2 Review and Applications of Algebra

**Exercise 2.1**

**Basic Problems**

 1. (– p) + (– 3p) + 4p = – p – 3p + 4p = 0

 2. (5s – 2t) – (2s – 4t) = 5s – 2t – 2s + 4t = 3s + 2t

 3. 4x2y+ (– 3x2y) – ( – 5x2y) = 4x2y – 3x2y + 5x2y = 6x2y

 4. 1 – (7e2 – 5 + 3e – e3) = 1 – 7e2 + 5 – 3e + e3 = e3 – 7e2 – 3e + 6

 5. (6x2 – 3xy + 4y2) – (8y2 – 10xy – x2) = 6x2 – 3xy + 4y2 – 8y2 + 10xy + x2

 = 7x2 – 4y2 + 7xy

 6. 6a – 3a – 2(2b – a) = 6a – 3a – 4b + 2a = 5a - 4b

 7. $\frac{3y}{1.2}+ 6.42y - 4y + 7 = 2.5y + 6.42y - 4y + 7=$ 4.92y + 7

 8. 13.2 + 7.4t – 3.6 + $\frac{2.8t}{0.4}$ = 13.2 + 7.4t – 3.6 + 7t = 14.4t + 9.6

**Intermediate Problems**

 9. 4a(3ab – 5a + 6b) = 12a2b – 20a2 + 24ab

 10. 9k(4 – 8k + 7k2) = 36k – 72k2 + 63k3

 11. – 5xy(2x2 – xy – 3y2) = – 10x3y + 5x2y2 + 15xy3

 12. (3p2 – 5p)(– 4p + 2) = – 12p3 + 6p2 + 20p2 – 10p = – 12p3 + 26p2 – 10p

 13. 3(a – 2)(4a + 1) – 5(2a + 3)(a – 7) = 3(4a 2 + a – 8a – 2) – 5(2a2 – 14a + 3a – 21)

 = 12a2 – 21a – 6 – 10a2 + 55a + 105

 = 2a2 + 34a + 99

 14. 5(2x – y)(y + 3x) – 6x(x – 5y) = 5(2xy + 6x2 – y2 – 3xy) – 6x2 + 30xy

 = – 5xy + 30x2 – 5y2 – 6x2 + 30xy

 = 24x2 + 25xy – 5y2

 15.  = 6x

 16.  = 

 17.  x – y

 18.  = 8 – 20x + 12x2

 19. 

**Exercise 2.1 *(continued)***

20. 

21. 3d2 – 4d + 15 = 3(2.5)2 – 4(2.5) + 15

 = 18.75 – 10 + 15

 = 23.75

 22. 15g – 9h + 3 = 15(14) – 9(15) + 3 = 78

 23. 7*x*(4y – 8) = 7(3.2)(4 × 1.5 – 8) = 22.4(6 – 8) = – 44.8

 24. (1 + *i*)*m* – 1 = (1 + 0.0225)4 – 1 = 0.093083

 25. *I* ÷ *Pr* =  = 0.250

 26.  = $99.00

 27. *P*(1 + *rt*) = $770= $770(1.0079425) = $776.12

 28. = $2430.38

 29. *P*(1 + *i*)*n* = $1280(1 + 0.025)3 = $1378.42

 30. = $812.73

**Advanced Problems**

31. = 0.5x + 2.25 – 1.2x + 1.2 = – 0.7x + 3.45

 32.  = 0.5x – x2 + 0.8 – 0.2x2 – 0.8x + 0.5

 = – 1.2x2 – 0.3x + 1.3

 33.  = 16x + 0.5x + 2.3x – 8.5 = 18.8x – 8.5

 34.  = 1.9139x – 0.6720x + 0.5x = 1.7419x

 35. = $1794.22

**Exercise 2.1 *(continued)***

 36. 

 

 = $4687.97

 37. = $1071.77

**Exercise 2.2**

**Basic Problems**

 1. *I = Prt*

$6.25 = *P*(0.05)0.25

$6.25 = 0.0125*P*

 *P* =  = $500.00

 2. 



