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2 Review and Applications of Algebra

Exercise 2.1

a. $(-p) + (-3p) + (4p) = -p - 3p + 4p = \underline{0}$

b. $5s - 2t - 2s - 4t = 5s - 2s - 2t - 4t = \underline{3s - 6t}$

c. $4x^2y - 3x^2y + (-5x^2y) = 4x^2y - 3x^2y - 5x^2y = \underline{-4x^2y}$

d. $(5s - 2t) - (2s - 4t) = 5s - 2t - 2s + 4t = \underline{3s + 2t}$

e. $4x^2y + (-3x^2y) - (-5x^2y) = 4x^2y - 3x^2y + 5x^2y = \underline{6x^2y}$

f. $1 - (7e^2 - 5 + 3e - e^3) = 1 - 7e^2 + 5 - 3e + e^3 = \underline{e^3 - 7e^2 - 3e + 6}$

g. $(6x^2 - 3xy + 4y^2) - (8y^2 - 10xy - x^2) = 6x^2 - 3xy + 4y^2 - 8y^2 + 10xy + x^2$
$= \underline{7x^2 + 7xy - 4y^2}$

h. $(7m^3 - m - 6m^2 + 10) - (5m^3 - 9 + 3m - 2m^2)$
$= 7m^3 - m - 6m^2 + 10 - 5m^3 + 9 - 3m + 2m^2$
$= \underline{2m^3 - 4m^2 - 4m + 19}$

i. $2(7x - 3y) - 3(2x - 3y) = 14x - 6y - 6x + 9y = \underline{8x + 3y}$

j. $4(a^2 - 3a - 4) - 2(5a^2 - a - 6) = 4a^2 - 12a - 16 - 10a^2 + 2a + 12$
$= \underline{-6a^2 - 10a - 4}$

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k. $15x - [4 - 5x - 6] = 15x - 4 + 5x + 6 = \underline{20x + 2}$

l. $6a - [3a - 2b - a] = 6a - 3a + 2b + a = \underline{4a + 2b}$

m. $15x - \left[4 - 2(5x - 6)\right] = 15x - 4 + 10x - 12 = \underline{25x - 16}$

n. $6a - \left[3a - 2(2b - a)\right] = 6a - 3a + 4b - 2a = \underline{a + 4b}$

o. $4a(3ab - 5a + 6b) = \underline{12a^2b - 20a^2 + 24ab}$

p. $9k(4 - 8k + 7k^2) = \underline{36k - 72k^2 + 63k^3}$

q. $-5xy(2x^2 - xy - 3y^2) = \underline{-10x^3y + 5x^2y^2 + 15xy^3}$

r. $-(p^2 - 4pq - 5p)\left(\frac{2q}{p}\right) = \underline{-2pq + 8q^2 + 10q}$

s. $(4r - 3t)(2t + 5r) = 8rt + 20r^2 - 6t^2 - 15rt = \underline{20r^2 - 7rt - 6t^2}$

t. $(3p^2 - 5p)(-4p + 2) = -12p^3 + 6p^2 + 20p^2 - 10p = \underline{-12p^3 + 26p^2 - 10p}$

u. $(4r - 3t) - (2t + 5r) = 4r - 3t - 2t - 5r = \underline{-r - 5t}$

v. $(3p^2 - 5p) + (-4p + 2) = 3p^2 - 5p - 4p + 2 = \underline{3p^2 - 9p + 2}$

w. $3(a - 2)(4a + 1) - 5(2a + 3)(a - 7) = 3(4a^2 + a - 8a - 2) - 5(2a^2 - 14a + 3a - 21)$
$= 12a^2 + 3a - 24a - 6 - 10a^2 + 70a - 15a + 105$
$= \underline{2a^2 + 34a + 99}$

