Answers.

Note:
- For questions that do not stipulate a specific level of rounding the answers given here have been rounded to a level considered appropriate for the question.
- If a question asks for an answer to be given "to the nearest millimetre" it does not necessarily have to be given "in millimetres". In such a situation an answer of 14·768 cm could be written as 14·8 cm or as 148 mm, both answers being to the nearest millimetre.

Exercise 1A. Page 17.

1. (a) $v = 23$ (b) $v = 22$ (c) $v = 52$ **2.** (a) $C \approx 18{\cdot}8$ (b) $C \approx 94{\cdot}2$ (c) $C \approx 17{\cdot}6$

3. (a) $V \approx 113$ (b) $V \approx 905$ (c) $V \approx 4189$ **4.** (a) $s = 40$ (b) $s = 36$ (c) $s = 133$

5. (a) $A \approx 705$ (b) $A \approx 990$ (c) $A \approx 1242$

6. (a) $C = 100$

(b) The cost of producing one kg of the metal of 99% purity is approximately \$1 000.

(c) The cost of producing one kg of the metal of 99·9% purity is approximately \$10 000.

7. (a) $C = 9800$

(b) The cost of producing one tonne of the metal of 75% purity is approximately \$11 000.

(c) The cost of producing one tonne of the metal of 95% purity is approximately \$23 800.

8. (a) At a depth of 5 metres in liquid of density 1000 kg/m^3 the pressure is 49 000 N/m^2.

(b) At a depth of 10 metres in liquid of density 1030 kg/m^3 the pressure is 100 940 N/m^2.

(c) At a depth of 30 metres in liquid of density 1030 kg/m^3 the pressure is 302 820 N/m^2.

9. (a) (i) To the nearest half unit the dose for a child aged 5 years would be 4·5 units.

(ii) To the nearest half unit the dose for a child aged 10 years would be 8·5 units.

(iii) To the nearest half unit the dose for a child aged 15 years would be 12·5 units.

(b) The rule makes sense for c up to 18, after which the formula would be giving the "child" more than the adult dose.

10. (a) The density of Aluminium is 2·7 g/cm^3.

(b) The density of Lead is 11 350 kg/m^3.

(c) The density of Diamond is 3·51 g/cm^3.

(d) Just below the surface sea water has a density of 1·028 2 g/cm^3.

(e) At a depth of 1 000 m sea water has a density of 1·032 8 g/cm^3.

(f) At a depth of 10 000 m sea water has a density of 1·071 g/cm^3.

11. (a) The amount in the account after 5 years is \$483·15.

(b) The amount in the account after 5 years is \$881·17.

(c) The amount in the account after 5 years is \$16 830·62.

12. (a) The value of T is 2·15 (correct to 2 decimal places).

(b) The value of T is 1·27 (correct to 2 decimal places).

(c) The value of T is 0·90 (correct to 2 decimal places).

Spreadsheets. Page 20.

Compare the output from your spreadsheets with those of others in your class.

Miscellaneous Exercise One. Page 22.

1.	(a)	16	(b)	14	(c)	17	(d)	100	(e)	26	(f)	−1
	(g)	1	(h)	3	(i)	1·414	(j)	2·02	(k)	10	(l)	8
2.	(a)	7	(b)	10	(c)	25	(d)	13	(e)	17	(f)	125
	(g)	19	(h)	−19	(i)	16	(j)	64	(k)	8	(l)	28
	(m)	4	(n)	6	(o)	5	(p)	4	(q)	6	(r)	2

3. (a) $208 \times 84 \approx 200 \times 80$. Hence a reasonable estimate would be 16000.
However, with multiplication a better estimate would be obtained if we rounded one number up and the other down (by a similar proportion).
Using this idea $208 \times 84 \approx 200 \times 90$ giving an estimate of 18000. (Check on your calculator which estimate is closest to the accurate answer.)

(b) $19{\cdot}6 \times 4{\cdot}7 \approx 20 \times 5$. Hence a reasonable estimate would be 100.
However, with multiplication a better estimate would be obtained if we rounded one number up and the other down.
Using this idea $19{\cdot}6 \times 4{\cdot}7 \approx 20 \times 4{\cdot}5$ giving an estimate of 90.

(c) $\frac{208}{9{\cdot}7} \approx \frac{200}{10}$. Hence a reasonable estimate would be 20.
However, with division a better estimate would be obtained if we rounded both numerator and denominator the same way (by a similar proportion).
Using this idea $\frac{208}{9{\cdot}7} \approx \frac{210}{10}$ giving an estimate of 21.

(d) Using the thinking of the previous part a reasonable estimate would be $\frac{5000}{100}$ i.e. 50 and a better estimate would be $\frac{4800}{100}$ i.e. 48.

(e) 623×80 cm $\approx 600 \times 80$ cm
$= 48000$ cm i.e. about 500 metres.

4. (a) Julie is considered to be the *correct* weight.
(b) Alex is considered to be *under*weight.
(c) Bill is considered to be *over*weight.
(d) Betty is considered to be the *correct* weight.

Exercise 2A. Page 27.

1.

(a)	0·1	(b)	0·3	(c)	0·25	(d)	0·04	(e)	0·125
(f)	1·4	(g)	1·1	(h)	1·23	(i)	1·04	(j)	1·125
(k)	0·9	(l)	0·92	(m)	0·82	(n)	0·4	(o)	0·975

2. (a) 21 students out of 50 is 42%.
(b) \$18 out of \$25 is 72%.
(c) \$2·25 out of \$18 is 12·5%.
(d) 174 sheep out of 1356 sheep is 12·8%, to nearest 0·1%.
(e) 8·5 cm out of 2·5 metres is 3·4%.
(f) 35 metres out of 5·832 kilometres is 0·6%, to nearest 0·1%.

3.

(a)	\$20	(b) \$60	(c) \$6	(d) \$22
(e)	40 kg	(f) \$12·65	(g) 0·6 metres (= 60 cm)	(h) 1·35 tonnes (= 1350 kg)

4.

(a)	\$60	(b) \$96	(c) 176 kg	(d) 77 metres
(e)	\$42·21	(f) \$585	(g) 63 litres	(h) \$281·25

5.

(a)	\$40	(b) \$13·50	(c) 405 kg	(d) 5·88 metres (= 588 cm)
(e)	5·2 metres	(f) \$2·30	(g) \$77	(h) 88 tonnes

6. (a) (i) \$28·66 (ii) \$28·65 (iii) \$28·70 (b) \$1 443 (c) \$1 077

7. (a) The amount is \$1345. (b) The amount is \$400.
(c) The amount is \$260. (d) The amount is \$158·50.
(e) The amount is \$12 540. (f) The price of the item before the rise was \$244.
(g) Before the rise the shares were worth \$1296 (nearest dollar).
(h) The normal price of the item is \$47.
(i) The normal price of the item is \$128.
(j) Before the rise Joe's weekly pay was \$835.
(k) The manufacturer sold 2340 cars the previous month.

8. The price of the commodity has increased by 9·7%, correct to 1 decimal place.

9. The share price has decreased by 6·4%, correct to 1 decimal place.

10. There are 14 girls in the class.
11. There are 32 students in the class.
12. Stamp duty payable is $24830.
13.

	Number of items	Cost per item	Sub total	GST (10%)	Total
e.g.	15	$16·40	$246·00	$24·60	$270·60
(a)	23	$17·50	$402·50	$40·25	$442·75
(b)	131	$16·40	$2148·40	$214·84	$2363·24
(c)	18	$15·90	$286·20	$28·62	$314·82
(d)	24	$17·50	$420·00	$42·00	$462·00
(e)	6	$19·85	$119·10	$11·91	$131·01
(f)	15	$75·30	$1129·50	$112·95	$1242·45
(g)	26	$8·00	$208·00	$20·80	$228·80
(h)	14	$6·75	$94·50	$9·45	$103·95
(i)	124	$3·40	$421·60	$42·16	$463·76
(j)	18	$38·75	$697·50	$69·75	$767·25

14. The percentage increase is 8%, to the nearest percent.
15. After the rise the person will be earning $2065·77 per fortnight, to the nearest cent.
16. The total rainfall for the region in 2007 was 226 mm, to the nearest millimetre.
17. (a) The child dose is 10 milligrams. (b) The adult dose is 12·5 millilitres.
18. The cost of the house has increased by 50·9%, correct to one decimal place.
19. To one decimal place a percentage increase of at least 4·8% is required to take the fortnightly pay to at least $1500.
20. In the sale you should expect to pay $106·25 for the drill, $277·95 for the chain saw, $30·60 for the sander and $23·80 for the tool box.
21. Aimee will pay no income tax.
Brittney will pay $2 850 income tax.
Chris will pay $3 905 income tax.
Devi will pay $11 924 income tax.
Emily will pay $23 898 income tax.
Frank will pay $69 564 income tax.
Megan has a taxable income of $105 600.
Allen has a taxable income of $56 800.
22. The region produced approximately 133 000 kg the year before and approximately 123 000 kg the year before that.
23. The pretax cost of the item is $176·00.

