of milk litres per week = x

# of orange juice cans per week = y

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 2

A day care purchases the same amount of milk and orange juice each week. The price of milk increased from $1.50 to $1.60 per litre and the price of orange juice increased from $1.30 to $1.39 per can. Before the increase, the weekly bill was $57.00. Now the weekly bill is $60.85. How many litres of milk and cans of orange juice are purchased each week?

Step 3: Create word equations

① Weekly bill before =

$ spent on milk before + $ spent on juice before

② Weekly bill after =

$ spent on milk after + $ spent on juice after

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 2

A day care purchases the same amount of milk and orange juice each week. The price of milk increased from $1.50 to $1.60 per litre and the price of orange juice increased from $1.30 to $1.39 per can. Before the increase, the weekly bill was $57.00. Now the weekly bill is $60.85. How many litres of milk and cans of orange juice are purchased each week?

Step 4: Convert to algebraic equations

① $\$57.00 = \$1.50x + \$1.30y$

② $\$60.85 = \$1.60x + \$1.39y$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Word Problems Ex. 2

A day care purchases the same amount of milk and orange juice each week. The price of milk increased from $1.50 to $1.60 per litre and the price of orange juice increased from $1.30 to $1.39 per can. Before the increase, the weekly bill was $57.00. Now the weekly bill is $60.85. How many litres of milk and cans of orange juice are purchased each week?

Step 5: Solve the equations

$$\therefore (x, y) = (25, 15)$$

25 litres of milk and 15 cans of orange juice are purchased each week

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Percent Change

When a quantity changes, the amount of the change is often expressed as a percentage of the initial value. That is,

$$\text{Percent Change} = \frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}} \times 100\%$$

To write this formula more compactly we define the following symbols:

Initial Value: V_i Final Value: V_f Percent Change: c

$$c = \frac{V_f - V_i}{V_i} \times 100\%$$

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Percent Change Ex. 1

Monday's sales were $1000 and Tuesday's sales were $2500. Find the percent change.

$$c = \frac{V_f - V_i}{V_i} \times 100\%$$

$$c = \frac{\$2500 - \$1000}{\$1000} \times 100\%$$

$$c = \frac{\$1500}{\$1000} \times 100\%$$

$$c = 1.5 \times 100\%$$

$$c = 150\%$$

$\therefore$ Sales increased by 150%

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Percent Change Ex. 2

In the making of dried fruit, 15 kg of fruit shrinks to 3 kg. Find the percent change.

$$c = \frac{V_f - V_i}{V_i} \times 100\%$$

$$c = \frac{3 - 15}{15} \times 100\%$$

$$c = \frac{-12}{15} \times 100\%$$

$$c = -0.80 \times 100\%$$

$$c = -80\%$$

$\therefore$ The fruit decreased by 80%

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

Percent Change Ex. 3

You paid \$75 for a coat after a 20% discount. What was the original price of the coat?

$$c = \frac{V_f - V_i}{V_i} \times 100\%$$

$$-20\% = \frac{\$75 - V_i}{V_i} \times 100\%$$

$$\frac{-20\%}{100\%} \times V_i = \$75 - V_i$$

$$-0.20V_i + V_i = \$75$$

$$V_i = \frac{\$75}{0.80}$$

$$V_i = \$93.75$$

$\therefore$ The coat originally cost \$93.75

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual

In summary, you can now

- Simplify algebraic expressions by extracting common factors and applying rules of exponents
- Rearrange a formula or equation to isolate a particular variable
- Solve a linear equation in one variable, and two linear equations in two variables
- Graph a linear equation in two variables
- Express a linear equation in slope-intercept form
- Solve two equations in two unknowns by a graphical method
- Solve "word problems" that lead to a linear equation in one unknown, or two linear equations in two unknowns
- Solve problems involving percent change

© 2017 McGraw-Hill Education Limited
Fundamentals of Business Math (Canadian) 3rd edition Jerome Solutions Manual