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x. $5(2x - y)(y + 3x) - 6x(x - 5y) = 5(2xy + 6x^2 - y^2 - 3xy) - 6x^2 + 30xy$
$= 10xy + 30x^2 - 5y^2 - 15xy - 6x^2 + 30xy$
$= \underline{24x^2 + 25xy - 5y^2}$

y. $\frac{18x^2}{3x} = \underline{6x}$

z. $\frac{6a^2b}{-2ab^2} = \underline{-3\frac{a}{b}}$

aa. $\frac{x^2y - xy^2}{xy} = \underline{x - y}$

bb. $\frac{-4x + 10x^2 - 6x^3}{-0.5x} = \underline{8 - 20x + 12x^2}$

cc. $\frac{12x^3 - 24x^2 + 36x}{48x} = \underline{\frac{x^2 - 2x + 3}{4}}$

dd. $\frac{32a^2b - 8ab + 14ab^2}{2ab} = \underline{16a - 4 + 7b}$

ee. $\frac{4a^2b^3 - 6a^3b^2}{2ab^2} = \underline{2ab - 3a^2}$

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

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gg. $\frac{4a^2b^3 \quad 6ab^2 + 2ab^3}{2ab^3} = \underline{\frac{2ab \quad 3+b}{b}}$

hh. $\frac{12(1+i) + 18(1+i)^2}{36(1+i)^2} = \underline{\frac{2 + 3(1+i)}{6(1+i)}}$

1. $3d^2 - 4d + \$15 = 3(\$2.50)^2 - 4(\$2.50) + \$15$
$= \$18.75 - \$10 + \$15$
$= \underline{\$23.75}$

2. $15g - 9h + \$3 = 15(\$14) - 9(\$15) + \$3 = \underline{\$78}$

3. $7x(4y - \$8) = 7(\$3.20)(4 \times \$1.50 - \$8) = \$22.4(\$6 - \$8) = \underline{-\$44.80}$

4. $I \div Pr = \frac{\$13.75}{\$500 \times 0.11} = \underline{0.25}$

5. $\frac{I}{rt} = \frac{\$23.21}{0.095 \times \frac{283}{365}} = \frac{\$23.21}{0.0736575} = \underline{\$315.10}$

6. $\frac{N}{1-d} = \frac{\$89.10}{1-0.10} = \underline{\$99.00}$

7. $L(1 - d_1)(1 - d_2)(1 - d_3) = \$490(1 - 0.125)(1 - 0.15)(1 - 0.05) = \underline{\$346.22}$

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

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

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

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

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

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

14. $\dfrac{2x}{1.045} - \dfrac{2.016x}{3} + \dfrac{x}{2} = 1.91388x - 0.6720x + 0.5x = \underline{1.7419x}$

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

16. $y\left(1 - 0.125\times\dfrac{213}{365}\right) + \dfrac{2y}{1+0.125\times\frac{88}{365}} = 0.927055y + 1.94149y = \underline{2.8685y}$

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17. $\dfrac{P}{1+0.095\times\frac{5}{12}} + 2P\left(1+0.095\times\dfrac{171}{365}\right) = 0.961924P + 2.08901P = \underline{3.0509P}$

18. $\dfrac{h}{(1+0.055)^2} - 3h(1+0.055)^3 = 0.898452h - 3.52272h = \underline{-2.6243h}$

19. $k(1+0.04)^2 + \dfrac{2k}{(1+0.04)^2} = 1.08160k + 1.84911k = \underline{2.9307k}$

20. $(1+i)^m - 1 = (1+0.0225)^4 - 1 = \underline{0.093083}$

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

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

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

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24. $P(1 + rt_1) + \dfrac{S}{1+rt_2} = \$470\left(1+0.075\times\dfrac{104}{365}\right)+\dfrac{\$390}{1+0.075\times\frac{73}{365}}$

$= \$470(1.021370)+\dfrac{\$390}{1.01500}$

$= \$480.044 + \$384.236$

$= \underline{\$864.28}$

Exercise 2.2

a. $a^2 \times a^3 = \underline{a^5}$

b. $(x^6)(x^{-4}) = \underline{x^2}$

c. $b^{10} \div b^6 = b^{10-6} = \underline{b^4}$

d. $h^7 \div h^{-4} = h^{7-(-4)} = \underline{h^{11}}$

e. $(1 + i)^4 \times (1 + i)^9 = \underline{(1 + i)^{13}}$

f. $(1 + i) \times (1 + i)^n = \underline{(1 + i)^{n+1}}$

g. $(x^4)^7 = x^{4\times7} = \underline{x^{28}}$

h. $(y^3)^3 = \underline{y^9}$

i. $\left(t^6\right)^{\frac{1}{3}} = \underline{t^2}$

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j. $(n^{0.5})^8 = \underline{n^4}$

k. $\dfrac{\left(x^5\right)\left(x^6\right)}{x^9} = x^{5+6-9} = \underline{x^2}$

l. $\dfrac{\left(x^5\right)^6}{x^9} = x^{5\times6-9} = \underline{x^{21}}$

m. $\left[2(1+i)\right]^2 = \underline{4(1+i)^2}$

n. $\left(\dfrac{1+i}{3i}\right)^3 = \underline{\dfrac{(1+i)^3}{27i^3}}$

o. $\dfrac{4r^5t^6}{(2r^2t)^3} = \dfrac{4r^5t^6}{8r^6t^3} = \dfrac{r^{5-6}t^{6-3}}{2} = \dfrac{r^{-1}t^3}{2} = \underline{\dfrac{t^3}{2r}}$