Exercise 2B. Page 31.

1. (a) $46·53 (or $46·55 rounded to nearest five cents).
(b) $48·11 (or $48·10 rounded to nearest five cents).
(c)) $49·75.
We would not want to place huge reliability on the predicted prices because inflation rates can vary and may well not remain steady at the 3·4% quoted. Certainly we would not want to claim the accuracy of the nearest five cent prices quoted above. Also, inflation rates are based on a selection of goods. The price of one particular type of commodity may, for some reason, experience price changes out of line with the general market. However, in the absence of further information the predicted values could be "as good as we can get" to make such estimates and would perhaps allow us to expect a price rise of about $1·50 per year on the item over the next three years.
2. Compare your answer with those of others in your class and with your teacher.
3. (a) $8795 (b) $84 (c) $2285

Exercise 2C. Page 34.

1. In the order displayed, left to right, the discounted prices are \$46, \$61·90, \$66·60 and \$79·95 (rounding to the nearest 5 cents when necessary).
2. Before the discount the price of the item was \$128.
3. A 10% discount is needed to reduce \$75 to \$67·50.
4. The discounted price of the item will be \$44·62.
5. The price of Order One would be \$7 707·53 .
   The price of Order Two would be \$435·10. (No discount given as order not over \$500.)
   The price of Order Three would be \$867·53.
6. (a) \$11·20 (b) \$2240 (c) 160.
7. The agency charges \$13 000 for the sale.
8. The sales person earns \$3 204 for the month.
9. The salesperson earns \$4 180 for the month
10. The real estate agent is paid \$10 720.
11. The salesperson receives \$2 294·40 for the fortnight.
12. The total value of the sales the previous fortnight was \$18 240.
13. (a) The commission charged is \$3 000. (b) The commission charged is \$3 600.
    (c) The commission charged is \$8 375. (d) The commission charged is \$19 620.

	What it cost.	What it was sold for.	Profit as percentage of cost.
14.	\$100	\$124	24%
15.	\$400	\$418	4·5%
16.	\$100	\$118	18%
17.	\$650	\$845	30%
18.	\$125	\$135	8%
19.	\$12 500	\$20 625	65%

	What it cost.	What it was sold for.	Loss as percentage of cost.
20.	\$100	\$84	16%
21.	\$175	\$105	40%
22.	\$6500	\$6 110	6%
23.	\$18·50	\$14·80	20%
24.	\$32·50	\$29·25	10%
25.	\$12 100	\$11 132	8%

26. Item A shows the greater percentage profit (28·57% compared to 28·35%).
27. Meta paid \$750 for the item.
28. Toni sold the item he bought for \$85 for between \$102 and \$119, the item he bought for \$155 for between \$186 and \$217 and the item he bought for \$2 150 for between \$2 580 and \$3 010.
29. Jack paid \$2 500 for the item.

Miscellaneous Exercise Two. Page 37.

1. (a) 12 (b) 12 (c) 35 (d) 19 (e) 17 (f) 24
   (g) 54 (h) 175 (i) 144 (j) 74 (k) 4 (l) 27
2. (a) 1·2 (b) 0·2 (c) 0·8 (d) 0·02 (e) 0·98 (f) 1·02
3. B (\$840), E (\$702), C (\$600), A (\$525), D (\$448), F (\$360).
4. 25%.
   Yes the question can be answered without knowing the quantities "\$17·50" and "200", as follows:
   100 units of normal cost, with 20% discount, becomes an 80 unit expenditure. Selling an 80 unit expenditure for 100 units gives a profit of 20 units on an expenditure of 80 units, i.e. 25% profit.
5. There are at least 288 year 8 students in the school but no more than 303.
6. His selling price should be \$22.
7. No.
   $1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 \times 1{\cdot}05 = 1{\cdot}6289$ rounded to 4 decimal places, i.e. after ten years the increase in the cost of living will be approximately 63%, not 50%.
8. (a) 403 (b) 910 (c) 49% (to nearest percent)

9. (a) (i) \$114 (ii) \$2 422·50 (iii) \$12 065 (iv) \$35 940

(b)

Dutiable Value			Stamp Duty Payable
\$0	to	\$150 000	1·5% of dutiable value.
\$150 001	to	\$300 000	\$2 250 + 2·8% of dutiable value over \$150 000
\$300 001	to	\$500 000	\$6 450 + 3·5% of dutiable value over \$300 000
\$500 001	to	\$750 000	\$13 450 + 4·2% of dutiable value over \$500 000
Over \$750 000			\$23 950 + 5·1% of dutiable value over \$750 000

10. Jill paid \$324 000 for the house and Jack paid \$180 000 for it.

11. $V \approx 15{\cdot}05\ m^3$ (2 dp). The container can safely hold $6{\cdot}02\ m^3$ (or less).

Exercise 3A. Page 42.

1. Interest paid is \$400.

2. \$360 in interest is earned and the final value of the investment is \$860.

3. After 15 years the account will be worth \$8600.

4. At closure the account will be worth eleven thousand seven hundred and forty five dollars.

5. (a) Three years later the account will be worth \$2905·70.

(b) The account would be worth \$1186 more. (I.e. the extra \$1000 invested + extra interest of \$186.)

6. He would have received \$145·80 more.

7. \$4500 interest is earned.

8. \$169 863·01, to the nearest cent.

9. The account will be worth \$792·19, to the nearest cent.

10. \$371·58, to the nearest cent.

11. The account will be worth \$53 807 at the end of this time.

12. The special offer rate will give her an extra \$45·48, to the nearest cent.

13. \$329·65 to the nearest cent.

Exercise 3B. Page 46.

1.

August	\$1·29
September	\$1·83
October	\$6·89

2.

March	\$7·95
April	\$10·55
May	\$27·02

(Lowest balance for March being on 1st to 6th March.)

3.

July	\$25·74	August	\$25·74	September	\$25·74
October	\$25·74	November	\$26·78	December	\$26·78
January	\$26·78	February	\$26·78	March	\$11·46
April	\$3·58	May	\$3·58	June	\$19·34

4.

April	\$6·32	(= \$1·4824 + \$2·5347 + \$0·6039 + \$1·7010)
May	\$9·95	(= \$2·2680 + \$0·7314 + \$3·2089 + \$0·3328 + \$0·8301 + \$2·5754)

5. \$16·67 (= \$2·4612 + \$2·4549 + \$2·1057 + \$5·6589 + \$3·1966 + \$0·7925)

Exercise 3C. Page 48.

1. \$3500

2. \$3675

3. \$168·23 to the nearest cent.

4. \$480·82 to the nearest cent.

5. \$9 960

6. \$23562·50

7. \$385 is owed after three years.

8. Tarni will have to pay \$9538 to clear the loan after 3 years.

9. Altogether Frank owes \$13525 at the end of the three years.

10. Ali will need to repay \$3105 to clear the new loan 2 years after starting it.

Miscellaneous Exercise Three. Page 49.

1. (a) 35·33 (b) 25·82 (c) 56·97 (d) 27·26

2.

	What it cost.	What it was sold for.	Profit as percentage of cost.
(a)	$200	$250	25%
(b)	$450	$540	20%
(c)	$1 650	$2 310	40%

	What it cost.	What it was sold for.	Loss as percentage of cost.
(d)	$200	$190	5%
(e)	$8 500	$8 330	2%
(f)	$156 000	$93 600	40%

3. (a) 25% of $500 is $125. (b) Increasing $500 by 25% gives $625.
(c) The amount is $2000. (d) The amount before the increase was $400.

4. (a) B is the odd one out. (b) B is the odd one out.
(c) A is the odd one out. (d) C is the odd one out.

5. At the end of the five years the investment has a value of $7076.

6. Neither account pays more interest than the other. They each pay $1400.

7. $A = 204·2$

8. (a) The formula suggests that a vehicle that left a skid mark of 22 metres would have been travelling at approximately 60 km/h.
(b) The formula suggests his speed was approximately 90 km/h and thus supports his claim. (However, if the evidence suggested that the car still had significant speed at the end of the skid that would indicate it was going faster than the 90 km/h indicated by the formula.)

9. (a) Rounding can result in the total adding up to more than 100. For example, consider the three numbers 38·47, 26 ·56 and 34·97.
Whilst 38·47 + 26·56 + 34·97 = 100, if we round each number to one decimal place and then add up the rounded answers we get a total of 100·1:
38·5 + 26·6 + 35·0 = 100·1.
(b) (i) Approximately 13000. (ii) Approximately 2000.
(c) Assuming that the Nickel sector approximately maintains its 12% share of the total, approximately 8000 to 8500 people will be employed in the Nickel sector 12 years after the year that the pie chart percentages referred to.