$150,000*i* = $900

*i* =  = 0.00600

 3. *S = P*(1 *+ rt*)

$3626 = *P*(1 + 0.004×9)

$3626 = 1.036*P*

*P* =  = $3500.00

 4. *N = L*(1 – *d*)

 $891 = *L*(1 – 0.10)

 $891 = 0.90*L*

 *L* =  = $990.00

 5. *N = L*(1 – *d*)

 $410.85 = $498(1 – d)

  = 1 – *d*

 0.825 = 1 – *d*

 *d* = 1 – 0.825 = 0.175

**Exercise 2.2 *(continued)***

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

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

 $5100 = $5000 + $12.5*t*

 $5100 – $5000 = $12.5*t*

 *t* =  = 8.00

7. *NI* =(*CM* )*X – FC*

 $15,000 = *CM*(5000) – $60,000

 $15,000 + $60,000 = 5000*CM*

*CM* = = $15.00

 8. *NI* =(*CM* )*X – FC*

 – $542.50 = ($13.50)*X* – $18,970

 $18,970 – $542.50 = ($13.50)*X*

*X* = = 1365

 9. 

 $1468.80 = *L*(1 – 0.20)(1 – 0.15)(1 – 0.10)

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

*L* =  = $2400.00

10. 



 0.12($6700) *= Vf* –$6700

 $804 + $6700*= Vf*

 *Vf =* $7504.00

11. 

 

 0.07*Vi=*$1850 - *Vi*

 0.07*Vi + Vi =* $1850

 1.07*Vi =* $1850

 *Vi =*$\frac{\$1850}{1.07}$

 *Vi =* $1728.97

**Exercise 2.2 *(continued)***

 **Intermediate Problems**

 12. a2 × a3 = a5

 13. (*x*6)(*x*-4) = *x*2

 14. b10 ÷ b6 = b10 – 6 = b4

15. h7 ÷ h– 4 = h7 – (– 4) = h11

 16. (1 + *i*)4 × (1 + *i*)9 = (1 + *i*)13

 17. (1 + *i*) × (1 + *i*)*n* = (1 + *i*)*n*+1

 18. (*x*4)7 = *x*4x7 = *x*28

 19. (y3)3 = y9

 20. = t2

 21. (n0.5)8 = n4

 22. 

 23. 

 24. = 4(1+*i*)2

 25. 

 26. 

 27. 

 28. 

 29. 

 30. (0.001)– 2 = 1,000,000

 31. 

 32. (1.0085)5(1.0085)3 = 1.00858 = 1.07006

33. (1.005)3(1.005)– 6 = 1.005–3 = 0.985149

**Exercise 2.2 *(continued)***

34. 

 35. 

**Advanced Problems**

36. 

 37. 

 38. 

 39. 

40. 

 41. 

 42. 

 43. 

 44. 

 45.  – 1 = 0.00896339

# Exercise 2.3

**Basic Problems**

 1. 10a + 10 = 12 + 9a

 10a – 9a = 12 – 10

 a = 2

**Exercise 2.3 *(continued)***

 2. 29 – 4y = 2y – 7

 36 = 6y

 y = 6

 3. 0.5 (x – 3) = 20

 x – 3 = 40

 x = 43

 4. 

 x – 2 = 12

 x = 14

 5. y = 192 + 0.04y

 y – 0.04y = 192

 y = 

 6. x – 0.025x = 341.25

 0.975x = 341.25

 x = 

 7. 12x – 4(2x – 1) =6(x + 1) – 3

 12x – 8x + 4 = 6x + 6 – 3

 – 2x = – 1

 x = 0.5

 8. 3y – 4 = 3(y + 6) – 2(y + 3)

 = 3y + 18 – 2y – 6

 2y = 16

 y = 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 = 9

 10. 5(2 – c) = 10(2c – 4) – 6(3c + 1)

 10 – 5c = 20c – 40 – 18c – 6

 – 7c = – 56

 c = 8

**Exercise 2.3 *(continued)***

**Intermediate Problems**

11. x – y = 2 ➀

 3x + 4y = 20 ➁

 ➀  3: 3x – 3y = 6

 Subtract: 7y = 14

 y = 2

 Substitute into equation ➀:

 x – 2 = 2

 x = 4

 (x, y) = (4, 2)

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

 12. y – 3x = 11 ➀

 – 4y + 5x = –30 ➁

 ➀  4: 4y – 12x = 44

 Add: –7x = 14

 x = –2

 Substitute into equation ➀:

 y – 3(– 2) = 11

 y = 11 – 6 = 5

 (x, y) = (–2, 5)

