

## 1.10 Exercises

1. Leo is a console operator at a service station and works for 16 hours per week. If he is paid \$14.25 per hour, find his weekly pay.
2. Ken is a builder's labourer and is paid a wage of \$647.50 for a 35-hour week. Find Ken's hourly pay rate.
3. Marge sells vacuum cleaners door-to-door, is paid \$215 per week and receives 12% of all her sales. Find Marge's total pay for a week when she sells \$2550 worth of vacuum cleaners.
4. Toni is a mathematics teacher and is paid \$39 000 per year. If she receives an increase in her salary of  $7\frac{1}{2}\%$ , find her new salary.
5. Jennifer's hourly rate is increased from \$8.40 to \$9.00. Express this increase as a percentage of the original rate (correct to one decimal place).
6. A wall tiler charges \$28 per m<sup>2</sup>. Find the cost of tiling an area measuring 4 metres by 3.2 metres.

7.

Day	Hours
Monday	8
Tuesday	8
Wednesday	8
Thursday	8
Friday	-
Saturday	-
Sunday	6

- In one week Janelle worked the hours detailed in the table. She is paid time-and-a-half rates on Saturday, double time on Sundays and normal rate on any other day. Find Janelle's pay for this period if she is paid \$11.47 per hour.
8. Mr Johnston received a \$66 bonus from his employer. If this represented 12% of his normal weekly pay, find his usual pay.
  9. Maria's holiday loading is set at  $17\frac{1}{2}\%$  of four weeks' normal pay. If her weekly wage is set at \$620, find her holiday loading.
  10. Sarah receives a wet-weather allowance of 7% of her pay for any wet day. In one fortnight when she worked ten days it rained on three days and she received her allowance of \$42. Find her total pay for the fortnight.

11.

Taxable income \$	Tax
\$1 — \$5 400	Nil
\$5 401 — \$20 700	Nil plus 20 cents for each \$1 over \$5 400
\$20 701 — \$36 000	\$3 060 plus 38 cents for each \$1 over \$20 700
\$36 001 — \$50 000	\$8 874 plus 46 cents for each \$1 over \$36 000
\$50 001 and over	\$15 314 plus 47 cents for each \$1 over \$50 000

Find the tax paid on a taxable income of

- (a) \$22 376      (b) \$47 389

12. Using the table in Question 11, what would be the taxable income if a person paid tax of:  
(a) 20 c?    (b) \$3475?    (c) \$19 625?

13. To fund government assistance for hospital and medical expenses, a Medicare levy is imposed on people whose income exceeds \$11 745.

Taxable income	Medicare levy
Less than \$11 745	Nil
\$11 745 — \$12 528	20 c for every dollar above \$11 745
More than \$12 528	1.25% of taxable income

Using the above table, find the Medicare levy for a person whose taxable income is:

