

# Sample Preliminary examination 2

Total time allowed: 2 hours Total marks: 85

## Sample exam 2

### Section 1

(Suggested time: 35 minutes)

Multiple-choice questions

25 marks

- Attempt ALL questions.
- All questions are of equal value.
- Select the alternative (A, B, C or D) that best answers the question.

1 Find the value of  $\frac{3.2 + 6.5}{7.8 \times 2.3}$  correct to two decimal places.

- A 5.17                      B 4.52  
C 0.54                      D 1.65

2 Christina has a bicycle and the circumference of the bicycle wheel is 2.15 m. How far does she travel in 3000 turns of the wheel?

- A 8.96 km                  B 5.3 km  
C 6.45 km                  D 7 km

3 In the yearly examination, 96% of the students passed. If 250 students sat for the examination, how many failed?

- A 10                          B 8  
C 20                          D 240

4 Find the percentage profit on the cost price if the cost price is \$560 and selling price is \$840.

- A 33.3%                      B 50%  
C 66.6%                      D 45%

5 Johan receives a 10% increase in his weekly wage. If the increase is \$30, find his new weekly wage.

- A \$300                      B \$360  
C \$310                      D \$330

6 On 24 December, 2002, Nav gave birth to a baby girl named Sohan Kaur whose weight at the time of birth was 3.5 kilograms. Nav herself weighed 56 kilograms. Find the ratio of the baby's weight to the mother's weight.

- A 8:1                          B 1:16  
C 16:1                          D 28:3

7 Simplify  $12 - 3(2a - 1)$

- A  $6a + 3$                       B  $9 - 6a$   
C  $11 - 6a$                       D  $15 - 6a$

8 Jaani is 10 years of age and J.R. is 12 years of age. They are given \$220 to be shared in the ratio of their ages. How much does Jaani get?

- A \$140                      B \$120  
C \$90                          D \$100

9 In scientific notation, 0.000 0496 is:

- A  $4.96 \times 10^{-5}$                   B  $4.96 \times 10^{-4}$   
C  $4.96 \times 10^4$                       D  $4.96 \times 10^5$

10 Vivan measured two pieces of wood to be 1.6 m and 2.3 m. What is the upper limit of their combined length when the two pieces of wood are placed end to end?

- A 3.9 m                      B 3.95 m  
C 4.0 m                      D 4.05 m

11 Find the value of  $\frac{2Rr}{R+r}$  when  $R = 9.6$  and  $r = 4.8$ .

- A 6.4                          B 2.3  
C 8.9                          D 14.4

12 Which of the following is a solution to the equation

$$\frac{5 - x}{-2} = 2?$$

- A  $x = 9$                           B  $x = 1$   
C  $x = -1$                           D  $x = -9$

13 Calculate  $23 \times 14^7$  and express your answer in scientific notation rounded off to three significant figures.

- A  $24.3 \times 10^{10}$       B  $2 \times 10^9$   
 C  $3.42 \times 10^7$       D  $2.42 \times 10^9$

14 Find the value of  $\frac{4.8 \times 10^9}{3.2 \times 10^{15}}$ .

- Give your answer in scientific notation.  
 A  $1.5 \times 10^{-6}$       B  $2.5 \times 10^5$   
 C  $4.2 \times 10^{-7}$       D  $2.1 \times 10^3$

15 Which classification accurately describes the variable, 'the weight of a student'?

- A Categorical nominal  
 B Categorical ordinal  
 C Quantitative discrete  
 D Quantitative continuous

16 Find the median of the following set of scores: 3, 8, 7, 5, 10, 2, 6

- A 5      B 6  
 C 8      D 7

17 Find the range of the following set of scores: 5, 6, 5, 8, 20, 9, 15, 18

- A 13      B 15  
 C 12      D 4

18 A new car costs \$37 500. A saving of 15% can be had by buying the previous year's model. The cost of the cheaper car is all of these, *except*:

- A  $\$37\,500 - \frac{15}{100} \times \$37\,500$   
 B  $\frac{85}{100} \times \$37\,500$   
 C  $0.85 \times \$37\,500$   
 D  $\frac{15}{100} \times \$37\,500$

19 A bag contains 3 white, 5 red and 7 black balls. If a ball is drawn at random, find the probability that it is either white or red.