 Check: LHS of ➁ = – 4(5) + 5(–2) = –30= RHS of ➁

 13. 7p – 3q = 23 ➀

 –2p – 3q = 5 ➁

 Subtract: 9p = 18

 p = 2

 Substitute into equation ➀:

 7(2) – 3q = 23

 3q = –23 + 14

 q = –3

 (p, q) = (2, –3)

 Check: LHS of ➁ = –2(2) –3(–3) = 5 = RHS of ➁

 14. y = 2x ➀

 7x – y = 35 ➁

 Add: 7x = 2x + 35

 5x = 35

 x = 7

 Substitute into ➀:

 y = 2(7) = 14

 (x, y) = (7, 14)

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

**Exercise 2.3 *(continued)***

 15. –3c + d =– 500 ➀

 0.7c + 0.2d = 550 ➁

 To eliminate d,

 ➀  0.2: –0.6c + 0.2d = –100

 ➁: 0.7c + 0.2d = 550

 Subtract: –1.3c + 0 = –650

 c = 500

 Substitute into ➀: d = 3(500) – 500 = 1000

 (c, d) = (500, 1000)

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

 16. 0.03x + 0.05y = 51 ➀

 0.8x – 0.7y = 140 ➁

 To eliminate y,

 ➀  0.7: 0.021x + 0.035y = 35.7

 ➁  0.05: 0.04x – 0.035y = 7

 Add: 0.061x + 0 = 42.7

 x = 700

 Substitute into ➁:

 0.8(700) – 0.7y = 140

 –0.7y = – 420

 y = 600

 (x, y) = (700, 600)

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

 17. 2v + 6w = 1 ➀

 10v – 9w = 18 ➁

 To eliminate v,

 ➀10: 20v + 60w = 10

 ➁  2: 20v – 18w = 36

 Subtract: 0 + 78w = –26

 w = 

 Substitute into ➀:

 2v + 6= 1

 2v = 1 + 2

 v = 

 (v, w) = 

 Check: LHS of ➁ =  = 18 = RHS of ➁

 **Exercise 2.3 *(continued)***

18. 2.5a + 2b = 11 ➀

 8a + 3.5b = 13 ➁

 To eliminate b,

 ➀3.5: 8.75a + 7b = 38.5

 ➁2: 16a + 7b = 26

 Subtract: –7.25a + 0 = 12.5

 a = –1.724

 Substitute into ➀:

 2.5(–1.724) + 2b = 11

 2b = 11 + 4.31

 b = 7.655

 (a, b) = (–1.72, 7.66)

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

 19. 37x – 63y = 235 ➀

 18x + 26y = 468 ➁

 To eliminate x,

 ➀18: 666x –1134y = 4230

 ➁37: 666x + 962y = 17,316

 Subtract: 0 – 2096y = –13,086

 y = 6.243

 Substitute into ➀:

 37x – 63(6.243) = 235

 37x = 628.3

 x = 16.98

 (x, y) = (17.0, 6.24)

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

 20. 68.9n – 38.5m = 57 ➀

 45.1n – 79.4m = –658 ➁

 To eliminate n,

 ➀45.1: 3107n – 1736.4m = 2571

 ➁68.9: 3107n – 5470.7m = – 45,336

 Subtract: 0 + 3734.3m = 47,907

 m = 12.83

 Substitute into ➀:

 68.9n – 38.5(12.83) = 57

 68.9n = 551.0

 n = 7.996

 (m, n) = (12.8, 8.00)

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

**Advanced Problems**

21. 

 0.8264463x + 2.622x = $1000

 3.488446x = $1000

 x = $286.66

**Exercise 2.3 *(continued)***

 22. 

 2.586891x + 1.218403x = $2641.35

 x = $694.13

 23. 

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

 3.970099x = $2776.974

 x = $699.47

 24. 

 1.157625x + 0.7106813x = $4535.147 – $1000

 x = $1892.17

 25. x

 1.021863x + 1.945318x = $1160.20

 2.967181x = $1160.20

 x = $391.01

**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 |





**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.* 2*x* = 3*y* + 4

 3*y* = 2*x* – 4

 *y* = *x* – 

 The slope is *m* =  and the *y*-intercept is *b* =  .