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

1. $8^{4/3} = \left(8^{1/3}\right)^4 = 2^4 = \underline{16.0000}$

2. $-27^{2/3} = -\left(27^{1/3}\right)^2 = \underline{-9.00000}$

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3. $7^{3/2} = 7^{1.5} = \underline{\underline{18.5203}}$

4. $5^{-\frac{3}{4}} = 5^{-0.75} = \underline{\underline{0.299070}}$

5. $(0.001)^{-2}$ = 1,000,000

6. $0.893^{-1/2} = 0.893^{-0.5} = \underline{\underline{1.05822}}$

7. $(1.0085)^5(1.0085)^3 = 1.0085^8$ = 1.07006

8. $(1.005)^3(1.005)^{-6} = 1.005^{-3}$ = 0.985149

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

10. $\sqrt[6]{1.05} = 1.05^{0.1\overline{6}}$ = 1.00816

11. $\left(4^4\right)\left(3^{-3}\right)\left(-\frac{3}{4}\right)^3 = \frac{4^4}{3^3}\left(-\frac{3^3}{4^3}\right)$ = - 4.00000

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

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

14. $\frac{2}{3}\div\frac{3}{2}\div = \frac{\left(\frac{2}{3}\right)^3}{\left(\frac{2}{3}\right)^2} = \frac{2}{3} = \underline{\underline{0.666667}}$

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15. $\frac{1.03^{16} - 1}{0.03} = \underline{\underline{20.1569}}$

16. $\frac{\left(1.00\overline{83}\right)^{30} - 1}{0.00\overline{83}} = \frac{0.2826960}{0.008333333} = \underline{\underline{33.9235}}$

17. $\frac{1 - 1.0225^{-20}}{0.0225} = \frac{0.3591835}{0.0225} = \underline{\underline{15.9637}}$

18. $\frac{1 - \left(1.00\overline{6}\right)^{-32}}{0.00\overline{6}} = \frac{0.1915410}{0.00\overline{6}} = \underline{\underline{28.7312}}$

19. $(1 + 0.0275)^{1/3}$ = 1.00908

20. $(1 + 0.055)^{1/6} - 1$ = 0.00896339

Exercise 2.3

$2a - 9 = a + 1$

$2a - a = 1 + 9$

$a = \underline{\underline{10}}$

a. $5 + 3x = 20$

$3x = 20 - 5$

$3x = 15$

$x = \underline{\underline{5}}$

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b. $6(y - 4) = 0$
$6y - 24 = 0$
$6y = 24$
$y = \underline{4}$

c. $\frac{b}{3} - 1 = 5$
$\frac{b}{3} = 6$
$b = \underline{18}$

d. $-7x - 10 = 11$
$-7x = 21$
$x = \underline{-3}$

e. $4 = \frac{10-m}{3}$
$12 = 10 - m$
$m = 10 - 12$
$m = \underline{-2}$

f. $12 - 3x - 8 = -10x - 10$
$4 - 3x = -10x - 10$
$-3x + 10x = -10 - 4$
$7x = -14$
$x = \underline{-2}$

g. $2(4x - 5) = x - 3$
$8x - 10 = x - 3$
$8x - x = -3 + 10$
$7x = 7$
$x = \underline{1}$

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h. $\frac{x+2}{x-1} = 4$
$x + 2 = 4(x - 1)$
$x + 2 = 4x - 4$
$x - 4x = -4 - 2$
$-3x = -6$
$x = \underline{2}$

i. $\frac{15p}{2} = 7p + 4$
$15p = 2(7p + 4)$
$15p = 14p + 8$
$15p - 14p = 8$
$p = \underline{8}$