- A  $\frac{3}{15}$       B  $\frac{1}{3}$   
 C  $\frac{8}{15}$       D  $\frac{7}{15}$

20 Two dice are thrown. Find the probability that the sum is 7.

- A  $\frac{1}{6}$       B  $\frac{1}{36}$   
 C  $\frac{1}{9}$       D  $\frac{5}{36}$

21 The insurance you take out to cover the cost of repairing or replacing your own vehicle if it is damaged in an accident or stolen is:

- A third party property insurance  
 B compulsory third party (CTP) insurance  
 C comprehensive insurance  
 D stamp duty insurance.

22 If 58.2% of the workforce in New South Wales is male, what percentage is female?

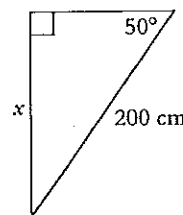
- A 41.2%      B 41.8%  
 C 21.8%      D 58.2%

23 Write 537 859 000 correct to the nearest million.

- A 537 000 000      B 540 000 000  
 C 530 000 000      D 538 000 000

24 The value of  $x$  is given by:

- A  $50 \times \sin 200^\circ$   
 B  $200 \div \sin 50^\circ$   
 C  $200 \sin 50^\circ$   
 D  $50 \div \sin 200^\circ$



25 The perimeter of a rectangle is 240 cm. The length of the rectangle is twice the breadth. What is the length of the rectangle?

- A 20 cm      B 40 cm  
 C 60 cm      D 80 cm

## Sample exam 2

### Section 2

(Suggested time: 85 minutes)

Objective-response questions

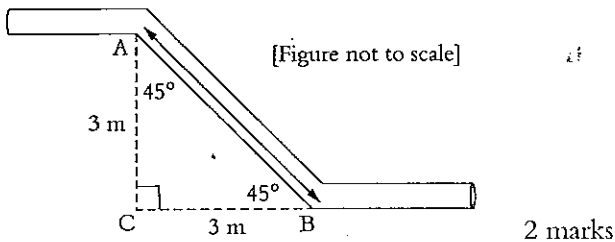
60 marks

• Attempt ALL questions.

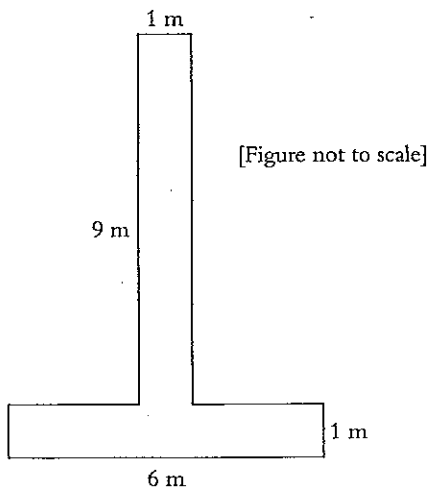
• Each question is worth 15 marks.

• Show all working.

- 26** a A cold-water pipe must be offset 3 metres, using  $45^\circ$  elbows. What is the length of the diagonal pipe to the nearest cm?

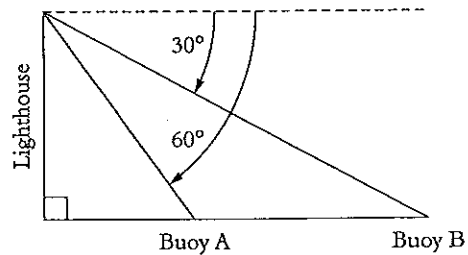


- b The figure below is the cross-section of a retaining wall.

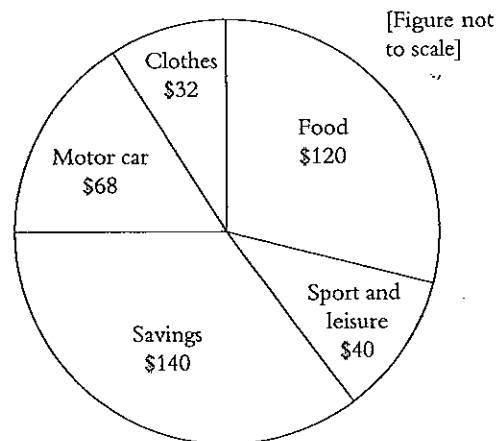


- i Show that the area of the cross-section is  $15 \text{ m}^2$ . 1 mark
- ii If the retaining wall is 135 metres long, show that the volume is  $2025 \text{ m}^3$ . 1 mark
- iii If 0.24 sacks of cement produce 1 cubic metre of concrete, how many sacks are needed for the construction of this retaining wall? 2 marks
- iv If cement is \$6.85 per sack, and there is a delivery fee of \$40, what is the cost of the cement for this job? 2 marks