 *b.* 8 – 3*x* = 2*y*

 2*y* = –3*x* + 8

 *y* = *x* + 4

 The slope is *m* =  and the *y*-intercept is *b* = 4 *(continued)*

**Exercise 2.4 *(continued)***

 6. *c.* 8*x* – 2*y* – 3 = 0

–2*y* = –8*x* + 3

 *y* = 4*x* – 

 The slope is *m* = 4 and the *y*-intercept is *b* =  .

 *d.* 6*x* = 9*y*

 *y* = *x* = *x*

 *y* = *x*

 The slope is *m* =  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 + $80*H*

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

 *C* = $80*H* + $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 + 0.05*R*

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

 *E* = 0.05*R* + $1500

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

 9. *a.* Comparing the equation *F* = *C* + 32 to *y = mx + b*,

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

 slope =  and *F*-intercept = 32 .

 *b.* 

 Therefore, (Change in *F*) = Slope(Change in *C*) = (10 Celsius) = 18 Fahrenheit

 *c.* *F* = *C* + 32

*C* = *F* – 32

*C* = *F* – = *F* –

 On a plot of *C* vs. *F*, slope = and *C*-intercept = .

**Exercise 2.4 *(continued)***

***x***

***y***

*x* = 5

*x* + *y* = 2

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).

***x***

***y***

*y* = –2

*x* – 3*y* = 3

11.*x* –3*y* = 3

|  |  |  |
| --- | --- | --- |
| *x:* | –6 | 3 |
| *y:* | –3 | 0 |

 *y* = –2

|  |  |  |
| --- | --- | --- |
| *x:* | –6 | 3 |
| *y:* | –2 | –2 |

The solution is

(*x, y*) = (–3, –2).

**Exercise 2.4 *(continued)***

12.

*x* + *y* = 4

|  |  |  |
| --- | --- | --- |
| *x:* | 0 | 6 |
| *y:* | 4 | –2 |

2*x* – *y* = 8

|  |  |  |
| --- | --- | --- |
| *x:* | 0 | 6 |
| *y:* | –8 | 4 |

The solution is

(*x, y*) = (4, 0).

***x***

2*x* – *y* = 8

*x + y* = 4

***y***

13.

***x***

***y***

*y –* 3*x =* 11

5*x* + 30 = 4*y*

*y –* 3*x =* 11

|  |  |  |
| --- | --- | --- |
| *x:* | – 4 | 2 |
| *y:* | –1 | 17 |

5*x* + 30 = 4*y*

|  |  |  |
| --- | --- | --- |
| *x:* | – 4 | 2 |
| *y:* | 2.5 | 10 |

The solution is

(*x, y*) = (–2, 5).

**Exercise 2.4 *(continued)***

**Advanced Problem**

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

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

 *b. TC* = $2*X* + $80,000

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

 *c. NI* = $4*X* – $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  increase.

 Let the number of hits 1 year ago be n.

 Step 3: Hits last month = Hits 1 year ago + (Hits 1 year ago)

 Step 4: 2655 = n + n

 Step 5: 2655 = n

Multiply both sides by .

n = 2655 ×  = 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 =  The wholesale cost is $445.00.

**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 =  = $35.35

The amount of HST is $39.95 – $35.35 = $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 =  = $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 =  = $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 + $0.15*d* − $150 = $389

 $0.15*d* = $244

 *d* = 1627 km

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

**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: $35.25*h* − 0.38($35.25*h*) = $2750

 Step 5: $21.855*h* = $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 ➀

 0.5*x* + 0.75*y* = 60.5 ➁

 ➀0.5: 0.5*x* + 0.5*y* = 46.5

 Subtract: 0 + 0.25*y* = 14

 *y* = 56

 Substitute into ➀: *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 ➀

 9m + 3e = $22.98 ➁

 To eliminate e,

 ➀3: 15m + 12e = $58.53

 ➁4: 36m + 12e = $91.92

 Subtract: –21 m + 0 = –$33.39

 m = $1.59

 Substitute into ➀: 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 ➀

 $1.60M + $1.39J = $60.85 ➁

 To eliminate M,

 ➀1.60: $2.40M + $2.08J = $91.20

 ➁1.50: $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.