- (a) \$11 314    (b) \$12 004    (c) \$32 476

14. Determine the best buy:
- (a) A. 300 mL of milk for 35 c  
B. 600 mL of milk for 72 c  
C. 1 L of milk for \$1.10  
D. 2 L of milk for \$2.15
- (b) 170 g of Spreadmite for \$1.45  
235 g of Spreadmite for \$1.90  
340 g of Spreadmite for \$2.65  
500 g of Spreadmite for \$3.95
15. A sales tax of 20% is imposed on all electrical 'whitegoods'. Find the new price of the following articles if the pre-tax prices are:
- (a) freezer: \$518  
(b) washing machine: \$815.
16. The Government decides to reduce the tax imposed on cosmetics from  $27\frac{1}{2}\%$  to 15%. Find the savings on a bottle of perfume priced at \$51 before the reduction in tax.
17. The Government imposed an increase in tax on cigarettes of 3%. Find the new price of a packet which already attracts a tax of 22% and is presently priced at \$4.80.
18. Georgio plans to buy a new television set marked at \$940. He agrees to the following terms:
- Deposit: 15%  
Interest: 22% per annum  
24 monthly instalments.
- (a) Find the size of each monthly instalment.
- (b) How much extra does Georgio have to pay compared to paying cash?
19. Chan purchases a wall unit by paying \$75 as a deposit and twenty-four monthly instalments of \$68.
- (a) Find the total cost of Chan's wall unit.
- (b) If Chan's deposit was 5% of the original cash price, how much extra did he pay as interest in buying the wall unit by instalments.
- (c) What was the *annual* interest rate Chan was charged, correct to one decimal place?
20. Find the simple interest on:
- (a) \$1240 at 9.25% per annum for 6 months.
- (b) \$65 at 6% per annum for 1 month.
- (c) \$207 at 9% per annum for 2 days.
- (d) \$400 at 1.25% per month for 2 months.
21. Find the compound interest on:
- (a) \$215 at 8% per annum for 3 years.
- (b) \$604 at 11% per annum for 6 years.
22. The town of Singleton had a population in 1980 of 11 420 and it increases at 3% per year. Find the population in the year 2000.
23. A certain country has an inflation rate of 8% per annum. If a resident of that country has an annual salary of \$41 000 which increases each year by an amount equal to the inflation rate, find the salary in 15 years' time.
24. Sam's building society has an account that offers 5% p.a. interest, compounded monthly. If he invests \$4000 in this account and withdraws the interest when it is paid twice annually, at six and twelve months, find his total interest.
25. A lounge suite depreciates annually at a rate of 17%. If it was purchased originally for \$1470, find its value after 4 years.
26. A car is purchased for \$24 000. If it is depreciated in value by 23% per annum, how much will it depreciate in value in its third year?
27. Sureloan's credit union structures its loans on a flat-rate interest of 9% per annum. If Yazu borrows \$2500 and agrees to thirty monthly payments, find the size of each payment.
28. Timothy gained a loan from a financial centre and was charged a flat-rate interest of 18% per annum. If the term of the loan was three years and each monthly instalment was \$616, find the amount that Timothy borrowed. (To the nearest dollar.)

29. Matthew borrows \$40 000 from a bank to buy a block of land. His monthly repayments are \$420. If he is charged an interest rate of 12% per annum reducible, how much will he owe the bank after:
- one month?
  - two months?
30. If a store reduces prices by 15%, how much will a watch cost if it was originally marked at \$79?
31. Konrad's purchases at Fred's Wreckers totalled \$375. As Konrad was a vehicle rebuilder, he gained a 12% trade discount. Find the cost of Konrad's purchases. If he gained a further 5% reduction for paying the bill within 30 days, find the final cost of his purchases.
32. 'This year was 35% wetter than last year.' Assuming that this statement is based on total rainfall, find last year's total if this year's rainfall is 810 mm.
33. A car dealer increases the price of a car by 18%. If the car sells for \$28 910, find the mark-up on the cost of the car. If 96% of this mark-up is for warranty, wages, rent, etc., how much profit is made by the car dealer on this sale?
34. Karen's car travels 100 km on 8 litres of petrol. Petrol costs 74 cents per litre.
- How much does Karen pay for the petrol to travel 100 km?
  - How far will Karen travel on \$20 worth of petrol? (To one decimal place.)
35. Annette's motorbike can travel 100 km on 5.2 litres of petrol. She purchases petrol at the price of 76.9 cents/L.
- How much will it cost Annette to travel 100 km?
  - Find the distance that Annette will travel using \$15 worth of petrol.
36. A car driven by Ronnie is moving at a steady speed. When his speed is 80 km/h, the car consumes 8 litres of petrol for every 100 km travelled.
- Ronnie's petrol tank holds 64 litres. How many kilometres can the car travel on full tank of petrol when its speed is 80 km/h?
  - When the speed is 110 km/h, the car consumes 30% more petrol. Calculate the number of litres of petrol per 100 km that the car consumes at 110 km/h.
37. Convert the following:
- 100 km/h to m/s (to one decimal place).
  - 40 km/h to m/s (to one decimal place)
  - 20 m/s to km/h
  - 250 m/min to km/h.
38. At the 1896 Olympic Games, Australia's Edwin Flack won a gold medal in the 800 m in a time of 2 minutes 11 seconds.
- Find the average speed in m/s, to one decimal place.
  - Express this speed in km/h.
39. At the 1992 Olympic Games Australia's Kieren Perkins won a gold medal in the 1500 m swimming race in a time of 14 minutes 43.48 seconds.
- Find the average speed in m/s, correct to 3 significant figures.
  - Express his speed in km/h.
40. The population of Bridgetown five years ago was 7420 and now it is 8280. Find the average annual rate of population increase.
41. On a property sold for \$60 000, a real estate agent receives a commission of \$1200. At what rate in the dollar is the commission calculated?
42. For a particular trip John averaged 90 km/h for 3 hours, stopped for 30 minutes, then averaged 80 km/h for the next 2 hours, rested again for 30 minutes and then drove for another hour covering 60 km. Find
- the total distance covered
  - his average speed for the entire trip in km/h.