- c From the top of a lighthouse 75 m above sea level, the angles of depression of two buoys due north of the lighthouse are  $60^\circ$  and  $30^\circ$  respectively. Find, correct to the nearest metre, the:



- i distance of each buoy from the lighthouse. 2 marks
  - ii distance between the two buoys. 1 mark
- d The sector graph represents the distribution of a person's total weekly income:

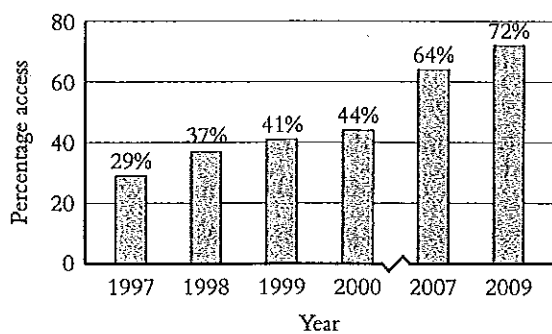


- i Find the person's total weekly income. 1 mark
- ii What fraction of the person's income is spent on food? 1 mark
- iii The sector angles in the diagram are incorrect. Calculate the correct angle for the sector that represents sport and leisure. 1 mark
- iv How many weeks will it take for this person to save \$2750? 1 mark

- 27** a The average temperature in June for the last 30 years in a city has been 15.2 degrees. This year the average June temperature was 14.8 degrees. What is the new 31-year average? [Answer correct to one decimal place.] 2 marks
- b The time taken to download music files of varying sizes is given in the table:

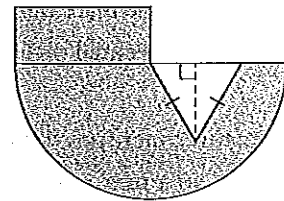
File size (MB)	Time (seconds)
5	10
10	25
15	40
20	58
25	70
30	85
35	101
40	114
45	135

- i What is the average increase in time that it takes to download a file increasing in 5 MB lots? 1 mark
- ii Estimate the time it would take to download a 55 MB file. 2 marks
- iii Plot these points and draw in a line of best fit. 2 marks
- c The diagram shows the percentage access to mobile phones by a population of a certain country:



- i What type of graph is this? 1 mark
- ii Explain the purpose of the zig-zag portion along the horizontal axis. 1 mark

- iii By what percentage has the access to mobile phones increased between 2000 and 2007? 1 mark
- iv The population of this country is 27 million. How many people, correct to the nearest million, had mobile phone access in 2009? 1 mark
- d A semicircle has an isosceles triangle cut out from it and a rectangle with base equal to the radius added on to it. If the triangle's base is 4 cm and its height is 3 cm, the semicircle's radius is 6 cm and the rectangle has a height of 2.5 cm, calculate the total area correct to four significant figures. 4 marks

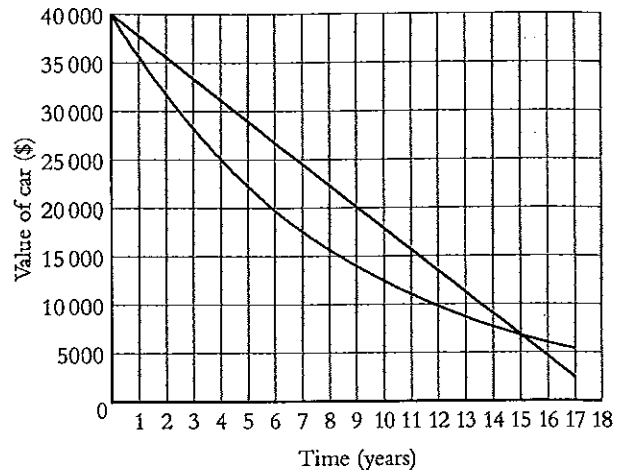


- 28** a The first print run of a new novel was 15 000 copies. The publisher sent 7% of the print run as free inspection copies, and sold 15% of the print run at a special discount price of \$15 each.
- i How many free inspection copies were sent? 1 mark
- ii How much did the publisher receive in total for the sale of the discounted copies? 2 marks
- The publisher sells the remaining books at a price of \$27.95 each.
- iii How much money does the publisher receive from the total print run? 2 marks
- b When thrown, a biased die shows a 6 (six) or a 3 (three) twice as often as the other numbers. What is the probability of throwing a:
- i 5? 1 mark
- ii 6? 1 mark
- iii 6 or a 3? 1 mark

