



# COMPLETE SOLUTION MANUAL FOR

## Business Mathematics In Canada 11th edition F. Ernest Jerome, Tracy Worswick

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### 1 Review and Applications of Basic Mathematics

#### Exercise 1.1

- a.  $10 + 10 \times 0 = 10 + 0 = \underline{10}$
- b.  $2 \times 2 + 4 - 8 = 4 + 4 - 8 = \underline{0}$
- c.  $(10 + 10) \times 0 = 20 \times 0 = \underline{0}$
- d.  $2 \times (2 + 4) - 8 = 2 \times 6 - 8 = 12 - 8 = \underline{4}$
- e.  $0 + 3 \times 3 - 3^2 + 10 = 0 + 9 - 9 + 10 = \underline{10}$
- f.  $12 - 2 \times 5 + 2^2 \times 0 = 12 - 10 + 4 \times 0 = 12 - 10 + 0 = \underline{2}$
- g.  $0 + 3 \times 3 - (3^2 + 10) = 0 + 9 - 19 = \underline{-10}$
- h.  $(12 - 2) \times (5 + 2^2) \times 0 = 10 \times 9 \times 0 = \underline{0}$
- i.  $\frac{2^2 - 4}{(4 - 2)^2} = \frac{4 - 4}{2^2} = \frac{0}{4} = \underline{0}$
- $\frac{(2 - 4)^2}{5 - 2^2} = \frac{(-2)^2}{5 - 4} = \frac{4}{1} = \underline{4}$
- j.
- $20 - 4 \times 2 - 8 = 20 - 8 - 8 = \underline{4}$
  - $18 \div 3 + 6 \times 2 = 6 + 12 = \underline{18}$
  - $(20 - 4) \times 2 - 8 = 16 \times 2 - 8 = 32 - 8 = \underline{24}$
  - $18 \div (3 + 6) \times 2 = 18 \div 9 \times 2 = 2 \times 2 = \underline{4}$
  - $20 - (4 \times 2 - 8) = 20 - (8 - 8) = \underline{20}$
  - $(18 \div 3 + 6) \times 2 = (6 + 6) \times 2 = \underline{24}$
  - $54 - 36 \div 4 + 2^2 = 54 - 9 + 4 = \underline{49}$
  - $(5 + 3)^2 - 3^2 \div 9 + 3 = 8^2 - 9 \div 9 + 3 = 64 - 1 + 3 = \underline{66}$

9.  $(54 - 36) \div (4 + 2)^2 = 18 \div 6^2 = 18 \div 36 = \underline{\underline{0.5}}$
10.  $5 + (3^2 - 3)^2 \div (9 + 3) = 5 + (9 - 3)^2 \div 12 = 5 + 36 \div 12 = 5 + 3 = \underline{\underline{8}}$
11.  $\frac{8^2 - 4^2}{(4 - 2)^3} = \frac{64 - 16}{2^3} = \frac{48}{8} = \underline{\underline{6}}$
12.  $\frac{(8 - 4)^2}{4 - 2^3} = \frac{4^2}{4 - 8} = \frac{16}{-4} = \underline{\underline{-4}}$
13.  $3(6 + 4)^2 - 5(17 - 20)^2 = 3 \times 10^2 - 5(-3)^2 = 3 \times 100 - 5 \times 9 = 300 - 45 = \underline{\underline{255}}$
14.  $(4 \times 3 - 2)^2 \div (4 - 3 \times 2^2) = (12 - 2)^2 \div (4 - 3 \times 4) = 10^2 \div (4 - 12) = 100 \div (-8) = \underline{\underline{-12.5}}$
15.  $[(20 + 8 \times 5) - 7 \times (-3)] \div 9 = (20 + 40 + 21) \div 9 = 81 \div 9 = \underline{\underline{9}}$
16.  $5 \left[ 19 + (5^2 - 16)^2 \right]^2 = 5 \left[ 19 + (25 - 16)^2 \right]^2 = 5(19 + 81)^2 = 5 \times 100^2 = \underline{\underline{50,000}}$
17.  $\$100(1 + 0.06 \times \frac{45}{365}) = \$100(1 + 0.00739726) = \underline{\underline{\$100.74}}$
18.  $\frac{\$200}{1 + 0.09 \times \frac{4}{12}} = \frac{\$200}{1 + 0.03} = \frac{\$200}{1.03} = \underline{\underline{\$194.17}}$
19.  $\frac{\$500}{(1 + 0.05)^2} = \frac{\$500}{1.05^2} = \frac{\$500}{1.1025} = \underline{\underline{\$453.51}}$
20.  $\$1000(1 + 0.02)^3 = \$1000(1.02^3) = \$1000(1.061208) = \underline{\underline{\$1061.21}}$
21.  $\$100 \left[ \frac{(1 + 0.04)^2 - 1}{0.04} \right] = \$100 \left( \frac{1.04^2 - 1}{0.04} \right) = \$100 \left( \frac{0.0816}{0.04} \right) = \underline{\underline{\$204.00}}$
22.  $\$300 \left[ \frac{1 - \frac{1}{(1 + 0.03)^2}}{0.03} \right] = \$300 \left( \frac{1 - \frac{1}{1.0609}}{0.03} \right) = \$300 \left( \frac{1 - 0.942596}{0.03} \right) = \underline{\underline{\$574.04}}$