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

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

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

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

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

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

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

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

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

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

11. $3.1t + 145 = 10 + 7.6t$
$-4.5t = -135$
$t = \underline{30}$

12. $1.25y - 20.5 = 0.5y - 11.5$
$0.75y = 9$
$y = \underline{12}$

13. $\frac{x+2}{5} = x + 0.8$
$x + 2 = 5(x + 0.8)$
$x + 2 = 5x + 4$
$x - 5x = 4 - 2$
$-4x = 2$
$x = \underline{-0.5}$

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14. $\frac{3.5}{x-1} = 2.5$

3.5 = 2.5(x – 1)
3.5 = 2.5x – 2.5
-2.5x = -2.5 – 3.5
-2.5x = -6
x = 2.4

15. $\frac{10a}{2.2} + (2.2)^2 = 6 + a(2.2)^3$

$4.\overline{54}a + 4.84 = 6 + 10.648a$
$4.\overline{54}a$ - 10.648a = 6 – 4.84
-6.1025a = 1.16
a = -0.19

16. 21 - $\frac{b}{1.45}$ = 5.5b – 9
21 – 0.6897b = 5.5b – 9
-0.6897b-5.5b = -9 – 21
-6.1897b = -30
b = 4.85

17. $(1.065)^2x - \frac{x}{1.065}$ = $35
1.134225x – 0.938967x = $35
0.195258x = $35
x = $179.25

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18. $12x – 4x(1.06)^4$ = $1800
12x – 5.04991x = $1800
6.95009x = $1800
x = $258.99

19. $\frac{x}{1.1^2} + 2x(1.1)^3 = \$1000$
0.8264463x + 2.662x = $1000
3.488446x = $1000
x = $286.66

20. $\frac{3x}{1.025^6} + x(1.025)^8 = \$2641.35$
2.586891x + 1.218403x = $2641.35
x = $694.13

21. $\frac{2x}{1.03^7} + x + x(1.03)^{10} = \$1000 + \frac{\$2000}{1.03^4}$
1.626183x + x + 1.343916x = $1000 + $1776.974
3.970099x = $2776.974
x = $699.47

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

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

$x = \underline{\$1892.17}$

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

$1.021863x + 1.945318x = \$1160.20$

$2.967181x = \$1160.20$

$x = \underline{\$391.01}$

24. $\frac{x}{1 + 0.115 \times \frac{78}{365}} + 3x\left(1 + 0.115 \times \frac{121}{365}\right) = \$1000\left(1 + 0.115 \times \frac{43}{365}\right)$

$0.9760141x + 3.114370x = \$1013.548$

$x = \underline{\$247.79}$

Exercise 2.4

1. $I = Prt$

$\$6.25 = P(0.05)0.25$

$\$6.25 = 0.0125P$

$P = \frac{\$6.25}{0.0125} = \underline{\$500.00}$

2. $PV = \frac{PMT}{i}$

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$\$150{,}000 = \frac{\$900}{i}$

$\$150{,}000i = \$900$

$i = \frac{\$900}{\$150{,}000} = \underline{0.006}$

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. $N = L(1 - d)$

$\$410.85 = \$498(1 - \mathrm{d})$

$\frac{\$410.85}{\$498} = 1 - d$

$0.825 = 1 - d$

$d = 1 - 0.825 = \underline{0.175}$

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

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

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

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

$$t = \frac{\$100}{\$12.5} = \underline{8}$$

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

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$\$70.29 = \$99.99(1 - 0.20)(1 - d_2)(1 - 0.05)$

$\$70.29 = \$75.9924(1 - d_2)$

$$\frac{\$70.29}{\$75.9924} = (1 - d_2)$$

$d_2 = 1 - 0.92496 = \underline{0.0750}$

11. $FV = PV(1+i_1)(1+i_2)(1+i_3)$

$\$1094.83 = \$1000(1 + i_1)(1 + 0.03)(1 + 0.035)$

$\$1094.83 = \$1066.05(1 + i_1)$

$$\frac{\$1094.83}{\$1066.05} = 1 + i_1$$

$i_1 = 1.02700 - 1 = \underline{0.0270}$

12. $FV = PMT\left[\frac{(1+i)^n - 1}{i}\right]$

$$\$1508.54 = PMT\left[\frac{(1+0.05)^4 - 1}{0.05}\right]$$

$$\$1508.54 = PMT\left(\frac{1.21550625 - 1}{0.05}\right)$$

$\$1508.54 = PMT(4.310125)$

$$PMT = \frac{\$1508.54}{4.310125} = \underline{\$350.00}$$

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13. $PV = PMT\left[\dfrac{1-(1+i)^{-n}}{i}\right]$