- c A car is advertised for sale as follows:  
Cash \$25 070. Terms: \$5070 deposit and \$1033.33 per calendar month for 2 years.
- What is the total amount paid for the car on these terms? 2 marks
  - Calculate the simple interest rate charged by the selling firm on the balance of the car's price over the 2-year repayment period. 2 marks
- d Hannah buys 1000 shares in a florist chain for \$0.42 each. Over 3 years, the shares rise in value by 50%.
- What is the market value of Hannah's shares after 3 years? 1 mark
  - If Hannah receives a dividend of 5¢ per share, calculate her dividend yield to one decimal place. 2 marks

- 29** a A manufacturer increases the price of a car by 25% to a new selling price of \$40 490. What was the selling price of the car before this increase? 2 marks
- b A cube of metal with side length 9 cm is melted down and formed into a cylinder with radius of 0.15 m. Find the height of the cylinder correct to three significant figures. 3 marks
- c The total amount \$A returned when \$P is invested at r per cent compound interest for n years is given by the formula:  
 $A = P(1 + r)^n$
- Find the amount returned when \$5000 is invested for 5 years at 8% compound interest. 1 mark
  - How much more interest would be earned if the investment were compounded monthly instead of yearly? 3 marks

- d A car is purchased for \$39 900. Using straight-line depreciation the amount is \$2200 p.a., while using the declining-balance method the percentage rate is 11% p.a. A graph is drawn showing the value of the car over a number of years:



- i Using the graph, complete the missing values P and Q in the following table:

Time (years)	Straight-line value (\$)	Declining-balance value(\$)
0	39 900	39 900
1	37 700	35 511
2	35 500	Q
3	P	28 128.26

2 marks

- When is the greatest difference between the values using the two methods? 1 mark
- What is significant after 15 years using either method? 1 mark
- When is the value of the car \$0 using the declining-balance method? Briefly explain your answer. 2 marks

Go to p. 244 for **Quick Answers**  
or to pp. 268–271 for **Worked Solutions**.

$$\begin{aligned} \frac{3.2 + 6.5}{7.8 \times 2.3} &= \frac{9.7}{17.94} \\ &= 0.5406911... \text{ [Cal.]} \\ &= 0.54 \text{ [2 d.p.]} \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{Distance travelled} &= 3000 \times 2.15 \text{ m} \\ &= 6450 \text{ m} \\ &= 6.45 \text{ km} \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{Number of students passed} &= 96\% \text{ of } 250 \\ &= 96\% \times 250 \\ &= 240 \\ \text{Number of students failed} &= 250 - 240 \\ &= 10 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{Cost price} &= \$560 \\ \text{Selling price} &= \$840 \\ \text{Profit} &= \$840 - \$560 = \$280 \\ \text{Percentage profit on cost price} &= \frac{280}{560} \times 100 \\ &= 50\% \quad \checkmark \end{aligned}$$

$$\begin{aligned} 10\% \text{ of the wage} &= \$30 \\ 1\% \text{ of the wage} &= \frac{\$30}{10} = \$3 \\ 100\% \text{ of the wage} &= \$3 \times 100 = \$300 \\ \text{His new wage} &= \$300 + \$30 = \$330 \quad \checkmark \end{aligned}$$

6 Baby (Sohan) : Mother (Nav)

$$3\frac{1}{2} \text{ kg} : 56 \text{ kg}$$

$$\frac{7}{2} : 56$$

$$7 : 112$$

$$1 : 16 \quad \checkmark$$

$$\begin{aligned} 12 - 3(2a - 1) &= 12 - 6a + 3 \\ &= 15 - 6a \quad \checkmark \end{aligned}$$