10. He should sell each of the remaining cars for $13520.

Exercise 4A. Page 55.

(In this chapter some answers may vary slightly dependent upon whether accurate answers are carried forward or "rounded to nearest cent" answers are carried forward.)

1. The investment will be worth $6 077·53 at the end of the four years.

2. After twenty five years the investment is worth $1 369·70.

3. After three years $410·76 is owed.

4. (a) $124·86 (b) $126·16 (c) $126·83

5. (a) $2 024·64 (b) $2 092·60 (c) $2 153·84

6. After two years $2254·32 is owed.

7. (a) $2 480 (b) $2 508·80 (c) $2 539·47 (d) $2 542·40

8. $153521·73 will need to be repaid on the loan 15 years later.

9.

	Simple Interest	Compounded Annually	Compounded every 6 months	Compounded quarterly
Amount borrowed	$10 000	$10 000	$10 000	$10 000
Amount owed after 1 year	$10 800	$10 800	$10 816	$10 824·32
Amount owed after 2 years	$11 600	$11 664	$11 698·59	$11 716·59
Amount owed after 3 years	$12 400	$12 597·12	$12 653·19	$12 682·42
Amount owed after 4 years	$13 200	$13 604·89	$13 685·69	$13 727·86
Amount owed after 10 years	$18 000	$21 589·25	$21 911·23	$22 080·40
Amount owed after 20 years	$26 000	$46 609·57	$48 010·21	$48 754·39

10.

	Simple Interest	Compounded Annually	Compounded every 6 months	Compounded monthly
Initial balance	\$2 000	\$2 000	\$2 000	\$2 000
Balance after 1 year	\$2 240	\$2 240	\$2 247·20	\$2 253·65
Balance after 2 years	\$2 480	\$2 508·80	\$2 524·95	\$2 539·47
Balance after 3 years	\$2 720	\$2 809·86	\$2 837·04	\$2 861·54
Balance after 4 years	\$2 960	\$3 147·04	\$3 187·70	\$3 224·45
Balance after 10 years	\$4 400	\$6 211·70	\$6 414·27	\$6 600·77
Balance after 20 years	\$6 800	\$19 292·59	\$20 571·44	\$21 785·11

Exercise 4B. Page 58.

1. (a) When one year old the car will have a value of approximately \$28 200.
(b) When five years old the car will have a value of approximately \$16 900.

2. (a) Two years from now the value of the house will be approximately \$385 000.
(b) Twenty years from now the value of the house will be approximately \$890 000.
(c) Fifty years from now the value of the house will be approximately \$3 650 000.

3. Assuming a constant annual inflation rate of 4% the chocolate bar will cost approximately \$4·80 in 20 years time.
If instead the inflation rate were 8% the chocolate bar would cost \$10·25 in 20 years time.

4. (a) Three years from now the car will have a value of approximately \$25 600.
(b) Five years from now the car will have a value of approximately \$22 000.
(c) Ten years from now the car will have a value of approximately \$15 000.

5. At the end of the five year period the commodity would cost approximately \$103 per kg.

Miscellaneous Exercise Four. Page 59.

1. (a) \$8 (b) \$8 (c) \$36
(d) \$6·96 (e) \$870 (f) \$352·60

2. (a) 6 (b) 8 (c) 10 (d) 3·5

3. In ten years time the item will cost approximately \$370.

4. Anje should choose scheme B for a value after three years of \$10190·79.

5.

Year	Interest for the year	Loan amount
1	\$5 100	\$65 100
2	\$5 533·50	\$70 633·50
3	\$6 003·85	\$76 637·35
4	\$6 514·17	\$83 151·52
10	\$10 627·66	\$135 659·01
25	\$36 131·33	\$461 205·74

6. Tables for "tax changes announced" not given here. Compare your answers with others in your class.

Exercise 5A. Page 62.

1. \$740 **2.** \$1267·20 **3.** \$1288 **4.** \$1998·88
5. \$809·60 **6.** \$1743·30 **7.** \$875 **8.** (a) \$22·50 (b) \$67·50
9. \$1210 **10.** \$872

11. Compare your answer with those of others in your class and check with your teacher.

12. (a) \$5750 (b) \$1250 (c) \$2153·85 (d) \$40560 (e) 67080

13. \$8000 per month.
\$1680 per week.
\$86000 per annum.
\$7000 per month.
\$3210 per fortnight.
\$41·20 per hour, 38 hour week, no overtime.
\$38·75 per hour, 40 hour week, no overtime.
\$75000 per year.

Exercise 5B. Page 67.

1. (a) \$0·0625/g (b) \$0·093/g (c) \$0·0336/g (d) \$0·0168/g
2. (a) \$5·93/100g (b) \$6·47/100g (c) \$1·29/100g (d) \$3·70/100g
3. (a) \$24/kg (b) \$23·20/kg (c) \$20/kg (d) \$15/kg
4. 3L for \$6·75 is \$2·25 per litre.
1·8L for \$4·50 is \$2·50 per litre.
2·4L for \$5·40 is \$2·25 per litre.
On this basis the 3L for \$6·75 and the 2·4L for \$5·40 are equally the "best buys".
5. 400g for \$4·65 is \$1·1625/100g.
600g for \$6·40 is \$1·067/100g (rounded to 3 dp).
1 kg for \$10·50 is \$1·05/100g.
On this basis the 1 kg for \$10·50 is the "best buy", then 600 g for \$6·40, then 400g for \$4·65.
6. In order, best value first: 375g for \$5·20 (which is \$1·387/100g, rounded to 3 dp).
500 g for \$7·00 (which is \$1·40/100g).
250g for \$3·95 (which is \$1·58/100g.).

Exercise 5C. Page 70.

1. (a) \$929 NZ (b) \$1008 Aus
2. (a) 769280 ¥ (b) \$83·19 Aus
3. (a) 2760 Rand (b) \$543·54 Aus
4. (a) £558·62 (b) \$7608 Aus
5. (a) 7975 RM (b) \$2507·92 Aus
6. \$623·95 Aus
7. \$197·10 Aus
8. Pete paid out \$1938·92. Pete gets back \$1900·24
9. \$342 Aus
10. \$4020
11. (a) \$257·40 (b) \$40

Exercise 5D. Page 74.

1. Total value \$62000 Total dividend \$7019
2. Total value \$819307 Total dividend \$48990
3. Total value \$103827·50 Total dividend \$5127
4. Total value \$112497 Total dividend \$4919·74 to nearest cent.
5. 12
6. 13·47 rounded to 2 decimal places
7. Premiere Bank (7·51)
Japatali Fund (9·56)
Jupiter Trust (11·50)
Tacomala Group (12·43)
DeepGas Ltd (12·49)
Iron Resources (13·82)
Linear Corp (22·18)
8. (a) 10 (b) 20 (c) 12·5%
9. The share price can depend on a number of things, one of which is likely to be the value of the assets and cash held by the company. Just prior to paying out some of the profits as dividends these profits are owned by the company and hence contribute to the share value. Once the dividends are paid out (i.e. the company goes "ex-dividend) the company no longer owns this money and so the company value, and hence the share price, will fall to reflect this fall in company value.

Exercise 5E. Page 80.

1. \$3600·40
2. \$4300.
3. Nil.
4. \$115·38 (nearest cent).
5. \$5100.
6. \$86 to the nearest dollar.
7. \$566 to the nearest dollar.
8. \$403 to the nearest dollar.
9. \$720 to the nearest dollar.
10. \$567 to the nearest dollar.
11. \$236 to nearest dollar
12. \$570 to the nearest dollar.

Miscellaneous Exercise Five. Page 83.

1. (a) 80% of \$55 is the greater.
(b) 93% of \$95 is the greater.
(c) The two are equal. Neither one is greater than the other one.
(d) The two are equal. Neither one is greater than the other one.

2. (a) \$5955·08
(b) \$5970·26
(c) \$5978·09
(d) \$5983·40

3. Based on cost per square metre the "best value for money first" rank order is:
1st: 35 m by 42 m
2nd: 21 m by 35 m
3rd 18 m by 52 m
4th 17 m by 42 m
When comparing the values of blocks of land it is very unlikely that "all other things will be equal" with regards to value for money. If the blocks are in different land developments then closeness to the city, closeness of public transport, views, reputation of local schools etc will all make these "other things" far from equal. Even if the blocks are on the same land development the views, the closeness of amenities such as shops and parkland, whether the block is a corner block etc will again be things that will be far from equal from one block to another.

4. (a) \$473·60 (b) \$368·60 (c) \$915

5.