43. Premiums are paid on an insurance policy at a rate of \$3.25 per \$100 of value of the goods to be insured. What is the premium payable on electrical equipment valued at \$3250?
44. A council charges ratepayers 2.1 cents in the dollar on the unimproved capital value (UCV) of their properties.
- What will be paid on a property valued at \$47 000?
  - If the property is revalued at \$53 000, what additional amount will the ratepayer be charged?
45. It is known that  $y \propto x$ . If  $y = 6$  and  $x = 2$ , find  $y$  when  $x = 7$ .
46. At a constant speed, distance travelled varies directly as time. If a man walks 32 km in 5 hours, how far would he have walked in 8 hours at the same constant speed?
47. The distance travelled by bicycle is directly proportional to the number of revolutions of the front wheel. If it travels 48 m in 20 revolutions of the front wheel, find:
- the distance travelled for 12 revolutions,
  - the number of revolutions required to travel a distance of 36 m.
48. The time  $t$  taken for a pendulum to swing varies as the square root of its length  $l$ . If one swing of a pendulum 81 cm long takes two seconds, find the time taken for one swing of a pendulum 16 cm long.
49. The distance of the horizon is proportional to the square root of the height above sea level. If Jacki is at the top of a building 125 m high, she can see 40 km to the horizon. How far could she see if she was at the top of a 20 m tower?
50.  $x$  varies inversely as  $y$ . If  $x = 8$  and  $y = 9$ , find  $x$  when  $y = 18$ .
51.  $a$  varies inversely as  $\sqrt{b}$ . If  $a = 9$  when  $b = 16$ , find  $a$  when  $b = 64$ .
52. The air pressure available from a bicycle pump varies inversely as the square of its radius. If a pump of radius 2 units can supply a pressure of 12 units, find the pressure that can be supplied by a pump of radius 3 units.
53. The intensity of light varies inversely as the square of the distance from the light source. If the intensity is 10 units 5 m away from the source, find:
- the intensity when observed 15 metres away
  - the distance, the observer must be from the light source for intensity to be 14 units. (Correct to one decimal place.)