8 Jaani : J.R.

$$10 : 12$$

$$5 : 6$$

$$\begin{aligned} \text{Total parts} &= 5 + 6 \\ &= 11 \end{aligned}$$

$$11 \text{ parts} = \$220$$

$$1 \text{ part} = \frac{\$220}{11} = \$20$$

$$5 \text{ parts} = 5 \times \$20 = \$100 \quad \checkmark$$

9  $4.96 \times 10^{-5}$ —the decimal point had to be moved five places.  $\checkmark$

10 The upper limit for each piece of wood is +0.5 of the smallest unit used (10 cm), which is 5 cm. Thus the upper limits of the pieces are 1.65 cm and 2.35 m, which combined gives 4.0 m.  $\checkmark$

$$\begin{aligned} \frac{2Rr}{R+r} &= \frac{2(9.6)(4.8)}{9.6 + 4.8} \\ &= \frac{92.16}{14.4} \\ &= 6.4 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{By substitution, using a calculator, } x &= 9; \text{ that is,} \\ \frac{5 - 9}{-2} &= 2 \quad \checkmark \end{aligned}$$

$$\begin{aligned} 23 \times 14^7 &= 2.4245106 \times 10^9 \\ &= 2.42 \times 10^9 \text{ [3 s.f.]} \quad \checkmark \end{aligned}$$

$$\frac{4.8 \times 10^9}{3.2 \times 10^{15}} = 1.5 \times 10^{-6} \quad \checkmark$$

15 A *quantitative continuous variable* can take any numerical value within a given range and is often the result of rounding a measurement.  $\checkmark$

16 2, 3, 5, 6, 7, 8, 10  
The middle score is 6.  
The median is 6.  $\checkmark$

$$\begin{aligned} \text{Range} &= 20 - 5 \\ &= 15 \quad \checkmark \end{aligned}$$

18  $\frac{15}{100} \times \$37500$  shows the saving that can be made by purchasing the cheaper alternative. All of the others show the cost of the cheaper car.  $\checkmark$

$$\begin{aligned} P(E) &= \frac{n(E)}{n(S)} & \left[ \begin{array}{l} n(E) = 8 \\ n(S) = 15 \end{array} \right] \\ &= \frac{8}{15} \quad \checkmark \end{aligned}$$

$$\begin{aligned} P(E) &= \frac{n(E)}{n(S)} & \left[ \begin{array}{l} n(E) = 6 \\ n(S) = 36 \end{array} \right] \\ &= \frac{6}{36} \\ &= \frac{1}{6} \quad \checkmark \end{aligned}$$

21 Comprehensive insurance includes third party property insurance *plus* insurance to your own vehicle. Third party insurance insures you against any claims of damages by a third party (someone else) in an accident that is deemed to be your fault. Compulsory third party covers the cost of injury to anyone where the driver of your car is at fault. There is no such thing as stamp duty insurance, though you do need to pay stamp duty, which is a tax on the purchase of a car.  $\checkmark$

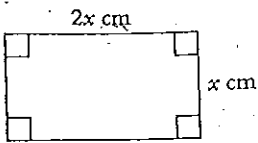
$$100\% - 58.2\% = 41.8\% \quad \checkmark$$

$$537859000 = 538000000 \text{ [to nearest million]} \quad \checkmark$$

$$\frac{x}{200} = \sin 50^\circ$$

$$x = 200 \sin 50^\circ \quad \checkmark$$

25



$$x + x + 2x + 2x = 240$$

$$6x = 240$$

$$x = 240 \div 6$$

$$x = 40 \text{ cm}$$

$$\therefore \text{Length} = 2x$$

$$= 2 \times 40 \text{ cm}$$

$$= 80 \text{ cm} \quad \checkmark$$

26 a In the right-angled  $\triangle ABC$ , use Pythagoras' Theorem:

$$x^2 = 3^2 + 3^2$$

$$x^2 = 9 + 9$$

$$x^2 = 18 \quad \checkmark$$

$$x = \sqrt{18}$$

$$= 4.2426407... \text{ [Cal.]}$$

$$x = 4.24 \quad \checkmark$$

b i Area =  $(9 \times 1 + 6 \times 1) \text{ m}^2$

$$= 15 \text{ m}^2 \quad \checkmark$$

ii Volume = Area  $\times$  Length

$$= (15 \times 135) \text{ m}^3$$

$$= 2025 \text{ m}^3 \quad \checkmark$$

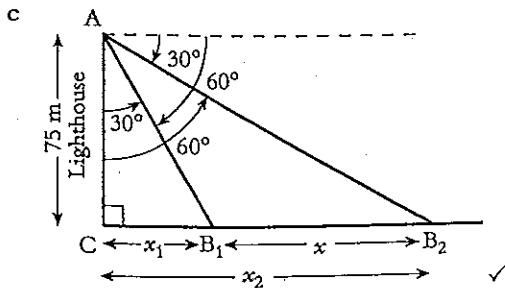
iii Number of sacks needed =  $2025 \times 0.24 \quad \checkmark$

$$= 486 \quad \checkmark$$

iv Total cost =  $(486 \times \$6.85) + \$40 \quad \checkmark$

$$= \$3329.10 + \$40$$

$$= \$3369.10 \quad \checkmark$$



i In right-angled  $\triangle ACB_2$

$$\frac{x_2}{75} = \tan 60^\circ$$

$$x_2 = 75 \tan 60^\circ$$

$$x_2 = 129.90381... \text{ m [Cal.]}$$

$$x_2 = 129.9 \text{ m [1 d.p.]}$$

In right-angled  $\triangle ACB_1$

$$\frac{x_1}{75} = \tan 30^\circ$$

$$x_1 = 75 \tan 30^\circ$$

$$x_1 = 43.30127... \text{ m [Cal.]}$$

$$x_1 = 43.3 \text{ m [1 d.p.] } \quad \checkmark$$

ii Distance between the two buoys

$$= x_2 - x_1$$

$$= (129.9 - 43.3) \text{ m}$$

$$= 86.6 \text{ m} \quad \checkmark$$

d i Total weekly income

$$= \$(32 + 68 + 120 + 40 + 140)$$

$$= \$400 \quad \checkmark$$

ii Fraction spent on food =  $\frac{120}{400}$

$$\text{Fraction spent on food} = \frac{3}{10} \quad \checkmark$$

iii \$400 represents  $360^\circ$

$$\$1 \text{ represents} = \frac{360^\circ}{400}$$

$$\$40 \text{ represents} = \frac{360^\circ}{400} \times 40$$

$$= 36^\circ \quad \checkmark$$

iv  $\$2750 \div \$140 = 19.64... \text{ or } 20 \text{ weeks} \quad \checkmark$

27 a New 31-year average =  $\frac{15.2^\circ \times 30 + 14.8^\circ}{31} \quad \checkmark$

$$= \frac{470.8}{31}$$

$$= 15.1879677$$

$$= 15.2^\circ \text{ [1 d.p.] } \quad \checkmark$$

b i The increases are 15, 15, 18, 12, 15, 16, 13, 21.

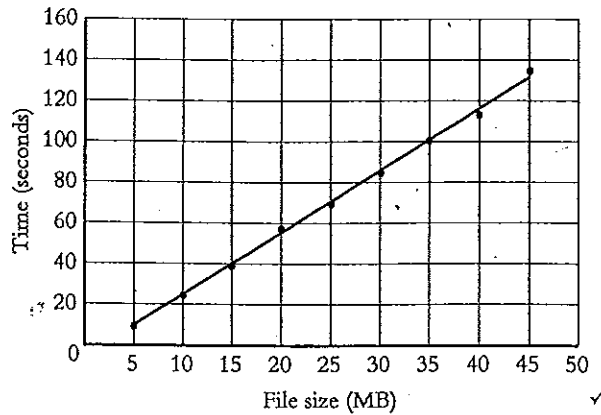
So the average increase is  $(15 + 15 + 18 + 12$

$$+ 15 + 16 + 13 + 21) \div 8 = 15.625 \quad \checkmark$$

ii Estimated time =  $135 + 2 \times 15.625$

$$= 166.25 \text{ seconds} \quad \checkmark \checkmark$$

iii



c i Vertical column graph  $\checkmark$

ii To show there has been a jump in the otherwise

regular progress of the years. That is, 1997, 1998,

1999, 2000, then the jump to 2007.  $\checkmark$

iii  $64\% - 44\% = 20\% \quad \checkmark$

iv  $72\% \times 27 \text{ million} = 19.44 \text{ million.}$

To the nearest million this is 19 million.  $\checkmark$

d  $\text{Area}_{\text{total}} = \text{Area}_{\text{semicircle}} - \text{Area}_{\text{triangle}} + \text{Area}_{\text{rectangle}} \quad \checkmark$