	Number of students	Percentage of those doing the unit getting				
		A's	B's	C's	D's	F's
Unit I	25	16	28	40	12	4
Unit II	13	15	15	46	23	0
Unit III	11	27	36	18	9	9
Unit IV	14	14	43	29	14	0
Unit V	15	7	40	27	20	7
Unit VI	22	23	36	23	18	0

Exercise 6A. Page 89.

1. $A_{4\times2}$, $B_{2\times4}$, $C_{4\times1}$, $D_{4\times3}$, $E_{2\times2}$, $F_{1\times3}$, $G_{3\times2}$, $H_{4\times4}$

2. (a) 4 (b) −4 (c) 7 (d) 7 (e) 3 (f) 0

3. (a) Cannot be determined (b) $\begin{bmatrix} 3 & -1 \\ 1 & -9 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & -5 \\ 1 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 6 \\ 2 \\ -4 \end{bmatrix}$ (e) $\begin{bmatrix} 9 & -3 \\ 6 & 12 \\ 0 & 9 \end{bmatrix}$

(f) Cannot be determined (g) $\begin{bmatrix} 2 & 4 \\ 0 & -8 \end{bmatrix}$ (h) $\begin{bmatrix} 0 & 7 \\ -1 & -3 \end{bmatrix}$

4. (a) $\begin{bmatrix} 5 & 3 & -1 \\ 1 & 3 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & -1 & 1 \\ -1 & -5 & -3 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 6 & 3 \\ 6 & 3 & 6 \end{bmatrix}$ (d) $\begin{bmatrix} 5 & 4 & -3 \\ 3 & 14 & 9 \end{bmatrix}$

5. (a) Cannot be determined (b) $\begin{bmatrix} 6 & 12 \\ 3 & 9 \end{bmatrix}$ (c) $\begin{bmatrix} 8 & 3 & 11 \end{bmatrix}$ (d) Cannot be determined

6. (a) Cannot be determined (b) $\begin{bmatrix} 6 & 4 & 3 & 0 \\ 2 & 2 & 6 & 6 \\ 1 & 5 & 3 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 6 & 2 & 8 \\ 4 & 2 & -6 \\ 0 & 2 & 4 \\ 2 & 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 14 & -3 & 6 \\ -2 & 4 & 6 & 12 \\ -1 & -5 & 3 & 20 \end{bmatrix}$

7. (a) No (b) No (c) Yes (d) Yes (e) Yes (f) No (g) Yes (h) No

8. Yes **9.** Yes **10.** $\begin{bmatrix} 1 & 2 & -3 \\ 1 & 0 & -2 \end{bmatrix}$

11. (a)

	P	A	B
Alan	40	20	4
Bob	37	15	14
Dave	47	19	9
Mark	39	21	3
Roger	39	19	16

(b)

	P	A	B
Alan	10	5	1
Bob	9·25	3·75	3·5
Dave	11·75	4·75	2·25
Mark	9·75	5·25	0·75
Roger	9·75	4·75	4

12.

	B	F	FL	G	GG
Centre I	6160	1925	2552	1947	4675
Centre II	3124	1397	1507	1122	2992
Centre III	5555	1617	3102	1408	2970
Centre IV	2409	1034	1672	924	1958

13. $\begin{bmatrix} 3 & 4 & 5 \\ 5 & 6 & 7 \\ 7 & 8 & 9 \end{bmatrix}$ **14.** $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 4 & 8 & 16 \\ 3 & 9 & 27 & 81 \end{bmatrix}$

Exercise 6B. Page 95.

1. $\begin{bmatrix} 4 & 9 \end{bmatrix}$

2. Cannot be determined. Number of columns in 1st matrix ≠ number of rows in 2nd matrix

3. $\begin{bmatrix} 2 & 10 \\ 1 & 4 \end{bmatrix}$ **4.** $[7]$ **5.** $\begin{bmatrix} 3 & 1 \\ 12 & 4 \end{bmatrix}$

6. $\begin{bmatrix} 13 & -4 \\ -14 & 7 \end{bmatrix}$ **7.** $\begin{bmatrix} 2 & 3 \\ 1 & -1 \end{bmatrix}$ **8.** $\begin{bmatrix} 1 & 4 \\ -1 & 3 \end{bmatrix}$

9. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ **10.** $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ **11.** $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

12. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ **13.** $[8]$ **14.** $\begin{bmatrix} 3 & 2 & 3 \\ 4 & 3 & 1 \end{bmatrix}$

15. $\begin{bmatrix} 1 & 0 & 5 \\ 10 & 2 & -2 \\ 6 & 1 & 4 \end{bmatrix}$ **16.** $\begin{bmatrix} 10 & 3 \\ 9 & 10 \end{bmatrix}$ **17.** $\begin{bmatrix} 14 \\ 32 \end{bmatrix}$

18. $\begin{bmatrix} 2 & 4 & 1 \\ 5 & 7 & 18 \\ 12 & 8 & 22 \end{bmatrix}$

19. (a) $\begin{bmatrix} 0 & 2 & 1 \\ 0 & 1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 2 & 3 \\ 4 & 0 & -1 \\ -2 & 1 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & -1 & -2 \\ 2 & 1 & -1 \\ 2 & 1 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & -1 & 2 \\ 2 & 3 & 4 \\ -2 & -2 & 1 \end{bmatrix}$

20. No. Justify by showing example for which $AB \neq BA$

24. (a) Cannot be formed (b) Cannot be formed (c) 3×3 (d) 2×2
(e) Cannot be formed (f) 1×2 (g) 3×2 (h) 1×3

25. (a) Yes (b) Yes (c) Yes (d) No (e) No (f) No (g) No (h) Yes

26. Matrix A must be a square matrix.

27. AA, AC, BA, CB

28. (a) $\begin{bmatrix} -1 & -2 \\ 4 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -2 \\ 7 & -3 \end{bmatrix}$

29. (a) 1st B, 2nd E, 3rd C, 4th D, 5th A
(b) 1st =B & C, 3rd E, 4th D, 5th A

30. Initially: $\begin{matrix} \text{Client 1} \\ \text{Client 2} \\ \text{Client 3} \end{matrix} \begin{bmatrix} \$15000 \\ \$15000 \\ \$15000 \end{bmatrix}$ Two years later: $\begin{matrix} \text{Client 1} \\ \text{Client 2} \\ \text{Client 3} \end{matrix} \begin{bmatrix} \$17700 \\ \$19300 \\ \$18800 \end{bmatrix}$

31.

Drink (mLs)	Burgers
18125	55

32. (a) QP (b)

Hotel A	Hotel B	Hotel C
\$4610	\$3680	\$2665

Displays total nightly tariff for each hotel when full.

(c) Row 1 column 1 of PR would be
Single rooms in A × Single room tariff +
Single rooms in B × Double room tariff +
Single rooms in C × Suite tariff
Thus PR not giving useful information.

33. (a) $\begin{bmatrix} 3 & 1 & 2 \end{bmatrix}$ (b)

Poles	Decking	Framing	Sheeting
25	205	145	320

Matrix shows number of metres of each size of timber required to complete order.

(c) $\begin{bmatrix} \$4 \\ \$2 \\ \$3 \\ \$1{\cdot}50 \end{bmatrix}$ Product will have dimensions 3 ×1.
Matrix will display the total cost of timber for each type of cubby.

34. (a)

	A	B	C
E =	800	50	1000

(b)

Model I	Model II	Model III	Model IV
4600	4900	6300	5600

Matrix displays the total cost of commodities, in dollars, for each model type.

35. (a) RP (b) $\begin{bmatrix} 6700 & 7200 & 2300 \end{bmatrix}$ (c) Matrix shows the number of minutes required for cutting (6700 minutes) assembling (7200 minutes) and packing (2300 minutes) to complete the order

Exercise 6C. Page 104.

1. (a) $B = \begin{bmatrix} -2 & 0 \\ 4 & 3 \end{bmatrix}$ (b) $C = \begin{bmatrix} -1 & 0 \\ 4 & 4 \end{bmatrix}$

2. (a) $E = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (b) $F = \begin{bmatrix} 5 & -1 \\ 2 & 0 \end{bmatrix}$ (c) $G = \begin{bmatrix} 6 & -1 \\ 2 & 1 \end{bmatrix}$ (d) $H = \begin{bmatrix} 5 & -1 \\ 2 & 0 \end{bmatrix}$ (h) $J = \begin{bmatrix} 5 & -1 \\ 2 & 0 \end{bmatrix}$

3. (a) True (b) True (c) Not necessarily true.
(d) True (e) True (f) True
(g) True (h) True (i) Not necessarily true.
(j) Not necessarily true.