$\$6595.20 = PMT\left[\dfrac{1-(1+0.06)^{-20}}{0.06}\right]$

$\$6595.20 = PMT\left[\dfrac{1-0.31180473}{0.06}\right]$

$\$6595.20 = PMT(11.46992117)$

$PMT = \dfrac{\$6595.20}{11.46992117} = \underline{\$575.00}$

14. $I = Prt$

$\dfrac{I}{Pr} = \dfrac{Prt}{Pr}$

$t = \dfrac{I}{Pr}$

15. $PV = \dfrac{PMT}{i}$

$i(PV) = PMT$

$i = \dfrac{PMT}{PV}$

16. $N = L(1-d)$

$\dfrac{N}{L} = 1-d$

$d = 1-\dfrac{N}{L}$

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

$NI + FC = (CM)X$

$CM = \dfrac{NI + FC}{X}$

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

$NI + FC = (CM)X$

$X = \dfrac{NI + FC}{CM}$

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

$S = P + Prt$

$S - P = Prt$

$r = (S-P)/Pt$

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

$S = P + Prt$

$S - P = Prt$

$t = (S-P)/Pr$

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

$\dfrac{N}{L(1-d_2)(1-d_3)} = (1-d_1)$

$d_1 = 1-\dfrac{N}{L(1-d_2)(1-d_3)}$

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

$\dfrac{N}{L(1-d_1)(1-d_2)} = (1-d_3)$

$d_3 = 1-\dfrac{N}{L(1-d_1)(1-d_2)}$

23. $FV = PV(1+i)^n$

$\dfrac{FV}{(1+i)^n} = PV$

$PV = FV(1+i)^{-n}$

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24. $FV = PV(1+i)^n$

$\$9321.91 = \$2000(1 + i)^{20}$

$\left(\frac{\$9321.91}{\$2000}\right)^{1/20} = 1 + i$

$1.0800 = 1 + i$

$i = 1.08000 - 1 = \underline{0.08}$

25. $PV = FV(1+i)^{-n}$

$\$5167.20 = \$10{,}000(1 + i)^{-15}$

$\frac{\$5167.20}{\$10{,}000} = \frac{1}{(1+i)^{15}}$

$(1+i)^{15} = \frac{\$10{,}000}{\$5167.20}$

$1 + i = (1.935284)^{1/15} = 1.0450$

$i = \underline{0.045}$

<u>26.</u> $FV = PV(1+i)^n$

$\left(\frac{FV}{PV}\right)^{1/n} = (1+i)$

$i = \left(\frac{FV}{PV}\right)^{1/n} - 1$

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Exercise 2.5

a. Step 2: Students on 4 buses = 177 less 9 in cars
Let number of students per bus be x.
Step 3: 4 buses x students per bus = students on buses less students in cars
Step 4: 4x = 177 – 9
Step 5: 4x = 168
x = 42
Each bus holds <u>42 students</u>.

b. Step 2: Cost of binder = \$9.50, Purchased 4 pencils
Let the cost of one pencil be p.
Step 3: Cost of order = cost of binder + cost of 4 pencils
Step 4: \$12.50 = \$9.50 + 4p
Step 5: 4p = \$12.50 - \$9.50
4p = \$3.00
p = \$0.75
Each pencil cost <u>\$0.75.</u>

c. Step 2: Weekly earnings = \$600 plus 2% commission on sales, Weekly salary = \$400
Let s represent weekly sales.
Step 3: Weekly earnings = weekly salary + 2% commission on sales
Step 4: \$600 = \$400 + 0.02s

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Step 5: $0.02s = \$600 - \$400$

$0.02s = \$200$

$s = \$10{,}000$

The salesperson's weekly sales were $10,000.

d. Step 2: Samuel's winnings = $600 after sharing $200 with each sibling.

Let s be the number of siblings.

Step 3: Total winnings = Samuel's winnings + siblings winnings

Step 4: $\$2000 = \$600 + \$200s$

Step 5: $\$200s = \$2000 - \$600$

$\$200s = \$1400$

$s = 7$

Samuel has 7 brothers and sisters.

e. Step 2: Money in pocket = $170 after ½ used to pay bill plus an extra $50.

Let c be the amount of her pay cheque.