### 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)
2. We want six-figure accuracy in the answer. Therefore, values used in the calculations must be accurate to at least seven figures. B)
3. We want seven-figure accuracy in the answer. Therefore, values used in the calculations must retain at least eight figures. C)
4. To be accurate to the nearest 0.01%, an interest rate greater than 10% must have four-figure accuracy. Therefore, five figures must be retained in numbers used in the calculations. C)

## Exercise 1.2

- a.  $\frac{1}{10} = \underline{0.10} = \underline{10\%}$
- b.  $\frac{2}{5} = \underline{0.40} = \underline{40\%}$
- c.  $\frac{1}{4} = \underline{0.25} = \underline{25\%}$
- d.  $\frac{3}{4} = \underline{0.75} = \underline{75\%}$
- e.  $1\frac{1}{2} = \underline{1.50} = \underline{150\%}$
- f.  $2\frac{1}{3} = \underline{2.3333} = \underline{233.33\%}$
- g.  $\frac{10}{5} = \underline{2.00} = \underline{200\%}$
- h.  $5\frac{2}{3} = \underline{5.6667} = \underline{566.67\%}$
- i.  $0.25 \times 80 = \underline{20}$
- j.  $0.20 \times 120 = \underline{24}$
- k. Money in Savings =  $0.20 \times \$1000 = \$200$   
Money in TFSA =  $0.50 \times \$200 = \underline{\$100}$
1.  $\frac{7}{8} = \underline{0.87500} = \underline{87.500\%}$
2.  $\frac{65}{104} = \underline{0.62500} = \underline{62.500\%}$
3.  $\frac{47}{20} = \underline{2.3500} = \underline{235.00\%}$
4.  $-\frac{9}{16} = \underline{-0.56250} = \underline{-56.250\%}$
5.  $\frac{-35}{25} = -1.4000 = -140.00\%$
6.  $1\frac{7}{25} = \underline{1.2800} = \underline{128.00\%}$
7.  $\frac{25}{1000} = \underline{0.025000} = \underline{2.5000\%}$
8.  $\frac{1000}{25} = \underline{40.000} = \underline{4000.0\%}$
9.  $2\frac{2}{100} = \underline{2.0200} = \underline{202.00\%}$
10.  $-1\frac{11}{32} = \underline{-1.3438} = \underline{-134.38\%}$
11.  $\frac{37.5}{50} = \underline{0.75000} = \underline{75.000\%}$
12.  $\frac{22.5}{-12} = \underline{-1.8750} = \underline{-187.50\%}$
13.  $\frac{5}{6} = \underline{0.8\bar{3}} = \underline{83.\bar{3}\%}$
14.  $-\frac{8}{3} = \underline{-2.\bar{6}} = \underline{-266.\bar{6}\%}$
15.  $7\frac{7}{9} = \underline{7.\bar{7}} = \underline{777.\bar{7}\%}$
16.  $1\frac{1}{11} = \underline{1.0\bar{9}} = \underline{109.0\bar{9}\%}$

