1 Review and Applications of

Basic Mathematics

**Exercise 1.1**

a. 10 + 10 x 0 = 10 + 0 = 10

c. (10 + 10) x 0 = 20 x 0 = 0

e. 0 + 3 x 3 – 32 + 10 = 0 + 9 – 9 + 10 = 10

g. 0 + 3 x 3 – (32 + 10) = 0 + 9 – 19 = –10

i**.**



**Concept Questions (Section 1.2)**

1. You must retain at least one more figure than you require in the answer. To achieve four-figure accuracy in the answer, you must retain a minimum of five figures in the values used in the calculations. B)

3. We want seven-figure accuracy in the answer. Therefore, values used in the calculations must retain at least eight figures. C)

**Exercise 1.2**

a. = 0.10 = 10%

c. = 0.25 = 25%

e. = 1.50 = 150%

g. = 2.00 = 200%

i. 0.25 x 80 = 20

k. Money in Savings = 0.20 x $1000 = $200

Money in TFSA = 0.50 x $200 = $100



5.



41. = $1447 (1.295029) (1.1449) = $2145.44



49. 0. x $1527 = $509.00

51. 2.50 x $25 = $62.50

53. 0.005 x $30 = $0.15

55. 0.12 x (0.055 x $458,000) = $3,022.80

57. Sales of in-store products = 0.36 x $102,300 = $36,828

HST collected on in-store products = 0.13 x $36,828 = $4,787.64



65. Seats not sold to season-ticket holders = 100% – 67.5% = 32.5%

Number of seats not sold to season-ticket holders = 0.325 x 19289 = 6,269 seats

Rounded to the nearest 100, 6300 seats were not sold to season-ticket holders.

67. Portion of commission retained = 0.60 × 4.8% = 2.88%

Income is 2.88% of sales =0.0288 x $5,225,000 = $150,480

That is, $150,480 = 0.0288 × Sales

Stan’s commission was $150,480.

69. Sodium intake from other foods = 100% – 35% = 65%

0.65 x 2300 mg = 1495 mg = 1.495 grams

**Exercise 1.3**

1. Regular weekly earnings = = $1130.77



Equivalent hourly rate = = $32.31



Overtime hourly rate = 1.5($32.31) = $48.47

Gross pay for 39-hour week = $1130.77 + 4($48.47) = $1324.65

3. Regular biweekly earnings = = $2100.00



Equivalent hourly wage = = $26.25



Hasad worked 3 hours of overtime in the first week and 6.5 hours in the second week.

Gross pay = $2100.00 + 9.5(1.5)$26.25 = $2474.06

5. Regular hours worked = 7.5 + 7.5 + 6 + 6 + 7.5 = 34.5

Overtime hours worked = 4.5 +1 + 1.5 =7

Gross earnings = 34.5($17.70) + 7(1.5)($17.70) = $796.50

7. Output in excess of quota = 4 + 6 + 7 + 8 +10 =35 shirts

Total pay = 40($7.50) + 35($3.00) = $405.00

9. October earnings = (# renewals) × $20 + (# new policies) × $35 + 0.055(Total premiums)

= 126($20) + 37($35) + 0.055($14,375 + $47,880)

= $7239.03

11. Estimated earnings from Supreme Audio &Video = $2000 + 0.04($55,000) = $4200

Estimated earnings from Buy-Right = $1500 + 0.03($25,000) + 0.06($55,000 – $25,000)

= $4050

13. Gross earnings = 0.033($50,000) + 0.044($50,000) + 0.055 ($40,000)

= $6050.00

15. *a.* Earnings = 0.05($20,000) + 0.075($20,000) + 0.10($14,880) = $3988.00

*b.* For the same earnings from a single straight commission rate,

Commission rate × $54,880 = $3988.00

Commission rate = × 100% = 7.267%



17. Commission earned in August = $3296.97 – $1500.00 = $1796.97

Hence,

Sales subject to commission = ($151,342 – $100,000) = $51,342

Commission rate = × 100% = 3.50%



19. Required monthly commission = $4000 – $2000 = $2000

Commission income on first $50,000 of monthly sales is

0.03($50,000 – $25,000) = $750

The combined commission and bonus rate on sales exceeding $50,000 is 3% + 3% = 6%.