**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: 

 Step 5: *h* + 2.5*h* + 0.5*h* = 96

4*h* = 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: 

 Step 5: 3.6*r* = $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: = 0.04 × + *s* + 1.4*s*

 Step 5: 1375 = 55 + 2.4*s*

*s* = 550

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

**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 = −3.3*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.

 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) = 0.0525*A* + 0.0284(32.5 − *A*)

 Step 5: 1.34875 = 0.0525*A* + 0.9230 − 0.0284*A*

 0.42575 = 0.0241*A*

*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(1.5*t*) + 14*t* + 3(2000 + 1.5*t*)

 Step 5: = 12*t* + 14*t* + 6000 + 4.5*t*

94,000 = 30.5*t*

 *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.

**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: 400*d* + 200 − 200*d* = 350

200*d* = 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 = $2.89*p* + $187.50 − $3.75*p*

 −$27.50 = −$0.86*p*

 *p* = 31.98 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 Step 5: $3310 = $120*x* + $2050 – $50*x*

 1260 = 70*x*

 *x* = 18

 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 = 

*(continued)*

**Exercise 2.5 *(continued)***

 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: (or 20%) of a 58% interest is worth $1.2 million

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

 Step 5: V =  = $10,344,828

 The implied value of Yukon’s interest is

0.42V = 0.42 × $10,344,828 = $4,344,828

**Exercise 2.5 *(continued)***

25. Step 2:  of entrants complete Level 1.  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:  of  of entrants will complete Level 2.

 Step 4: N = 587

 Step 5: N =  x 587 = 1056.6

 1057 students began Level 1.

 26. Step 2:  of inventory was sold at cost.

 inventory was sold to liquidators at 45% of cost, yielding $6700.

Let C represent the original cost of the entire inventory.

 Step 3:  of inventory was sold to liquidators at 45% of cost, yielding $6700.

 Step 4: (0.45C) = $6700

 Step 5: C =  = $34,740.74

 *a.* The cost of inventory sold to liquidators was

($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 ➀

 Total revenue: $2140*r* + $856*s* = $942,028 ➁

 ➀$856: $856*r* + $856*s* = $499,048

 Subtract: $1284*r* + 0 = $442,980

 *r* = 345

 Substitute into ➀: 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* + 2*c* = $610 ➀

 Chudnowskis’ cost: 2*a* + 3*c* = $1050 ➁

 ➀2: 2*a* + 4*c* = $1220

 Subtract: 0 + −*c* = −$170

 Substitute *c* = $170 into ➀: *a* +2($170) = $610

 *a* = $610 − $340 = $270

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

**Exercise 2.5 *(continued)***

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

 Vratislav’s cost: 2*h* + 47*k* = $ 54.45 ➀

 Bryn’s cost: 5*h* + 93*k* = $127.55 ➁

 To eliminate *h*,

 ➀5: 10*h* + 235*k* = $272.25 ➀

 ➁2: 10*h* + 186*k* = $255.10 ➁

 Subtract: 0 + 49*k* = $ 17.15

 *k* = $0.35 per km

 Substitute into ➀:

 2*h* + 47($0.35) = $54.45

 2*h* = $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 (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(0.5w)

 Step 5: $759,000 = w + 2w + 

 = 

 w = $146,903.226

 Each child will receive 0.5($146,903.226) = $73,451.61

 and each grandchild will receive ($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

**Exercise 2.6**

**Basic Problems**

 1. 

 2. 

 3. 

 4. 

 5. 

 6. 

 7. 

 8. 

 9. Given: *Vi* = $90, *Vf* = $100

 

 $100 is 11.11% more than $90.

10. Given: *Vi* = $110, *Vf* = $100

 

 $100 is 9.09% less than $110.

 11. Given: *c =* 25%, *Vf* = $100

 

 $80.00 increased by 25% equals $100.00.

 12. Given: *Vf* = $75, *c* = 75%

 

 $75 is 75% more than $42.86.

 13. Given: *Vi* = $759.00, *Vf* = $754.30

 

 $754.30 is 0.62% less than $759.00.

**Exercise 2.6 *(continued)***

 14. Given: *Vi* = $75, *c* = 75%

 *Vf = Vi* (1 + *c*) = $75(1 + 0.75) = $131.25

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

 15. Given: *Vf* = $100, *c* = – 10%

 

 $100.00 is 10% less than $111.11.