17.  $\frac{10}{9} = \underline{1.1} = \underline{111.1\%}$
18.  $-\frac{4}{900} = -0.00\bar{4} = -0.\bar{4}\%$
19.  $-\frac{7}{270} = \underline{-0.0259} = \underline{-2.592\%}$
20.  $\frac{37}{27} = \underline{1.370} = \underline{137.037\%}$
21.  $11.3845 \approx \underline{11.38}$
22.  $9.6455 \approx \underline{9.646}$
23.  $0.5545454 \approx \underline{0.5545}$
24.  $1000.49 \approx \underline{1000}$
25.  $1.0023456 \approx \underline{1.002}$
26.  $0.030405 \approx \underline{0.03041}$
27.  $40.09515 \approx \underline{40.10}$
28.  $0.0090909 \approx \underline{0.009091}$
29.  $\frac{1}{6} = \underline{0.16667} = \underline{16.667\%}$
30.  $\frac{7}{6} = \underline{1.1667} = \underline{116.67\%}$
31.  $\frac{1}{60} = \underline{0.016667} = \underline{1.6667\%}$
32.  $2\frac{5}{9} = \underline{2.5556} = \underline{255.56\%}$
33.  $\frac{250}{365} = \underline{0.68493} = \underline{68.493\%}$
34.  $\frac{15}{365} = \underline{0.041096} = \underline{4.1096\%}$
35.  $\frac{0.11}{12} = \underline{0.0091667} = \underline{0.91667\%}$
36.  $\frac{0.095}{12} = \underline{0.0079167} = \underline{0.79167\%}$
37.  $\$92\left(1 + 0.095 \times \frac{112}{365}\right) = \$92 \times 1.02915 = \underline{\underline{\$94.68}}$
38.  $\$100\left(1 + 0.11 \times \frac{5}{12}\right) = \$100 \times 1.04583 = \underline{\underline{\$104.58}}$
39.  $\$454.76\left(1 - 0.105 \times \frac{11}{12}\right) = \$454.76 \times 0.903750 = \underline{\underline{\$410.99}}$
40.  $\frac{1}{(1+0.22)^3} = 0.550707 = \underline{0.55}$
41.  $\$1447\left(1 + \frac{0.18}{2}\right)^3 \left(1 + \frac{0.21}{3}\right)^2 = \$1447 (1.295029) (1.1449) = \underline{\underline{\$2145.44}}$
42.  $\frac{\$790.84}{1 + 0.13 \times \frac{311}{365}} = \frac{\$790.84}{1.110767} = \underline{\underline{\$711.98}}$

43.  $\frac{\$3490}{1 + 0.125 \times \frac{91}{365}} = \frac{\$3490}{1.031164} = \underline{\underline{\$3384.52}}$
44.  $\frac{\$10,000}{1 - 0.10 \times \frac{182}{365}} = \frac{\$10,000}{0.95013699} = \underline{\underline{\$10,524.80}}$
45.  $\$650(1 + \frac{0.105}{2})^2 = \$650(1.0525)^2 = \underline{\underline{\$720.04}}$
46.  $\$950.75(1 - \frac{0.095}{4})^2 = \$950.75(0.97625)^2 = \underline{\underline{\$906.13}}$
47.  $\frac{\$15,400}{(1 + \frac{0.13}{12})^6} = \frac{\$15,400}{1.0108333^6} = \underline{\underline{\$14,435.88}}$
48.  $\frac{\$550}{(1 + \frac{0.115}{2})^4} = \frac{\$550}{1.05750^4} = \underline{\underline{\$439.79}}$
49.  $0.\overline{33} \times \$1527 = \underline{\underline{\$509.00}}$
50.  $0.0275 \times \$2.75 = \underline{\underline{\$0.08}}$
51.  $2.50 \times \$25 = \underline{\underline{\$62.50}}$
52.  $0.00025 \times \$200 = \underline{\underline{\$0.05}}$
53.  $0.005 \times \$30 = \underline{\underline{\$0.15}}$
54. Off-peak hours =  $\frac{12}{24} \times 100 = \underline{\underline{50\%}}$   
 Mid-peak hours =  $\frac{6}{24} \times 100 = \underline{\underline{25\%}}$   
 On-peak hours =  $\frac{6}{24} \times 100 = \underline{\underline{25\%}}$
55.  $0.12 \times (0.055 \times \$458,000) = \underline{\underline{\$3,022.80}}$
56. Money available to be spent on entertainment is  $100 - (53+42) = 5\%$   
 In dollars,  $0.05 \times \$14,775 = \underline{\underline{\$738.75}}$   
 They can spend \$738.75 on entertainment.
57. Sales of in-store products =  $0.36 \times \$102,300 = \$36,828$   
 HST collected on in-store products =  $0.13 \times \$36,828 = \underline{\underline{\$4,787.64}}$
58. Shots scored from 2-point zone =  $0.545454 \times 33 = 18$   
 Shots scored from 3-point distance =  $0.46667 \times 15 = 7$   
 Foul shots scored =  $0.793 \times 29 = 23$   
 Total points scored =  $18(2) + 7(3) + 23(1) = \underline{\underline{80}}$