Hence,

0.06(Sales exceeding $50,000) = $2000 – $750

Sales exceeding $50,000 = = $20,833.33



Required monthly sales = $70,833.33

**Concept Questions (Section 1.4)**

1. You should calculate a weighted average when some of the values being averaged are more important or occur more frequently than other values.

3. If you invest the same amount of money in each investment, each rate of return has the same importance. The portfolio’s rate of return will then equal the simple average of the individual rates of return.

**Exercise 1.4**

1. Weight each number of TV sets per household by the number of homes with that number of TVs. The weighted average number of TVs per household in the survey sample is

= 1.53



Based on the survey, we estimate the average number of TVs per household to be 1.53.

3 We should weight each “goals against” figure by the number of games in which that number was scored.

GAA = = 3.50



5. Babe Ruth’s weighted average slugging percentage is

= 85.12%

7. The weighted average interest rate that willbe charged on the new $57,500 balance is

= 7.65%



9. Weight each score by the number of students who obtained that score. The weighted average score is

= 7.53



11. Note that the age of receivables (rather than the dollar amount of receivables) is to be averaged. The relative importance of each of the three age classifications is determined by the dollar amount in each category. Hence, the weighting factors are the respective dollar amounts of receivables. The (weighted) average age of accounts receivable is

= 43.74 days



13.  *a*. The weighted average cost of units purchased during the year is

= $10.67



*b.* The weighted average cost of the beginning inventory and units purchased during the year is

= $10.66



*c.* Value of ending inventory = 239 × Weighted average cost

= 239($10.66)

= $2547.74

15. Each “Menu price as a % of cost” should be weighted by the fraction of revenue obtained from the respective food category. The weighted average “Menu price as a % of cost” is

a. The weighted average menu price (as % of input cost) is

= 226.25% of input costs



On average, Menu prices = 2.2625(Input costs)

b. We can find the average input cost as a percentage of revenue (menu prices) by rearranging the equation in part a:

Input costs = = 0.44199(Menu prices)



On average, input costs are 44.20% of revenue.

|  |  |  |
| --- | --- | --- |
| *Period* | No. of *months* | Number of *employees* |
| Jan. 1 to Mar. 31 | 3 | 14 |
| Apr. 1 to Apr. 30 | 1 | 14 + 7 = 21 |
| May 1 to May 31 | 1 | 21 + 8 = 29 |
| June 1 to Aug. 31 | 3 | 29 + 11 = 40 |
| Sept. 1 to Sept. 30 | 1 | 40 – 6 = 34 |
| Oct. 1 to Dec. 31 | 3 | 34 – 14 = 20 |

17. We want the average number of people working over the course of the year. The given figures for the number of employees added or laid off at various times are used to determine the cumulative number of people employed.

Each number in the third column must be weighted by the number of months in the second column. The average number employed was

= 25.50



|  |  |  |
| --- | --- | --- |
|  | *No. of* | Number of shares |
| Period | *months* | *outstanding (millions)* |
| Jan. 1 to Feb. 28 | 2 | 5 |
| Mar. 1 to May 31 | 3 | 5 + 1 = 6 |
| June 1 to Oct. 31 | 5 | 6 + 0.5 = 6.5 |
| Nov. 1 to Dec. 31 | 2 | 6.5 + 0.75 = 7.25 |

19. Each number of shares in the third column must be weighted by the number of months in the second column. The (weighted) average number of shares outstanding was

= 6.25 million = 6,250,000



21. The rating for each factor must be weighted by the percentage of respondents who selected that rating.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Factor | Not at all Important (1) | Somewhat Important (2) | Important (3) | Extremely Important (4) |
| Price | 19% | 24% | 28% | 29% |
| Service | 13% | 30% | 39% | 18% |
| Quality | 0% | 43% | 21% | 36% |
| Promotions | 11% | 32% | 45% | 12% |

The weighted average ratings (out of 4) for the factors are:

Price = = 2.67

Service = = 2.62

Quality = = 2.93

Promotions = = 2.58

The factor with the highest weighted average rating is quality = 2.93 out of 4.