4. (a)

	A	B	C
A	0	1	1
B	1	0	1
C	1	1	0

(b)

	A	B	C
A	0	1	0
B	1	1	1
C	0	0	0

(c)

	A	B	C
A	2	1	0
B	1	0	2
C	0	1	0

5. (a)

	A	B	C	D
A	0	1	1	1
B	1	0	1	0
C	1	1	0	0
D	1	0	0	0

(b)

	A	B	C	D
A	0	1	0	0
B	1	0	1	2
C	0	1	2	0
D	1	2	0	0

(c)

	A	B	C	D
A	0	1	2	0
B	1	0	2	0
C	2	2	0	1
D	1	1	1	0

6. (a)

	A	B	C	D	E
A	0	1	0	0	1
B	1	0	1	1	1
C	0	1	0	1	0
D	0	1	1	0	1
E	1	1	0	1	0

(b)

	A	B	C	D	E
A	0	1	0	0	1
B	1	0	1	0	0
C	0	1	0	1	0
D	0	0	1	0	1
E	1	0	0	1	0

(c)

	A	B	C	D	E
A	0	1	0	1	1
B	1	0	1	0	0
C	0	1	2	0	0
D	1	1	0	0	1
E	1	0	0	0	0

7. The two stage route matrices are as follows:
(a)

	A	B	C
A	1	0	1
B	0	2	0
C	1	0	1

(b)

	A	B	C
A	3	2	1
B	1	2	2
C	1	1	3

(c)

	A	B	C
A	3	3	2
B	5	6	3
C	2	4	6

(d)

	A	B	C	D
A	2	0	2	0
B	0	2	0	2
C	2	0	2	0
D	0	2	0	2

(e)

	A	B	C	D
A	2	2	2	1
B	1	3	2	2
C	2	1	2	0
D	0	2	1	2

(f)

	A	B	C	D
A	5	0	0	2
B	0	1	2	0
C	0	2	5	0
D	2	0	0	1

9. (a)

	Sue Min	Tanya	Julie	Peta	Donelle	Mandy
Sue Min	0	1	1	0	1	0
Tanya	1	0	0	0	1	0
Julie	0	0	0	0	1	0
Peta	0	0	1	0	1	0
Donelle	1	1	1	1	0	1
Mandy	1	0	0	0	1	0

10. (a) Because if F has been to the movies with G then it follows automatically that G has been with F. It is impossible for F to go with G without G also going with F. Hence no "one way paths".

(b) The matrix will be symmetrical with $A_{ij} = A_{ji}$.

(c)

	Ann	Bill	Chris	Dave	Enya
Ann	0	0	1	0	1
Bill	0	0	0	1	1
Chris	1	0	0	1	1
Dave	0	1	1	0	1
Enya	1	1	1	1	0

(d)

	Ann	Bill	Chris	Dave	Enya
Ann	0	1	0	0	1
Bill	1	0	1	0	1
Chris	0	1	0	0	0
Dave	0	0	0	0	1
Enya	1	1	0	1	0

11. Being able to display social interactions using numbers in a matrix allows the situation to be subjected to mathematical manipulation and analysis.

12. (a)

	Jack	John	Sue	Bill	Ken	Tony	Mary
Jack	0	1	1	1	0	1	0
John	1	0	0	1	0	0	0
Sue	0	0	0	1	0	1	0
Bill	1	1	1	0	1	1	1
Ken	0	0	0	1	0	0	0
Tony	1	0	1	0	0	0	1
Mary	0	0	0	1	0	1	0

(b)

	Jack	John	Sue	Bill	Ken	Tony	Mary
Jack	0	1	2	2	1	2	2
John	1	0	2	1	1	2	1
Sue	2	1	0	0	1	1	2
Bill	2	1	2	0	0	3	1
Ken	1	1	1	0	0	1	1
Tony	0	1	1	3	0	0	0
Mary	2	1	2	0	1	1	0

Part (a) answer squared is same as part (b) answer except for the leading diagonal.

(c) Only Tony who does not have Ken's, nor can he get Ken's in a two stage process.
In both one stage and two stage matrices there is a zero in the "Tony row, Ken column" location (and this is not on the leading diagonal).

13. (a) One stage:

	Mai	Tiny	Tonto	Pronto	Slow
Mai	0	1	0	0	0
Tiny	1	0	0	1	1
Tonto	0	0	0	1	0
Pronto	0	1	1	0	0
Slow	1	0	0	1	0

Two stage:

	Mai	Tiny	Tonto	Pronto	Slow
Mai	0	0	0	1	1
Tiny	1	0	1	1	0
Tonto	0	1	0	0	0
Pronto	1	0	0	0	1
Slow	0	1	1	0	0

(b) The two stage matrix is not equal to the square of the one stage matrix because the leading diagonal is different and the "Slow row Tiny column" is different.
The reasons for these differences are as follows:
The "Slow row Tiny column" entry shows a 2 in the squared matrix because there are two ways that Slow can contact Tiny in two stages; Slow → Mai → Tiny and Slow → Pronto → Tiny. However on the two stage matrix this is shown as a 1 because the question instructed us to use one of only two entries, a 0 to show no contact and a 1 to indicate contact.
The first entry on the leading diagonal of the squared matrix is a 1 because it has allowed the two stage connection Mai → Tiny → Mai whereas our two stage matrix shows 0 as instructed.
The second entry of the leading diagonal of the squared matrix is 2 because it allows the connections Tiny→ Pronto → Tiny and Tiny → Mai → Tiny whereas our two stage matrix shows 0 as instructed. Etc.

Miscellanous Exercise Six. Page 109.

1. (a) Cannot be performed. (b) Can be performed. 2 rows and 3 columns.
(c) Cannot be performed. (d) Can be performed. 3 rows and 5 columns.
(e) Cannot be performed. (f) Can be performed. 3 rows and 4 columns.
(g) Cannot be performed. (h) Can be performed. 3 rows and 3 columns.
(i) Cannot be performed. (j) Cannot be performed.
(k) Can be performed. 1 row and 1 column. (l) Can be performed. 5 rows and 3 columns.

2. (a) $\begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} 10 & -4 \\ 6 & -2 \end{bmatrix}$ (c) $\begin{bmatrix} 6 & -4 \\ 6 & -6 \end{bmatrix}$
(d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (e) $\begin{bmatrix} 12 & 0 \\ 0 & 12 \end{bmatrix}$ (f) $\begin{bmatrix} 24 & -16 \\ 24 & -24 \end{bmatrix}$

3. (a) \$1003·20 (b) \$1103·52 (c) \$1320 (d) \$1219·68

4. (a) \$1476 (b) \$1600·64

5.

	\$25000 borrowed at 9% per annum.			
	Simple Interest	Compounded annually	Compounded 6 monthly	Compounded quarterly
Initial amount borrowed	\$25000	\$25000	\$25000	\$25000
Amount owed after 1 year	\$27250	\$27250	\$27300·63	\$27327·08
Amount owed after 2 year	\$29500	\$29702·50	\$29812·97	\$29870·78
Amount owed after 3 year	\$31750	\$32375·73	\$32556·50	\$32651·25
Amount owed after 4 year	\$34000	\$35289·54	\$35552·52	\$35690·54
Amount owed after 10 year	\$47500	\$59184·09	\$60292·85	\$60879·72
Amount owed after 20 year	\$70000	\$140110·27	\$145409·11	\$148253·63

Exercise 7A. Page 114.

1. (a) BC (b) EF (c) GH (d) JL (e) NO (f) QR
2. Statements III and VI are true. **3.** Statements III, V and VI are true.
4. Statements I, V and VI are true. **5.** $x = 10$ **6.** $x = 26$
7. $x = 7$ **8.** $x = 15·1$ (1dp) **9.** $x = 16·4$ (1dp) **10.** $x = 3·9$ (1dp)
11. $x = 14·2$ (1dp) **12.** $x = 10·2$ (1dp) **13.** $x = 24$ **14.** $x = 13·0$ (1dp)
15. $x = 17·1$ (1dp) **16.** $x = 5·8$ (1dp) **17.** $x = 30·2$ (1dp) **18.** $x = 7·4$ (1dp)
19. $x = 3·3$ (1dp) **20.** $x = 15$ **21.** $x = 6·9$ (1dp) **22.** $x = 2·9$ (1dp)
23. $x = 11·6$ (1dp) **24.** $x = 3·1$ (1dp)
25. AC is of length 59 mm, to the nearest millimetre.
26. RQ is of length 16·1 cm, to the nearest millimetre.
27. XZ is either of length 10·1 cm or of length 14·3 cm, to the nearest millimetre.
28. The longer diagonal exceeds the shorter diagonal by 94 mm, to the nearest millimetre.

Exercise 7B. Page 118.