$$59. \quad \frac{\$6600(1+0.085 \times \frac{153}{365})}{1+0.125 \times \frac{82}{365}} = \frac{\$6600(1.035630)}{1.028082} = \underline{\underline{\$6648.46}}$$

$$60. \quad \frac{\$780(1+\frac{0.0825}{2})^5}{(1+\frac{0.10}{12})^8} = \frac{\$780(1.22398)}{1.06864} = \underline{\underline{\$893.38}}$$

$$61. \quad \$1000 \left[ \frac{(1+\frac{0.09}{12})^7 - 1}{\frac{0.09}{12}} \right] = \$1000 \left( \frac{0.05369613}{0.0075} \right) = \underline{\underline{\$7159.48}}$$

$$62. \quad \frac{\frac{\$350}{\frac{0.0975}{12}}}{1 - \frac{1}{(1+\frac{0.0975}{12})^5}} = \frac{\$350}{0.008125} (0.03965324) = \$1708.14$$

$$63. \quad \frac{\$9500}{\frac{(1+\frac{0.075}{4})^5 - 1}{\frac{0.075}{4}}} = \frac{\$9500}{\frac{0.09733216}{0.01875}} = \underline{\underline{\$1830.07}}$$

$$64. \quad \$45 \left[ \frac{1 - \frac{1}{(1+\frac{0.0837}{2})^4}}{\frac{0.0837}{2}} \right] + \frac{\$1000}{(1+\frac{0.0837}{2})^4} = \$45 \left( \frac{1 - \frac{1}{1.178205}}{0.04185} \right) + \frac{\$1000}{1.178205}$$

$$= \$45 \left( \frac{0.151251}{0.04185} \right) + \$848.75$$

$$= \$162.635 + \$848.749$$

$$= \underline{\underline{\$1011.38}}$$

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.

66. Percentage of impurities = 100% – 99.95% = 0.05%

Amount of impurities = 0.0005 × 31.16 g = 0.01558 g = 15.58 mg

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.

68. If 18% of \$128,500 is lower than \$27,230 then that will be the contribution.

0.18 x \$128,500 = \$23,130

Maximum RRSP contribution is \$23,130 since it is lower than \$27,230.

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

0.65 x 2300 mg = 1495 mg = 1.495 grams

### Exercise 1.3

- Regular weekly earnings =  $\frac{\$58,800}{52} = \$1130.77$   
Equivalent hourly rate =  $\frac{\$1130.77}{35} = \$32.31$   
Overtime hourly rate =  $1.5(\$32.31) = \$48.47$   
Gross pay for 39-hour week =  $\$1130.77 + 4(\$48.47) = \underline{\$1324.65}$
- Regular biweekly earnings =  $\frac{\$37,500}{26} = \$1442.31$   
Equivalent hourly rate =  $\frac{\$1442.31}{2 \times 37.5} = \$19.23$   
Gross earnings =  $\$1442.31 + 9(1.5)\$19.23 = \underline{\$1701.92}$
- Regular biweekly earnings =  $\frac{\$54,600}{26} = \$2100.00$   
Equivalent hourly wage =  $\frac{\$2100.00}{2 \times 40} = \$26.25$   
Hasad worked 3 hours of overtime in the first week and 6.5 hours in the second week.  
Gross pay =  $\$2100.00 + 9.5(1.5)\$26.25 = \underline{\$2474.06}$
- Annual earnings =  $52(40)\$31.50 = \$65,520$   
Equivalent semimonthly earnings =  $\frac{\$65,520}{24} = \underline{\$2730.00}$
- Regular hours worked =  $7.5 + 7.5 + 6 + 6 + 7.5 = 34.5$   
Overtime hours worked =  $4.5 + 1 + 1.5 = 7$   
Gross earnings =  $34.5(\$17.70) + 7(1.5)(\$17.70) = \underline{\$796.50}$
- Total hours worked = 51.5 of which 8 hours were worked on a statutory holiday.  
Overtime hours worked =  $51.5 - (40 + 8) = 3.5$   
Regular earnings =  $40(\$34.50) = \$1380.00$   
Overtime pay =  $3.5(1.5)\$34.50 = \$181.13$   
Holiday pay =  $8(\$34.50) = \$276.00$   
Holiday premium =  $8(2)\$34.50 = \underline{\$552.00}$   
Gross earnings =  $\underline{\$2389.13}$
- Output in excess of quota =  $4 + 6 + 7 + 8 + 10 = 35$  shirts  
Total pay =  $40(\$7.50) + 35(\$3.00) = \underline{\$405.00}$
- Weight packed per day =  $7.5(250)(0.500\text{kg}) = 937.5$  kg.  
Earnings per day =  $7.5(\$8.25) + (937.5 - 500)(\$0.18) = \underline{\$140.63}$
- October earnings =  $(\# \text{ renewals}) \times \$20 + (\# \text{ new policies}) \times \$35 + 0.055(\text{Total premiums})$   
 $= 126(\$20) + 37(\$35) + 0.055(\$14,375 + \$47,880)$   
 $= \underline{\$7239.03}$
- Annual sales =  $12(\$11,000) = \$132,000$   
Hillary's earnings =  $0.21(\$132,000) + 0.07(\$132,000 - \$100,000) = \underline{\$29,960}$