 16. Given: *Vf* = $100, *c* = – 20%

 

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

 17. Given: *Vi* = $900, *c* = –90%

 *Vf = Vi* (1 + *c*) = $900[1 + (–0.9)] = $90.00

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

 18. Given: *c* = 0.75%, *Vi* = $10,000

 *Vf = Vi* (1 + *c*) = $10,000(1 + 0.0075) = $10,075.00

 $10,000 after an increase of % is $10,075.00.

 19. Given: *c* = 210%, *Vf* = $465

  = $150.00

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

**Intermediate Problems**

 20. Let the retail price be *p*. Then

 *p* + 0.13 *p* = $281.37

*p* =  = $249.00

 The jacket's retail price was $249.00.

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

 *s*  + 0.0526 *s*  = 1200

 1.0526 *s*  = 1200

 *s* =  $≈$ 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*  = $20,608

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

**Exercise 2.6 *(continued)***

23. Given: *Vi* = $285,000*, Vf* = $334,000

  = 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* + 0.0439*p* = 35,851,800

 *p* =  $≈$ 34,344,094

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

26. *a.* Given: *Vi* = 32,400, *Vf* = 27,450

  = –15.28%

 The number of hammers sold declined by 15.28%.

 *b.* Given: *Vi* = $15.10, *Vf* = $15.50

  = 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

  = –13.03%

 The revenue decreased by 13.03%.

 27. *a.* Given: *Vi* = $0.55*, Vf* = $1.55

  = 181.82%

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

 *b.* Given: *Vi* = $1.55, *Vf* = $0.75

  = –51.61%

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

 *c.* Given: *Vi* = $0.55, *Vf* = $0.75

  = 36.36%

 The share price rose by 36.36% over 2 years.

**Exercise 2.6 *(continued)***

 28. Initial unit price = = $3.327 per litre

 Final unit price = = $3.627 per litre

 The percent increase in the unit price is

 = 9.02%

 29. Initial unit price = = 1.5686 cents per g

 Final unit price = = 1.6633 cents per g

 The percent increase in unit price is

 = 6.04%

 30. Given: *Vf* = $348,535, *c* = 1.8%

  $≈$ $354,900

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

 31. Given: *Vf* = $348.60, *c* = –0.30

  = $498.00

 The regular price of the boots is $498.00.

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

 *Vi*  $≈$ 223,037,000

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

33. Given: *Vf* = $2,030,000,000, *c* = 241%

 

 

 

 

 

 

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

**Exercise 2.6 *(continued)***

34. The fees to Fund A will be

  44.24%

 more than the fees to Fund B.

 35. Percent change in the GST rate

 

 The GST paid by consumers was reduced by 16.67%.

 36. Given: *Vf* = $0.45, *c* = 76%

 

 Price decline = *Vi – Vf* = $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 = = 1.0152(Canadian dollar)

 Therefore, the US dollar is worth 1.52% more than the Canadian dollar.

 38. Current unit price = = 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 =  = 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) =  = 1.1655(Sales for 2014)

 That is, sales revenues for 2013 were 116.55% of sales revenues for 2014.

**Exercise 2.6 *(continued)***

**Advanced Problems**

41. Given: For the appreciation, *Vi* = Purchase price, *c* = 140%, *Vf* = List price

 For the price reduction, *Vi* = List price, *c* = –10%, *Vf* = $172,800

 List price = 

 Original purchase price = 

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

42. Given: For the markup, *Vi* = Cost, *c* = 22%, *Vf* = List price

 For the markdown, *Vi* = List price, *c* = –10%, *Vf* = $17,568

 List price = 

 Cost (to dealer) = 

 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,

 

 Therefore, Teachers next year =  = 1.1765(Teachers now)

 That is, if the number of students does not change, the number of

 teachers must be increased by 17.65%.

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

  = 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 23.08% less time 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 =  = 0.7576(Euro) = 75.76% of a Euro.

 That is, the Canadian dollar is worth 100% − 75.76% = 24.24% less than the Euro.