1. A piece of timber of length 289 cm is needed (to the nearest centimetre).
2. The boat is then 5·8 km from the harbour.
3. The boat travelled 2·8 km due East.
4. The television screen is of size 70 cm.
5. The foot of the ladder is 3·4 metres from the base of the wall (to the nearest 10 cm).
6. The height of the wall is 4·9 metres, to the nearest 10 centimetres.
7. The length of each wire will be 19 metres, rounded to the next metre.
8. The new road will reduce the journey by 11·6 km (correct to one decimal place).
9. The height of the container is 87 cm, to the nearest centimetre.
10. The shortcut makes the journey 31 metres shorter, to the nearest metre.
11. Each rectangular side of the tent has an area of 6 m^2.
12. Each side of the square is of length 85 mm, to the nearest millimetre.
13. The length of steel needed for the 100 frames is, rounded up to the next whole metre, 435 m.
14. The perimeter of the trapezium is 134·2 metres, correct to one decimal place.
15. The length of BC is 4·7 metres, correct to one decimal place.
16. Layout B uses the smaller total length of piping, by 69 cm (to the nearest cm).
17. The area of the triangle is, to the nearest ten square metres, 8380 m^2.
18. For the 3m × 1·4 m frame: Design A requires the greater length of steel by 1·12 metres.
    For the 1·8 m × 1·4 m frame: Design B requires the greater length of steel by 0·17 metres.

Miscellaneous Exercise Seven. Page 121.

1. \$977·50
2. (a) $\begin{bmatrix} 2 & -4 \\ 3 & -6 \end{bmatrix}$ (b) $[\,-4\,]$
3. (a) \$532·35 (b) \$315·00 (c) \$286·65 (d) \$585 (e) \$122·85
4. BAC (5 5 2 4)
5. The longest pole that could fit into the given container is, to the nearest centimetre, 5·74 m.
6. The water slide is 5·25 m long, to the nearest centimetre.
7. First check there are no odd numbers on the leading diagonal.
   Then check where the symmetry "breaks down". i.e. where $a_{ij} \neq a_{ji}$.
   From these non symmetrical entries the one way roads can be determined.
8. (a) 276 (b) 66% (c) 27%
9. (a) \$2 350 (b) \$10 317 235·01 (c) \$14 457 828·11 (d) \$41 112 576·17

Exercise 8A. Page 124.

1. (a) 38 m (b) 80 m^2
2. (a) 671 mm (b) 236 cm^2
3. (a) 30 m (b) 32 m^2
4. (a) 33·7 cm (b) 79 cm^2
5. (a) 18·67 m (b) 15·61 m^2
6. (a) 34 m (b) 44 m^2
7. (a) 95·7 cm (b) 537 cm^2
8. (a) 20·57 m (b) 23·43 m^2
9. 80·5 cm^2
10. 63 m^2
11. 42 cm^2
12. 75·1 m^2
13. 85 978 cm^2
14. 19·43 m^2
15. 20 094 cm^2
16. 78610 mm^2

Exercise 8B. Page 126.

1. (a) \$952 (b) \$2040, \$3145 (c) \$486

2. (a) 6 × 2·4 m with an excess of 1·6 m.
5 × 3 m with an excess of 2·2 m.
Minimum excess: 3 × 2·4 m and 2 × 3 m with an excess of 0·4 m.

(b) 8 × 2·4 m with an excess of 1 m.
7 × 3 m with an excess of 2·8 m.
Minimum excess: 4 × 2·4 m and 3 × 3 m with an excess of 0·4 m.

(c) 15 × 2·4 m with an excess of 0·6 m.
12 × 3 m with an excess of 0·6 m.
Minimum excess: 1 × 2·4 m and 11 × 3 m with no excess.
Or 6 × 2·4 m and 7 × 3 m with no excess.
Or 11 × 2·4 m and 3 × 3 m with no excess.

3. (a) \$5 901·50 (b) \$865·80 (c) \$3 052·50 (d) \$2 131·20
(e) \$1 731·60 (f) \$2 238·50 (g) \$5 291·00 (h) \$666·00

4. (a) \$36 036 (b) \$6 586 (c) \$2 554 (d) \$5 356

5. (a)

Qty	Item	Unit Price (\$)	Total (\$)
90	Fence post	10·00	900·00
90	Post pack (cement, brackets and nails for 1 post)	18·00	1620·00
1	Gate pack (gate, gate posts, latch, cement and all fastenings)	240·00	240·00
132	3·6 metre rail	8·00	1056·00
		Sub total	3816·00
		GST (10%)	381·60
		Grand total	4197·60

(b)

Qty	Item	Unit Price (\$)	Total (\$)
143	Fence post	10·00	1430·00
143	Post pack (cement, brackets and nails for 1 post)	18·00	2574·00
1	Gate pack (gate, gate posts, latch, cement and all fastenings)	240·00	240·00
213	3·6 metre rail	8·00	1704·00
		Sub total	5948·00
		GST (10%)	594·80
		Grand total	6542·80

6. 43 200 kg

7. (a) \$12 870 000 construction costs, \$263 250 annual maintenance.
(b) \$10 296 000 construction costs, \$210 600 annual maintenance.
(c) \$13 728 000 construction costs, \$280 800 annual maintenance.
(d) \$29 744 000 construction costs, \$608 400 annual maintenance.

8. (a) Seed 2 160 kg. Harvest 48 600 kg
(b) Seed 12 000 kg Harvest 270 000 kg
(c) Seed 1 790 kg (nearest 10 kg) Harvest 40 250 kg (nearest 10 kg). Approx 40 tonnes
(d) Seed 110 kg (nearest 10 kg) Harvest 2 450 kg (nearest 10 kg). Approx 2·5 tonnes

9. (a) \$1194 (b) \$281 (c) \$244 (d) \$232

10. (a) 4000 follicular units (b) 5660 follicular units
(c) 8250 follicular units (d) 6810 follicular units

11. 1. "per linear" metre makes it clear that the cost of the bull nose edging is based on length of edge.

2. (a)

Cost of benchtop	\$810·24
Cost of edging	\$375·00
Total cost	\$1185·24
Quote	\$1185

(b)

Cost of benchtop	\$3689·69*
Cost of edging	\$834·16
Total cost	\$4523·85
Quote	\$4524

* Includes 30% loading for semicircle.

12. [Total area of the eight walls is 89·8 m^2, to nearest 0·1m^2.]
Need 17 litres. Could get 10L + 4L + 2L + 1L for \$359·30 but if not concerned about having more paint left over get 10L + 2 × 4L for just \$335·80. As well as being cheaper this latter option also has the advantage that if the painting requires a little more paint than the estimate suggests you have paint available.

13.

	Maynard Waters	Plymptain by Sea	Woodstock Valley
(a)	\$226 000	\$242 000	\$291 000
(b)	\$210 000	\$226 000	\$271 000
(c)	\$386 000	\$414 000	\$498 000
(d)	\$300 000	\$322 000	\$386 000
(e)	\$291 000	\$312 000	\$375 000

14. [Floor area calculation gives 125·917 m^2.]

Construction type	Finish		
	Basic	Basic Plus	Deluxe
3 bedroom brick veneer standard design.	\$136 000	\$160 000	\$204 000
3 bedroom full brick unique design.	\$179 000	\$210 000	\$268 000
4 bedroom brick veneer standard design.	\$152 000	\$179 000	\$228 000
4 bedroom full brick unique design.	\$200 000	\$235 000	\$300 000

15. (a) \$6 565 (nearest dollar) (b) \$5 442 (c) \$17 385 (nearest dollar)

Exercise 8C. Page 141.

1. 256 cm^2 **2.** 32 cm
3. 26 cm **4.** 3 m
5. 3·09 m, to the nearest centimetre. **6.** 121 mm, to the nearest millimetre.
7. 9·55 m, to the nearest centimetre. **8.** 319 mm
9. $a = 3$, $b = 2$, $c = 6$, $d = 7$, $e = 9$.
20 cm^2, 24 cm^2, 27 cm^2, 28 cm^2, 30 cm^2, 36 cm^2.
10. $a = 12$, $b = 6$, $c = 8$, $d = 3{\cdot}2$, $e = 6$.
11. $r_3 = 2r_1$, $r_2 = \sqrt{2}\, r_1$

Miscellaneous Exercise Eight. Page 144.