# SOLUTIONS TO EXERCISES

## Chapter 1 Consumer arithmetic, rates and variation (page 1)

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| <p>1. \$228</p> <p>2. \$18.50</p> <p>3. \$521</p> <p>4. \$41 925</p> <p>5. 7.1%</p> <p>6. \$358.40</p> <p>7. \$504.68</p> <p>8. \$550</p> <p>9. \$434</p> <p>10. \$242</p> <p>11. (a) \$3696.88 (b) \$14 112.94</p> <p>12. (a) \$5401 (b) \$21 792.11</p> <p>(c) \$59 172.34</p> <p>13. (a) Nothing (b) \$51.80</p> <p>(c) \$405.95</p> <p>14. (a) D (b) C</p> <p>15. (a) \$621.60 (b) \$978</p> <p>16. \$5 cheaper</p> <p>17. \$4.92</p> <p>18. (a) \$47.94 (b) \$351.56</p> <p>19. (a) \$1707 (b) \$207</p> <p>(c) 7.3%</p> <p>20. (a) \$57.35 (b) 33 cents</p> <p>(c) 10 cents (d) \$10</p> <p>21. (a) \$55.84 (b) \$525.73</p> <p>22. 20 626</p> <p>23. \$130 058.93</p> <p>24. \$202.10</p> <p>25. \$697.64</p> <p>26. \$3272.81</p> <p>27. \$102.08</p> <p>28. \$14 400</p> <p>29. (a) \$39 980 (b) \$39 959.80</p> | <p>30. \$67.15</p> <p>31. \$330, \$313.50</p> <p>32. 600 mm</p> <p>33. \$176.40</p> <p>34. (a) \$5.92 (b) 337.8 km</p> <p>35. (a) \$4 (b) 375 km</p> <p>36. (a) 800 km (b) 10.4 L/100 km</p> <p>37. (a) 27.8 m/s (b) 11.1 m/s</p> <p>(c) 72 km/h (d) 15 km/h</p> <p>38. (a) 6.1 m/s (b) 21.96 km/h</p> <p>39. (a) 1.70 m/s (b) 6.12 km/h</p> <p>40. 172 people/year</p> <p>41. \$2 in \$100</p> <p>42. (a) 490 km (b) 70 km/h</p> <p>43. \$105.63</p> <p>44. (a) \$987 (b) \$136.50</p> <p>45.</p> <p style="padding-left: 40px;"><math>y \propto x</math></p> <p style="padding-left: 40px;"><math>y = kx</math></p> <p>When <math>y = 6, x = 2</math></p> <p style="padding-left: 40px;"><math>6 = 2k</math></p> <p style="padding-left: 40px;"><math>k = 3</math></p> <p><math>\therefore y = 3x</math></p> <p><math>\therefore</math> when <math>x = 7, y = 21</math></p> <p>46. Let <math>d =</math> distance, <math>t =</math> time.</p> <p><math>\therefore d \propto t</math></p> <p><math>\therefore d = kt</math></p> <p>Substitute <math>d = 32, t = 5</math></p> <p><math>\therefore 32 = k \cdot 5</math></p> <p><math>\therefore 5k = 32</math></p> <p style="padding-left: 40px;"><math>k = 6.4</math></p> <p><math>\therefore d = 6.4t</math></p> <p>Now, substitute <math>t = 8</math></p> <p><math>\therefore d = 6.4 \times 8</math></p> <p style="padding-left: 40px;"><math>= 51.2</math></p> <p><math>\therefore</math> man travelled 51.2 km.</p> |
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47. Let  $d$  = distance,  $r$  = revolutions

(a)  $\therefore d \propto r$

$\therefore d = kr$

Substitute  $d = 48, r = 20$ 

$\therefore 48 = k \cdot 20$

$\therefore 20k = 48$

$k = 2.4$

$\therefore d = 2.4r$

Substitute  $r = 12$ 

$\therefore d = 2.4 \times 12$

$= 28.8$

 $\therefore$  distance is 28.8 km.(b) As  $d = 2.4r$ substitute  $d = 36$ 

$\therefore 36 = 2.4r$

$\therefore r = \frac{36}{2.4}$

$= 15$

 $\therefore$  15 revolutions to travel 36 m.

48.  $t \propto \sqrt{\ell}$

that is,  $t = k\sqrt{\ell}$ Substitute  $\ell = 81$  and  $t = 2$ that is,  $2 = k\sqrt{81}$ that is,  $2 = 9k$ 

$9k = 2$

$k = \frac{2}{9}$

$\therefore t = \frac{2}{9}\sqrt{\ell}$

Now, substitute  $\ell = 16$ 

$\therefore t = \frac{2}{9}\sqrt{16}$

$t = \frac{2}{9} \times 4$

$= \frac{8}{9}$

 $\therefore$  will take  $\frac{8}{9}$  second.49. Let  $d$  = distance,  $h$  = height

$\therefore d \propto \sqrt{h}$

$d = k\sqrt{h}$

Substitute  $h = 125, d = 40$ 

$\therefore 40 = k\sqrt{125}$

that is,  $40 = k \cdot 5\sqrt{5}$ 

$\therefore k = \frac{40^8}{15\sqrt{5}}$

that is,  $k = \frac{8}{\sqrt{5}}$ 

$\therefore d = \frac{8}{\sqrt{5}} \cdot \sqrt{h}$

Now, substitute  $h = 20$ 

$\therefore d = \frac{8}{\sqrt{5}} \cdot \sqrt{20}$

$= \frac{8}{\sqrt{5}} \cdot 2\sqrt{5}$

$= 16$

 $\therefore$  she can see 16 km.