**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

 OT hours (this year) = 

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

 OT hours (next year) = 

= 0.98095

= 98.10% of this year’s OT hours

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

**Review Problems**

**Basic Problems**

 1. *a.* 2(7x – 3y) – 3(2x – 3y) = 14x – 6y – 6x + 9y = 8x + 3y

 *b.* 15x – (4 – 10x + 12) = 15x – 4 + 10x – 12 = 25x – 16

 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 =* $120,000

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

 S = P(1 + rt)

 $1243.75 = $1200$\left[1+r\left(\frac{7}{12}\right)\right]$

 $\frac{\$1243.75}{\$1200}$ = 1 + *r*$ \left(\frac{7}{12}\right)$

 1.0365 – 1 = *r* $\left(\frac{7}{12}\right)$

 0.0365 = 0.58$\overbar{3}$ *r*

 *r =* $\frac{0.0365}{0.58\overbar{3}}$

 *r = 0.0626* x 100% = 6.26%

 4. *a*. 3.1t + 145 = 10 + 7.6t

 3.1t – 7.6t = 10 – 145

 -4.5t = -135

 t = 30

 b. 1.25y – 20.5 = 0.5y – 11.5

 1.25y – 0.5y = -11.5 + 20.5

 0.75y = 9

 y = 12

**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.* 2*b* + 3 = 5*a*

2*b* = 5*a* – 3

 *b* = *a* – 

 The slope is  and the *b-*intercept is  .

 *b.* 3*a* – 4*b* = 12

– 4*b* = –3*a* + 12

 *b* = *a* – 3

 The slope is  and the *b-*intercept is –3 .

 *c.* 7*a* = – 8*b*

8*b* = –7*a*

 *b* = *a*

 The slope is  and the *b-*intercept is 0 .

**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* ➀

 $240.75 = $3.50*A* + $1.25*C* ➁

 Step 5: Rearrange ➀: *A* = 126 – *C*

 Substitute into ➁: $240.75 = $3.50(126 – *C*) + $1.25*C*

 Sove: $240.75 = $441 – $3.50*C* + $1.25*C*

 $240.75 = $441 – $2.25*C*

 $240.75 - $441 = –$2.25*C*

 –$200.25 = –$2.25*C*

 *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%, *Vi* = $29.43

 *Vf  = Vi* (1 + *c*) = $29.43(1.175) = $34.58

 $34.58 is 17.5% more than $29.43.

 *b.* Given: *Vf* = $100, *c* = – 80%

 

 80% off $500 leaves $100.

 *c.* Given: *Vf* = $100, *c* = – 15%

 

 $117.65 reduced by 15% equals $100.

*(continued)*

**Review Problems *(continued)***

 9. *d.* Given: *Vi* = $47.50, *c* = 320%

 *Vf = Vi* (1 + *c*) = $47.50(1 + 3.2) = $199.50

 $47.50 after an increase of 320% is $199.50.

 *e.* Given: *c* = – 62%, *Vf* = $213.56

 

 $562 decreased by 62% equals $213.56.

 *f.* Given: *c* = 125%, *Vf* = $787.50

 

 $350 increased by 125% equals $787.50.

 *g.* Given: *c* = – 30%, *Vi* = $300

 

 $210 is 30% less than $300.

**Intermediate Problems**

 10. 

 11. 4(3a + 2b)(2b – a) – 5a(2a – b) = 4(6ab – 3a2 + 4b2 – 2ab) – 10a2 + 5ab

 = – 22a2 + 21ab + 16b2

 12. *a.* L(1 – d1)(1 – d2)(1 – d3) = $340(1 – 0.15)(1 – 0.08)(1 – 0.05) = $252.59

 *b.* 

13. 

 $324.30 = $498(1 – 0.20)(1 – *d*2)(1 – 0.075)

 $324.30 = $368.52(1 – *d*2)

  = (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 – 12y2 – 6 + 9y) – 3(5 + 20y – y – 4y2)

 = – 60y2 + 45y – 51

 *b.*  = 1.25b – 1 – 20 + 0.8b + 0.875b = 2.925b – 21

 *c.* 

 15. 