1. (a) \$17500 (b) \$15700 (c) \$5500
2. (a) $\begin{bmatrix} 1 \\ -3 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & -2 \\ 15 & -10 \end{bmatrix}$ (d) $[-7]$
3. (a) £1314 (b) \$887·10
4. The item would have cost him \$99·20 if the discount had been 20%.
5. At 87 cents per 50 g the 250 g of sliced ham for \$4·35 is the better buy as the 450 g costs more than 88 cents per 50 g.
6. The third side could be 10 cm in length or it could be $\sqrt{28}$ cm in length.
($\sqrt{28}$ cm = $2\sqrt{7}$ cm or 5·29 cm rounded to two decimal places.)
7. To the nearest whole numbers (a) 4823 (b) 6121 (c) 4301
8. The base of the ladder should be placed 2·6 metres from the base of the wall. (To the nearest 0·1 m.)
9. (a) The height of the building is 19·6 m.
(b) The balloon was 180 m high when the sandwich was dropped.
(c) The teeth will take approximately 3·5 seconds to reach the ground.
10. 21·5%
11. (a) XY (b) $\begin{bmatrix} 420 \\ 410 \\ 430 \end{bmatrix}$ (c) $\begin{bmatrix} \text{Commodity cost (\$) to produce one model A} \\ \text{Commodity cost (\$) to produce one model B} \\ \text{Commodity cost (\$) to produce one model C} \end{bmatrix}$
12. (a) 2 bags (b) 77 bags (c) 32 bags

13.

PATSY LING

Normal hourly rate	*$19.20*	/hr	Normal	$19.20	/hr
Week	*23*		Time & half	$28.80	/hr
			Double time	$38.40	/hr

Hours worked		Payment due
Normal	*35*	$672.00
Time and a half	*4*	$115.20
Double time	*0*	$0.00
	Total	**$787.20**

Troy Marcesi

Normal hourly rate	*$21.40*	/hr	Normal	$21.40	/hr
Week	*23*		Time & half	$32.10	/hr
			Double time	$42.80	/hr

Hours worked		Payment due
Normal	*35*	$749.00
Time and a half	*6*	$192.60
Double time	*4*	$171.20
	Total	**$1,112.80**

Exercise 9A. Page 150.

1. 1350 cm^2 **2.** 158 m^2 **3.** 6700 mm^2 **4.** 1008 cm^2 **5.** 2700 cm^2
6. 840 m^2 **7.** 308 cm^2 **8.** 1568 cm^2 **9.** 384 cm^2 **10.** 564 cm^2
11. 8954 cm^2 (nearest cm^2) **12.** 70700 cm^2 (nearest 100 cm^2)
13. 1850 cm^2 (nearest 50 cm^2) **14.** 7500 cm^2 (nearest 100 cm^2) **15.** 1680 cm^2
16. 1253 cm^2 (nearest cm^2)

Exercise 9B. Page 154.

1. 216 cm^3 **2.** 270 cm^3 **3.** 108500 mm^3 **4.** 16450 cm^3 **5.** 168 m^3
6. 160 m^3 **7.** 1780 cm^3 **8.** 195 cm^3 **9.** 22300 cm^3 **10.** 198 cm^3
11. 16 kilolitres **12.** 240 litres
13. 4021 millilitres (to the nearest millilitre) **14.** 2094 litres (to the nearest litre)
15. 8000 cubes with each edge of length 1cm could be made from the larger cube.
1909 spheres of radius 1 cm could be made from the large cube.
16. The volume of material required is 198600 mm^3 (rounded up to the next 100 mm^3).

Exercise 9C. Page 157.

1. (a) $2{\cdot}8\ m^3$ (b) $15{\cdot}8\ m^3$ (c) $50{\cdot}4\ m^3$ (d) $21{\cdot}9\ m^3$

2. (a) $2{\cdot}47\ m^3$, $2m^3$ (b) $4{\cdot}524\ m^3$, $4\ m^3$
(c) $6{\cdot}72\ m^3$, $6\ m^3$ (d) $5{\cdot}576\ m^3$, $5\ m^3$

3. (a) $45{\cdot}9\ m^3$, i.e. 45·9 kL 15 hours and 18 minutes to fill to 10 cm from top.
(b) $14{\cdot}4\ m^3$, i.e. 14·4 kL 4 hours and 48 minutes to fill to 10 cm from top.
(c) $11{\cdot}16\ m^3$ (rounded to 2 dp), i.e. 11·16 kL 3 hours and 43 minutes to fill to 10 cm from top.
(d) $23{\cdot}4\ m^3$, i.e. 23·4 kL 7 hours and 48 minutes to fill to 10 cm from top.

4. (a) (i) $38{\cdot}6\ m^3$ (ii) $48{\cdot}2\ m^3$ (b) (i) $14{\cdot}8\ m^3$ (ii) $19{\cdot}2\ m^3$
(c) (i) $13{\cdot}2\ m^3$ (ii) $17{\cdot}2\ m^3$ (d) (i) $22{\cdot}7\ m^3$ (ii) $30{\cdot}7\ m^3$

5. (a) Capacity of tank is 4 500 litres. Needs approximately $2{\cdot}25\ m^3$ of concrete.
(b) Capacity of tank is 40 039 litres (i.e. approx 40 kL). Needs approximately $9{\cdot}43\ m^3$ of concrete.

6. (a) $1854\ m^2$ (b) $53\ m^2$ (c) $58653\ m^2$ (d) $81\ m^2$

7. (a) 218·68 litres (b) 91·5% (d) 73·68 metres

8. (a) (i) Approx $2\,570\,000\ m^3$ (ii) Approx 5 800 000 000 kg i.e. approx. 5·8 million tonnes.
(b) (i) Approx $2\,220\,000\ m^3$ (ii) Approx 4 990 000 000 kg i.e. approx. 5·0 million tonnes
(c) (i) Approx $257\,000\ m^3$ (ii) Approx 577 000 000 kg i.e. approx. 0·58 million tonnes

9. (a) Earth: Approximately $1{\cdot}1 \times 10^{12}\ km^3$.
(b) Basketball: Approximately $7\,238\ cm^3$.
(c) Wrecking ball: Approximately $382\,000\ cm^3$ (i.e. approximately $0{\cdot}382\ m^3$).
(d) Moon: Approximately $2{\cdot}21 \times 10^{10}\ km^3$.
(e) Snooker ball: Approximately $75800\ mm^3$ (i.e. approximately $75{\cdot}8\ cm^3$).
(f) Eyeball: Approximately $5{\cdot}58\ cm^3$.

10. (a) (i) Real weight is approximately 14·5 kg. Cubic weight is 12 kg. Hence charge by real weight.
Charge is $\$7{\cdot}50 + 14 \times \$4{\cdot}40 = \$69{\cdot}10$
(ii) Real weight is approximately 6·3 kg. Cubic weight is 12 kg Hence charge by cubic weight.
Charge is $\$7{\cdot}50 + 11 \times \$4{\cdot}40 = \$55{\cdot}90$
(b) (i) Real weight is 4·423 kg. Cubic weight is 6 kg. Hence charge by cubic weight.
Charge is $\$8{\cdot}40 + 5 \times \$5{\cdot}20 = \$34{\cdot}40$
(ii) Real weight is 8·452 kg. Cubic weight is 7·5 kg. Hence charge by real weight.
Charge is $\$8{\cdot}40 + 8 \times \$5{\cdot}20 = \$50$

11. (a) (i) $87{\cdot}96\ m^2$ (ii) 33 litres.
(b) (i) $45{\cdot}05\ m^2$ (ii) 17 litres.
(c) (i) $80{\cdot}92\ m^2$ (ii) 31 litres.
(d) (i) $31{\cdot}48\ m^2$ (ii) 12 litres.

12. (a) $810\ cm^3$ (b) $12945\ cm^3$ (c) $2295\ cm^3$ (d) $28845\ cm^3$

Exercise 9D. Page 170.

1. (a) 5 cm (b) $150\ cm^2$

2. (a) 4 cm (b) $64\ cm^3$

3. The sphere has a radius of 26 mm, to the nearest millimetre.

4. The radius of the hemisphere is 84 mm, to the nearest millimetre.

5. The radius of the sphere is 247 mm, to the nearest millimetre.

6. The cube has a surface area of $1350\ cm^2$.

7. The sphere has a surface area of $1088\ cm^2$ (nearest cm^2).

8. $v = 6$, $w = 8$, $x = 18$, $y = 7{\cdot}4$, $z = 8{\cdot}3$

9. The length of the cylinder is, to the nearest millimetre, 214 mm.

10. (a) $x = 25$ (b) $y = 7$

11. $x = 2{\cdot}5$

12. The two identical smaller sphere will each have a radius of 15·9 cm, to the nearest mm.
The total surface area of the two small spheres is 6333 cm^2 compared with 5027 cm^2 for the larger sphere (nearest cm^2). Hence the two smaller spheres have a greater surface area (by about 26%).

13. The cylinders will be of length 21 cm and 42 cm. The surface area increases from 5542 cm^2 (nearest cm^2) to 8005 cm^2 (nearest cm^2), an increase of approximately 44%.