Step 3: Money in pocket = ½ pay cheque + extra money earned

Step 4: $\$170 = 0.5c + \$50$

$0.5c = \$170 - \$50$

$0.5c = \$120$

$c = \$240$

Josie's weekly pay cheque is $240.

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

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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 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.

3. Step 2: Tag price = $39.55 (including 13% HST). Let the plant's pretax price be P.

Step 3: Tag price = Pre-tax price + HST

Step 4: $\$39.55 = P + 0.13P$

Step 5: $\$39.55 = 1.13P$

$P = \frac{\$39.55}{1.13} = \$35.00$

The amount of HST is $39.55 – $35.00 = $4.55

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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

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

Step 5: \$295 + \$0.15d – \$150 = \$389
\$0.15d = \$244
d = 1627 km
The unlimited driving plan will be cheaper if you drive more than 1626.7 km in the one-week interval.

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
Rounded to the nearest quarter hour, Alicia must work 125¾ hours of overtime to earn enough money to buy the canoe.

8. 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: $h + \frac{h}{0.4} + \frac{h}{2} = 96$

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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.

9. Step 2: Cost of radio advertising = 0.5(Cost of newspaper 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 + Newspaper advertising = \$160,000
Step 4: $r + 0.6r + \frac{r}{0.5} = \$160{,}000$
Step 5: $3.6r = \$160{,}000$
$r = \$44{,}444.44$
Rounded to the nearest dollar, 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 newspaper advertising.

10. Step 2: By-laws require: 5 parking spaces per 100 square meters,
4% of spaces for physically handicapped
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 handicapped + # regular spaces + # small spaces
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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 the physically handicapped, 550 small-car spaces, and 770 regular parking spaces.

11. Step 2: Overall portfolio's rate 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: $1.1\% = -3.3\%e + 7.7\% - 7.7\%e$
$-6.6\% = -11.0\%e$
$e = 0.600$
Therefore, 60.0% of Erin's original portfolio was invested in the equity fund.

12. 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: $0.0415(32.5) = 0.0525A + 0.0284(32.5 - A)$

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Step 5: $1.34875 = 0.0525A + 0.9230 - 0.0284A$
$0.42575 = 0.0241A$
$A = 17.67$ tonnes
$B = 32.5 - 17.67 = 14.83$ tonnes
The recycling company should mix 17.67 tonnes from pile A with 14.83 tonnes from pile B.

13. Step 2: Total options = 100,000
# of options to an executive = 2000 + # of options to a scientist or engineer
# of options to a scientist or engineer = 1.5(# of options to a technician)
There are 3 executives, 8 scientists and engineers, and 14 technicians.
Let t represent the number of options to each technician.
Step 3: Total options = Total options to scientists and 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
Rounded to the nearest whole numbers, each technician will receive 3082 options, each scientist and engineer will receive 1.5(3082) = 4623 options, and each executive will receive 2000 + 4623 = 6623 options.

14. Step 2: Plan X: 6.5 cents/minute (in business hours) and 4.5 cents/minute (at other times)
Plan Y: 5.3 cents/minute any time
Let b represent the fraction of business-hour usage at which costs are equal.
Step 3: Cost of Plan X = Cost of plan Y
Step 4: Pick any amount of usage in a month—say 1000 minutes.
$b(1000)\$0.065 + (1 - b)(1000)\$0.045 = 1000(\$0.053)$
Step 5: $\$65b + \$45 - \$45b = \$53$
$\$20b = \$8$
$b = 0.40$
If business-hour usage exceeds 40% of overall usage, plan Y will be cheaper.

15. 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: $\$160.00 = \$2.89p + \$187.50 - \$3.75p$
$-\$27.50 = -\$0.86p$
$p = 31.98$ kg peanuts
$(50 - p) = 50 - 31.98 = 18.0$ kg raisins
32.0 kg of peanuts should be mixed with 18.0 kg of raisins.

16. Step 2: Total bill = \$3310. Total hours = 41.
Hourly rate = \$120 for CGA
= \$50 for technician.
Let x represent the CGA's hours.
Step 3: Total bill = (CGA hours x CGA rate) + (Technician hours x Technician rate)
Step 4: $\$3310 = x(\$120) + (41 - x)\$50$

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Step 5: $3310 = 120x$ + $2050 – 50x$
1260 = 70x
x = 18
The CGA worked 18 hours and the technician worked 41 – 18 = 23 hours.