**Review Problems *(continued)***

 16. *a.* 1.007524 = 1.19641

 *b.* 

 *c.* 

 17. *a.* 4a – 5b = 30 ➀

 2a – 6b = 22 ➁

 To eliminate a,

 ➀ × 1: 4a – 5b = 30

 ➁ × 2: 4a – 12b = 44

 Subtract: 7b = –14

 b = –2

 Substitute into ➀:4a – 5(–2) = 30

 4a = 30 – 10

 a = 5

 Hence, (a, b) = (5, –2)

 *b.* 76x – 29y = 1050 ➀

 –13x – 63y = 250 ➁

 To eliminate x,

 ➀ × 13: 988x – 377y = 13,650

 ➁ × 76: −988x – 4788y = 19,000

 Add: –5165y = 32,650

 y = –6.321

 Substitute into ➀: 76x – 29(–6.321) = 1050

 76x = 1050 – 183.31

 x = 11.40

 Hence, (x, y) = (11.40, –6.32)

 18. 3x + 5y = 11 ➀

 2x – y = 16 ➁

 To eliminate y,

 ➀: 3x + 5y = 11

 ➁ × 5: 10x – 5y = 80

 Add: 13x + 0 = 91

 x = 7

 Substitute into equation ➁: 2(7) – y = 16

 y = –2

 Hence, (x, y) = (7, –2)

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

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

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

 *B* = $2.75*C* + $28

 On a plot of *B* vs. *C*, slope = $2.75 and *B*-intercept = $28.

**Review Problems *(continued)***

20.

*y +*3*x* = 18

|  |  |  |
| --- | --- | --- |
| *x:* | 0 | 7 |
| *y:* | 18 | -3 |

 5*x +* 10= 5*y*

|  |  |  |
| --- | --- | --- |
| *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 = (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 +  = $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($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.

**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 ➀

 255R + 304L = $2124.70 ➁

 To eliminate R,

 ➀370: R + 0.71351L = $6.6330

 ➁255: R + 1.19216L = $8.3322

 Subtract: –0.47865L = –$1.6992

 L = $3.55

 Substitute into ➀: 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* (*Vi*) | Year 2 *value* (*Vf*) |
| Gold produced: | 34,300 oz. | 23,750 oz. |
| Average price: | $1160 | $1280 |

 *a.* Percent change in gold production = 

 *b.* Percent change in price = 

 *c.* Year 1 revenue, *Vi* = 34,300($1160) = $39.788 million

 Year 2 revenue, *Vf,* = 23,750($1280) =$30.400 million

 Percent change in revenue = 

 25. Given: For the first year, *Vi* = $3.40, *Vf* = $11.50.

 For the second year, *Vi* = $11.50, *c* = – 35%.

 *a.* 

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

 *b.* Current share price, *Vf = Vi* (1 + *c*) = $11.50(1 – 0.35) = $7.48.

 26. Given: For the first year, *c* = 150%

 For the second year, *c* = – 40%, *Vf* = $24

 The price at the beginning of the second year was

  for the first year.

 The price at the beginning of the first year was

 

 Barry bought the stock for $16.00 per share.

**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, *Vf = Vi* (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

 Percent increase in profit = 

 *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

 Percent change in profit = 

 The operating profit will decline by 79.27%.

 28. *a.* 

 *b.* 

**Advanced Problems**

29. 

 30. *a.* 

 0.793832*x* + 0.680245*x* = $850

 *x* = $576.63

 Check: 

 *b.* 

 2.03586*x* + 0.97018*x* = $1565.70

 *x* = $520.85

 Check:

 2($520.85)

 31. *P*(1 + *i*)*n* +  = $3038.766 + $1466.374 = $4505.14

**Review Problems *(continued)***

32. *a.* 

 1.93655*x* + 1.02101*x* = $831

 2.95756*x* = $831

 *x* = $280.97

 *b.* 3*x*(1.035) + 

 3.47782*x* + 0.915142*x* + *x* = $2356.49

 *x* = $436.96

 33. 60% of a interest was purchased for $65,000.

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

 Then V = $65,000

 V =  = $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 ➀

 r($35,500) + b = $3197.50 ➁

 Subtract: –$8500r = –$382.50

 r = 0.045

 Substitute into ➀: 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 ➀

 2500(1.3R) + 4500(1.2B) = $62,400 ➁

 ➀ × 1.2: 2500(1.2R) + 4500(1.2B) = $60,300

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

 R = $8.40

 Substitute into ➀: 2500($8.40) + 4500B = $50,250

 B = $6.50

 The ticket prices for the playoffs cost

 1.3 × $8.40 = $10.92 in the “reds”

 and 1.2 × $6.50 = $7.80 in the “blues”.