14. When the container holds 0·5 litres of liquid the depth of the liquid is 12·4 cm (correct to 1 dp).

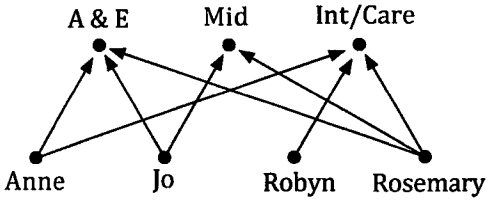
Miscellaneous Exercise Nine. Page 173.

1. Answers not given here. Check your answers with those of others in your class.

2. $117·40

3.

	A & E	Mid	Int/Care
Anne	1	0	1
Jo	1	1	0
Robyn	0	0	1
Rosemary	1	1	1



4. (a) $2 + (3 \times 5)^2 = 227$ (b) $(2 + 3 \times 5)^2 = 289$ (c) $(2 + 3) \times 5^2 = 125$

5. $\begin{bmatrix} 12 & 7 \end{bmatrix}$

6. The 450 g box of brekky cereal for $5·90 is the best buy.

7. $5000 invested for 5 years at 8·2% per annum compounded every 6 months. Interest $2472·70.
$5000 invested for 5 years at 8% per annum compounded every 3 months. Interest $2429·74.
$5000 invested for 5 years at 8·5% per annum simple interest. Interest $2125·00

8. The surface area of the earth is approximately $5·1 \times 10^8$ km^2.
Approximately $3·6 \times 10^8$ km^2 of the earth's surface is covered by water.

9.

Unit cost	Number ordered	Sub total	Less 20% discount	Plus 10% tax
$34·50	*17*	*$586·50*	*$469·20*	*$516·12*
$8·50	23	$195·50	$156·40	$172·04
$145·50	13	$1891·50	$1513·20	$1664·52
$8·00	56	$448·00	$358·40	$394·24
$1024·00	8	$8192·00	$6553·60	$7208·96

10. (a) The percentage profit is, to the nearest percent, 33%.
(b) The item must be sold for at least $31·20.
(c) The seller purchased the item for $2 450.
(d) The person putting the item into the auction paid $3 080 for the item originally.

11. $\begin{bmatrix} 7 & 0 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{bmatrix}$

12. The area of the square is 11 250 cm^2.

13. The area of the rectangle is 360 cm^2.

14. To the nearest whole percent, 36% of the circle is shaded.

15. (a) The new total surface area is 119% of the original surface area (to nearest percent).
(b) The new total surface area is 148% of the original surface area (to nearest percent).

Exercise 10A. Page 179.

1. \$960
2. \$270
3. 15 minutes
4. \$270
5. \$560
Note: For some boxes a bigger box would need thicker card and hence this would be a volume question with an answer of \$1120 (= $\$28 \times 2^3 \times 5$). However this question does say *using the same thickness and type of card* and so thickness remains unchanged. Hence the question involves considering areas to give the answer of \$560 = (= $\$28 \times 2^2 \times 5$).
6. 1·125 km^2
7. \$560 000
8. 86·4 m^3, i.e. about 85 m^3.
9. 0·8 cm^2
10. 20 cm^2
11. (a) 3 : 2 (b) 9: 4
12. (a) 4 : 5 (b) 64: 125

Exercise 10B. Page 183.

1. (a) 12 cm (b) 30° (c) 9 : 4
2. (a) 6·25 cm (b) 20° (c) 16 : 25
3. (a) 7·5 cm (b) 36 : 25 (c) 216 : 125
4. (a) 3300 km (b) 2600 km (c) 700 km
(d) 2600 km (e) A little over 900 km (f) Yes
5. (a) 5·8 m x 6 m (b) 3·5 m x 4 m
(c) 3·5 m x 2·7 m (d) 4·1 m x 1·6 m
6. (a) Approximately 210 metres. (b) Approximately 320 metres.
(c) Approximately 1250 m^2. (d) Approximately 3000 m^2.

Exercise 10C. Page 188.

1. Shapes A and B are similar.
Lengths in shape A : corresponding lengths in shape B = 2 : 3
2. Shapes A and B are not similar.
3. Shapes A and B are similar.
Lengths in shape A : corresponding lengths in shape B = 1 : 2
4. Shapes A and B are similar.
Lengths in shape A : corresponding lengths in shape B = 4 : 1
5. Shapes A and B are not similar.
6. Shapes A and B are similar.
Lengths in shape A : corresponding lengths in shape B = 2 : 1
7. Shapes A and B are not similar.
8. Shapes A and B are similar.
Lengths in shape A : corresponding lengths in shape B = 3 : 1
9. No **10.** No **11.** Yes
12. No **13.** No **14.** Yes

Exercise 10D. Page 192.

1. $\Delta ABC \sim \Delta DEF$, corresponding angles equal.
Area ΔABC : Area ΔDEF = 1 : 9 x = 7, y = 18.

2. $\Delta PQR \sim \Delta YZX$, corresponding angles equal.
Area ΔPQR : Area ΔYZX = 9 : 4 x = 10, y = 24.

3. $\Delta DEF \sim \Delta UTS$, two pairs of corresponding sides in same ratio and the included angles equal.
Area ΔDEF : Area ΔUTS = 25 : 64 x = 10·4,

4. Not similar.

5. $\Delta TUV \sim \Delta MNL$, corresponding sides in same ratio.
Area ΔTUV : Area ΔMNL = 16 : 9 x = 60, y = 46.

6. $\Delta UVW \sim \Delta ZXY$, corresponding angles equal.
Area ΔUVW : Area ΔZXY = 1 : 4 x = 7, y = 12.

7. $\Delta ABC \sim \Delta EDC$, corresponding angles equal.
Area ΔABC : Area ΔEDC = 9 : 25 x = 3, y = 4·5.

8. $\Delta PQT \sim \Delta SRT$, corresponding angles equal.
Area ΔPQT : Area ΔSRT = 16 : 9 x = 16, y = 15.

9. $\Delta ABE \sim \Delta ACD$, corresponding angles equal. EB = 5 metres.

10. $\Delta PQT \sim \Delta PRS$, corresponding angles equal. TS = 10·5 metres.

Miscellaneous Exercise Ten. Page 194.

1. (a) length (b) length (c) area (d) area
(e) area (f) length (g) volume (h) area
(i) area (j) area (k) area (l) length
(m) volume (n) volume (o) volume

2. (a) $1{\cdot}23 \times 10^{6}$ (b) $1{\cdot}2 \times 10^{-3}$ (c) $2{\cdot}5 \times 10^{4}$ (d) $2{\cdot}45 \times 10^{-8}$
(e) $1{\cdot}5 \times 10^{10}$ (f) 3×10^{-5} (g) $7{\cdot}6 \times 10^{1}$ (h) 1×10^{-1}

3. 20 cm, 32 cm and 40 cm.

4. 45 bags

5. The 250 g pack of butter costing \$4·85 is the better deal.

6. (a) 7·7 km (b) 4 cm (c) 0·25 km^2

7. 7 : 5

8. \$2000 invested for 4 years at 8% per annum compounded six monthly earns more interest by \$109·21*.
(* If you got \$309·21 this is the difference in the final amounts, not the difference in the interest.)

9. $AA = \begin{bmatrix} 4 & 0 \\ 1 & 1 \end{bmatrix}$, $AC = \begin{bmatrix} -2 \\ -3 \end{bmatrix}$, $BA = \begin{bmatrix} 5 & -3 \end{bmatrix}$, $CB = \begin{bmatrix} -1 & -3 \\ 2 & 6 \end{bmatrix}$, $BC = \begin{bmatrix} 5 \end{bmatrix}$.

10. The length of the scale model is 22 cm.

11. Shop B (\$1·229 per 100 g), Shop C (\$1·326 per 100 g), Shop A (\$1·36 per 100 g).

12. (a) 31 km (b) 20 km^2

13. (a) There will be 1000 smaller cubes each of side length 1 cm.
(b) The total surface area of the 1000 small cubes will be 10 times that of the surface area of the initial cube. (6000 cm^2 compared to 600 cm^2.)

14. (a) \$1350 (b) \$1850 (c) \$2350

15. 125 **16.** 54 seconds. **17.** 3200 cm^3.

18. (a) 2·41 grams (b) 43·2 kg

19. The top of the ladder will move 66 cm down the wall, to the nearest centimetre.

20. We will assume that Jen's rate of polishing (in area polished per unit of time) stays the same throughout. The time taken will then only depend on the surface area that requires polishing.
The larger sphere is twice the volume of the smaller one. Hence comparison of length would involve $\sqrt[3]{2}$ and comparison of surface areas would involve $\left(\sqrt[3]{2}\right)^2$. Jen will take 10 minutes $\times \left(\sqrt[3]{2}\right)^2$, i.e. approximately 16 minutes to polish the larger of the two spheres.