17. 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

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

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

18. 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

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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.

19. 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.

20. 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

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1340 seats were sold in the red section and 4460 – 1340 = 3120 seats were sold in the blue section.

21. 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: $759,000 = w + 2w + 2.1\overline{6}w$
$= 5.1\overline{6}w$
$w = \$146,903.23$
Each child will receive 0.5($146,903.23) = $73,451.62
and each grandchild will receive $0.\overline{3}$ ($73,451.62) = $24,483.87.

22. 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.

23. 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

24. Step 2: There are 3 managers and 26 production workers. Total distribution = $100,000.
Manager's share = 1.2 (Production worker's share).
Let p represent a production worker's share.

Step 3: 3(Manager's share) + 26(Production worker's share) = $100,000

Step 4: 3(1.2p) + 26p = $100,000
Step 5: 29.6p = $100,000
p = $3378.38
Each production worker will receive $3378.38 and each manager will receive
1.2($3378.38) = $4054.06.

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Review Problems

1. $4(3a + 2b) - 5a(2 - b) = 12a + 8b - 10a + 5ab$

$= \underline{2a + 5ab + 8b}$

2. $4(3a + 2b)(2b - a) - (2a - b)(a + 3b) = 4(6ab - 3a^2 + 4b^2 - 2ab) - (2a^2 + 6ab - ab - 3b^2)$

$= 4(-3a^2 + 4ab + 4b^2) - (2a^2 + 5ab - 3b^2)$

$= -12a^2 + 16ab + 16b^2 - 2a^2 - 5ab + 3b^2$

$= \underline{-14a^2 + 11ab + 19b^2}$

3. *a.* $\dfrac{9y-7}{3} - 2.3(y-2) = 3y - 2.\overline{3} - 2.3y + 4.6 = \underline{0.7y + 2.2\overline{6}}$

b. $P\left(1 + 0.095 \times \dfrac{135}{365}\right) + \dfrac{2P}{1 + 0.095 \times \frac{75}{365}} = 1.035137P + 1.961706P = \underline{2.996843P}$

4. *a.* $6(4y - 3)(2 - 3y) - 3(5 - y)(1 + 4y) = 6(8y - 12y^2 - 6 + 9y) - 3(5 + 20y - y - 4y^2)$

$= 6(-12y^2 + 17y - 6) - 3(-4y^2 + 19y + 5)$

$= -72y^2 + 102y - 36 + 12y^2 - 57y - 15$

$= \underline{-60y^2 + 45y - 51}$

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

c. $\dfrac{x}{1 + 0.085 \times \frac{63}{365}} + 2x\left(1 + 0.085 \times \dfrac{151}{365}\right) = 0.985541x + 2.070329x = \underline{3.05587x}$

d. $\dfrac{96\text{nm}^2 \quad 72\text{n}^2\text{m}^2}{48\text{n}^2\text{m}} = \dfrac{4\text{m} \quad 3\text{nm}}{2\text{n}}$

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

6. *a.* $L(1 - d_1)(1 - d_2)(1 - d_3) = \$340(1 - 0.15)(1 - 0.08)(1 - 0.05) = \underline{\$252.59}$

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

7. *a.* $\dfrac{(-3x^2)^3(2x^{-2})}{6x^5} = \dfrac{(-27x^6)(2x^{-2})}{6x^5} = \underline{-\dfrac{9}{x}}$

b. $\dfrac{(-2a^3)^{-2}(4b^4)^{3/2}}{(-2b^3)(0.5a)^3} = \dfrac{\left(\frac{1}{4a^6}\right)(8b^6)}{(-2b^3)(0.125a^3)} = \dfrac{0.25a^{-6}(8b^6)}{-0.25b^3a^3} = \dfrac{2a^{-6}b^6}{-0.25b^3a^3} = -\dfrac{8b^{(6-3)}}{a^{(3+6)}} = \underline{-\dfrac{8b^3}{a^9}}$

8. $\left(-\dfrac{2x^2}{3}\right)^{-2}\left(\dfrac{5^2}{6x^3}\right)\left(-\dfrac{15}{x^5}\right)^{-1} = \left(-\dfrac{3}{2x^2}\right)^2\left(\dfrac{25}{6x^3}\right)\left(-\dfrac{x^5}{15}\right) = \left(\dfrac{9}{4x^4}\right)\left(\dfrac{25}{6x^3}\right)\left(-\dfrac{x^5}{15}\right) = -\dfrac{225x^5}{360x^7} = \underline{-\dfrac{5}{8x^2}}$