**Exercise 1.5**

|  |  |  |
| --- | --- | --- |
| 1.Quarter | Sales – Purchases | GST Remittance(Refund) |
| 1 | $155,365 | $7768.25 |
| 2 | (340,305) | (17,015.25) |
| 3 | 408,648 | 20,432.40 |
| 4 | 164,818 | 8240.90 |

3. The GST charged in each case will be

0.05($39,500) = $1975.00

*a.* With no PST in Alberta, the total amount paid will be

$39,500 + $1975.00 = $41,475.00

*b.* PST in Saskatchewan = 0.06($39,500) = $2370.00

Total amount = $39,500 + $1975.00 + $2370.00 = $43,845.00

*c.* PST in Quebec = 0.09975($39,500) = $3940.13

Total amount = $39,500 + $1975.00 + $3940.13 = $45,415.13

5. *a.* The HST reported for a $39.45 (pre-tax) item is 0.13($39.45) = $5.13.

*b.* The HST inclusive price is $39.45 + $5.13 = $44.58. If $50 cash is paid, change will be based on the rounded price of $44.60. Therefore, change will be $50 – $44.60 = $5.40.

7. Property tax =



9. Total taxes =



= $2149.204 + $2167.954

= $4317.16

11. *a.* Tax increase = Assessed value



$2,430,000 = $6,780,000,000



Mill rate increase = = 0.3584



Next year’s mill rate = 7.1253 + 0.3584 = 7.4837

*b.* Next year's assessment = 1.05($6.78 billion) = $7.119 billion

Next year’s budget = Current year's taxes + $2,430,000

= $6.78 billion + $2,430,000



= $50,739,534

Next year’s school mill rate applied to next year’s assessment must generate

enough tax revenue to meet next year’s budget. That is,

$50,739,534=



New mill rate = 

**Review Problems**

1. *a.* = 25 – 20 ÷ 10 = 25 – 2 = 23



*b.* 4 = 4(2 × 9 – 8)2 ÷ (10 – 20)



= 4 × 102 ÷ (– 10)

= – 40

*c.* $213.85= $213.85(1 – 0.0395833) = $205.39



*d.*  = = $2275.40



*e.* $325.75$325.75(1.053189) = $343.08



*f.* = $619.94



*g.* $885.75 = $885.75(1.049048) –



= $929.194 – $471.593

= $457.60

*h*. $859 = $859(1.020767) +



= $876.839 + $672.718

= $1549.56

3. 0.62 x $99 = $61.38

5. 0.0075 x $ 133. = $1.00

7. Actual profit = 0.90 x $23,400 = $21,060

9. *a.* Gross biweekly earnings = = $2176.92



Equivalent hourly wage = = $29.03



*b.* Total remuneration = $2176.92 + 4.5(1.5)$29.03 = $2372.87

11. Total hours worked = 41 hours

Overtime hours worked = 1.5 (on Wednesday)+ 0.5 (on Friday) = 2 hours

Regular hours worked = 41 – 2 (hrs of overtime) – 3 (hrs on stat holiday) = 36 hours

Regular earnings = 36($42.50) = $1530.00

Overtime pay = 2(1.5)$42.50 = $127.50

Holiday pay = 7.5($42.50) = $318.75

Holiday premium = 3(2)$42.50 = $255.00

Gross earnings = $2231.25

13. Commission earnings = Commission rate (Sales – $40,000)

$3188.35 – $1000 = Commission rate ($88,630 – $40,000)

Commission rate = 100% = 4.50%



15. Average change in revenue for the year =

= –1.98%

17. Rate of return on entire portfolio

= Weighted average rate of return

=



= 7.96%

|  |  |  |
| --- | --- | --- |
| 19. | No. of | Number of |
| Period | *months* | *employees* |
| July 1 to Aug. 31 | 2 | 7 |
| Sept. 1 to Oct. 31 | 2 | 7+ 6 = 13 |
| Nov. 1 to Nov. 30 | 1 | 13 + 18 = 31 |
| Dec. 1 to Feb. 28 | 3 | 31 + 23 = 54 |
| Mar. 1 to Mar. 31 | 1 | 54 – 11 = 43 |
| Apr. 1 to Apr. 30 | 1 | 43 – 20 = 23 |
| May 1 to June 30 | 2 | 23 – 16 = 7 |

The (weighted) average number of employees was