50.

$x \propto \frac{1}{y}$

that is,  $x = \frac{k}{y}$ Substitute in  $x = 8, y = 9$ 

$\therefore 8 = \frac{k}{9}$

$\therefore k = 8 \times 9$

that is,  $k = 72$ 

$\therefore x = \frac{72}{y}$

Now, substitute  $y = 18$ 

$\therefore x = \frac{72}{18}$

$= 4$

$\therefore x = 4$

51.

$a \propto \frac{1}{\sqrt{b}}$

that is,  $a = \frac{k}{\sqrt{b}}$ Substitute in  $a = 9, b = 16$ 

$\therefore 9 = \frac{k}{\sqrt{16}}$

$\therefore 9 = \frac{k}{4}$

$\therefore k = 36$

$\therefore a = \frac{36}{\sqrt{b}}$

Now, substitute in  $b = 64$

$$\begin{aligned}\therefore a &= \frac{36}{\sqrt{64}} \\ &= \frac{36}{8} \\ &= 4.5\end{aligned}$$

$\therefore a = 4.5$ .

52. Let  $p =$  pressure,  $r =$  radius.

$$p \propto \frac{1}{r^2}$$

$$\therefore p = \frac{k}{r^2}$$

Substitute  $p = 12$ ,  $r = 2$

$$\therefore 12 = \frac{k}{2^2}$$

$$12 = \frac{k}{4}$$

$$k = 48$$

$$\therefore p = \frac{48}{r^2}$$

Now, substitute  $r = 3$

$$\therefore p = \frac{48}{3^2}$$

$$= \frac{48}{9}$$

$$= 5\frac{1}{3}$$

$\therefore$  pressure of  $5\frac{1}{3}$  units.

53. (a) Let light intensity  $= i$ , distance  $= d$

$$\therefore i \propto \frac{1}{d^2}$$

$$\text{that is, } i = \frac{k}{d^2}$$

Substitute in  $i = 10$ ,  $d = 5$

$$\therefore 10 = \frac{k}{5^2}$$

$$\therefore 10 = \frac{k}{25}$$

$$\therefore k = 250$$

$$\therefore i = \frac{250}{d^2}$$

Now, substitute  $d = 15$

$$\therefore i = \frac{250}{15^2}$$

$$= \frac{250}{225}$$

$$i = 1.\bar{1}$$

$$= 1\frac{1}{9}$$

$\therefore$  intensity is  $1\frac{1}{9}$  units when  
15 metres away.

(b) Substitute  $i = 14$  in  $i = \frac{250}{d^2}$

$$\text{that is, } 14 = \frac{250}{d^2}$$

$$14d^2 = 250$$

$$d^2 = \frac{250}{14}$$

$$\therefore d = \sqrt{\frac{250}{14}}$$

(Only positive square root required.)

$$= 4.225\ 771\ 3$$

that is, the distance is 4.2 m

(to one decimal place).

## Chapter 2 Algebra and quadratics (page 19)

- $(x - y)$  km/hour
- (a)  $(14 + x)$  years old  
(b)  $(14 - y)$  years old  
(c)  $(p + 14)$  years old  
(d)  $(p + 14 + q)$  years old
- (a)  $xy$  m<sup>2</sup>                      (b)  $mq$  m<sup>2</sup>  
(c)  $rmq$  m<sup>2</sup>                      (d)  $(xy - rmq)$  m<sup>2</sup>
- (a)  $10k$                               (b)  $1440p$   
  
(c)  $1000k$                           (d)  $\frac{r}{100}$   
  
(e)  $\frac{v}{1000}$
- $(16\ 400 - 1000x + y)$  grams
- $(100x + y)$  cents
- $\frac{\$3c}{20}$
- $180^\circ - (p^\circ + q^\circ)$