9. *a.* $(1.0075)^{24} = \underline{1.19641}$

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

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

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d. $\dfrac{1-(1+0.045)^{-12}}{0.045} = \underline{\underline{9.11858}}$

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

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

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

$$1.936545x + 1.021014x = \$831$$
$$2.957559x = \$831$$
$$x = \underline{\underline{\$280.97}}$$

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

$$3.47782x + 0.915142x + x = \$2356.49$$
$$x = \underline{\underline{\$436.96}}$$

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

$$0.793832x + 0.680244x = \$850$$
$$x = \underline{\underline{\$576.63}}$$

Check: $\frac{\$576.63}{1.08^3} + \frac{\$576.63}{2}(1.08)^4 = \$457.747 + \$392.249 = \$850.00$

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

$$2.03586x + 0.970177x = \$1565.70$$
$$x = \underline{\underline{\$520.85}}$$

Check:

$2(\$520.85)\left(1+0.085\times\frac{77}{365}\right) + \frac{\$520.85}{1+0.085\times\frac{132}{365}} = \$1060.379 + \$505.317 = \$1565.70$

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

$\$324.30 = \$498(1 - 0.20)(1 - d_2)(1 - 0.075)$

$\$324.30 = \$368.52(1 - d_2)$

$$\frac{\$324.30}{\$368.52} = (1 - d_2)$$

$d_2 = 1 - 0.8800 = \underline{\underline{0.120}} = \underline{\underline{12.0\%}}$

14. $V_f = V_i(1 + c_1)(1 + c_2)(1 + c_3)$

$\$586.64 = \$500(1 + 0.17)(1 + c_2)(1 + 0.09)$

$\$586.64 = \$637.65(1 + c_2)$

$$1 + c_2 = \frac{\$586.64}{\$637.65}$$

$c_2 = 0.9200 - 1 = \underline{\underline{-0.0800 = -8.00\%}}$

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15. $FV = PV(1 + i_1)(1 + i_2)$

$$\frac{FV}{PV(1+i_2)} = (1 + i_1)$$

$$i_1 = \frac{FV}{PV(1+i_2)} - 1$$

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

$$NI + FC = (CM)X$$

$$CM = \frac{NI+FC}{X}$$

17. Given: Mint = \$0.202/gram; Camomile = \$0.158/gram; Blend = \$0.179/gram; Total Weight of Blend = 2kg

Let M represent grams of Mint tea used in the blend

Total cost of Mint tea + Total cost of Camomile tea = Price for 2kg of the blend

$\$0.202M + \$0.158(2000 - M) = \$0.179 \times 2000$

$\$0.202M + \$316 - \$0.158M = \$358$

$\$0.044M = \$42$

$M = 954.55$ grams

Norman's tea blend should contain 954.55 grams of Mint tea

18. Given: Ken's share = 0.80(Hugh's share) + \$15,000; Total distribution = \$98,430

Let H represent Hugh's share. Then

Hugh's share + Ken's share = Total distribution

$H + 0.8H + \$15{,}000 = \$98{,}430$

$1.8H = \$83{,}430$

$H = \$46{,}350$

Hugh should receive \$46,350 and Ken should receive \$98,430 – \$46,350 = \$52,080.

19. 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's 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.

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20. Given: Class A shares = $9 per share; Class B shares = $5 per share; Class C shares = $2 per share; Total value for 20,000 shares = $142,500.

Let x represent number of Class C shares

Value Class A shares + Value Class B shares + Value Class C shares = $142,500

$9(5x) + $5(20,000 – 6x) + $2x = $142,500

$45x + $100,000 - $30x + $2x = $142,500

$17x = $42,500

x = 2500

They issued 2500 Class C shares, 5 x 2500 = 12,500 Class A shares and

20,000 – 2500 – 12,500 = 5000 Class B shares

21. Given: Beef = $17.05 per kg; Pork = $12.10 per kg, Total kg sold = 150.

Total sales = $2022.90

Let x represent number of kg of beef sold.

$17.05x + $12.10(150 – x) = $2022.90

$17.05x + $1815 - $12.10x = $2022.90

$4.95 x = $207.90

x = 42

They sold 42 kg of beef sausage and 150 – 42 = 108 kg of pork sausage

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