11. Estimated earnings from Supreme Audio & Video =  $\$2000 + 0.04(\$55,000) = \underline{\$4200}$   
 Estimated earnings from Buy-Right =  $\$1500 + 0.03(\$25,000) + 0.06(\$55,000 - \$25,000)$   
 $= \underline{\$4050}$
12. a. Earnings will be the greater of  
 $\$600$  or  $0.11(\text{Sales}) = 0.11(\$5636) = \underline{\$619.96}$
- b. The salesperson will earn the  $\$600$  from sales if  
 $0.11(\text{Sales}) = \$600$   
 That is, if  $\text{Sales} = \frac{\$600}{0.11} = \underline{\$5454.55}$  per week
13. Gross earnings =  $0.033(\$50,000) + 0.044(\$50,000) + 0.055(\$40,000)$   
 $= \underline{\$6050.00}$
14. a. Earnings =  $\$2000 + 0.022(\$227,000 - \$150,000) = \underline{\$3694.00}$
- b. Average earnings =  $\$2000 + 0.022(\$235,000 - \$150,000) = \$3870.00$   
 For a straight commission rate to generate the same monthly earnings,  
 $\text{Commission rate} = \frac{\$3870}{\$235,000} \times 100\% = \underline{1.6468\%}$
15. a. Earnings =  $0.05(\$20,000) + 0.075(\$20,000) + 0.10(\$14,880) = \underline{\$3988.00}$
- b. For the same earnings from a single straight commission rate,  
 $\text{Commission rate} \times \$54,880 = \$3988.00$   
 $\text{Commission rate} = \frac{\$3988}{\$54,880} \times 100\% = \underline{7.267\%}$
16. Commission earned =  $\$630.38 - \$300 = \$330.38$   
 Hence,  
 $0.03(\text{Sales subject to commission}) = \$330.38$   
 $\text{Sales subject to commission} = \frac{\$330.38}{0.03} = \$11,012.67$   
 $\text{Total sales} = \$11,012.67 + \$20,000 = \underline{\$31,012.67}$
17. Commission earned in August =  $\$3296.97 - \$1500.00 = \$1796.97$   
 Hence,  
 $\text{Sales subject to commission} = (\$151,342 - \$100,000) = \$51,342$   
 $\text{Commission rate} = \frac{\$1796.97}{\$51,342} \times 100\% = \underline{3.50\%}$
18. Commission earned on first  $\$90,000$  of sales was  
 $0.04(\$40,000) + 0.05(\$50,000) = \$4100$   
 Commission earned on sales in excess of  $\$90,000$  was  $\$5350 - \$4100 = \$1250$   
 That is,  
 $0.06(\text{Sales exceeding } \$90,000) = \$1250$   
 $\text{Sales exceeding } \$90,000 = \frac{\$1250}{0.06} = \$20,833.33$   
 $\text{Total sales for the month} = \$90,000 + \$20,833.33 = \underline{\$110,833.33}$
19. Required monthly commission =  $\$4000 - \$2000 = \$2000$