$$= \frac{1}{2} \times \pi \times r^2 - \frac{1}{2} \times b \times h + b \times h$$

$$= \frac{1}{2} \times \pi \times 6^2 - \frac{1}{2} \times 4 \times 3 + 6 \times 2.5 \quad \checkmark$$

$$= 65.54866... \quad \checkmark$$

$$= 65.55 \text{ cm}^2 \text{ (4 s.f.) } \quad \checkmark$$

- 28** a i  $7\%$  of  $15\,000 = 7\% \times 15\,000$   
 $= 1050$  copies ✓  
 ii  $15\%$  of  $15\,000 = 15\% \times 15\,000$   
 $= 2250$  copies ✓  
 Amount received  $= 2250 \times \$15$   
 $= \$33\,750$  ✓  
 iii Number of books sold at  $\$27.95$  each  
 $= 15\,000 - 1050 - 2250$   
 $= 11\,700$   
 Amount received for  $11\,700 = 11\,700 \times \$27.95$   
 $= \$327\,015$  ✓  
 Money received from the total print run  
 $= \$327\,015 + \$33\,750$   
 $= \$360\,765$  ✓

b i  $P(E) = \frac{n(E)}{n(S)} = \frac{1}{8}$  ✓  
 ii  $P(E) = \frac{n(E)}{n(S)} = \frac{2}{8} = \frac{1}{4}$  ✓  
 iii  $P(E) = \frac{n(E)}{n(S)} = \frac{4}{8} = \frac{1}{2}$  ✓

- c i Amount paid in instalments  
 $= \$1033.33 \times 24$   
 $= \$24\,799.92$  ✓  
 Deposit  $= \$5070$   
 Total amount paid  $= \$24\,799.92 + \$5070$   
 $= \$29\,869.92$  ✓

ii Interest  $= \$29\,869.92 - \$25\,070$   
 $= \$4799.92$

$$\left[ \begin{array}{l} P = \$20\,000, n = 2 \text{ years,} \\ I = \$4799.92, r = ? \end{array} \right]$$

$$I = Prn$$

$$4799.92 = 20\,000 \times r \times 2$$
 ✓

$$r = \frac{4799.92}{40\,000}$$

$$r = 0.119998$$

$$r = 11.9998\%$$

$$r = 12\%$$
 ✓

- d i Market value  $= 1000 \times \$0.42 \times 150\%$   
 $= \$630$  ✓

ii Dividend yield  $= \frac{0.05 \times 1000}{630} \times 100\%$  ✓  
 $= 7.9365\ldots$   
 $= 7.9\%$  ✓

**29** a  $125\%$  of price  $= \$40\,490$

$$1\% \text{ of price} = \frac{\$40\,490}{125}$$
 ✓

$$100\% \text{ of price} = \frac{\$40\,490}{125} \times 100$$

$$= \$32\,392$$
 ✓

b Volume of the cube  $= 9^3 = 729 \text{ cm}^3$  ✓

Volume of the cylinder  $= V = \pi r^2 h$  ✓

$$729 = \pi(15)^2 \times h$$

$$729 = 225\pi h$$

$$[0.15 \text{ m} = 15 \text{ cm}]$$

$$225\pi h = 729$$

$$h = \frac{729}{225\pi}$$

$$h = 1.0313\ldots$$
 [Cal.]

$$h = 1.03 \text{ cm}$$
 [3 s.f.] ✓

c i  $A = P(1 + r)^n$

$$A = 5000(1 + 8\%)^5$$

$$A = 5000(1.08)^5$$

$$A = \$7346.64$$
 ✓

- ii If interest is compounded monthly,  $n = 5 \times 12$  and  
 $r = 8\% \div 12$ .

$$A = P(1 + r)^n$$

$$= 5000 \left( 1 + \frac{8\%}{12} \right)^{60}$$
 ✓

$$= 7449.2285\ldots$$

$$= 7449.23$$
 ✓

Therefore, if the interest is compounded monthly, the investment would earn  $\$7449.23 - \$7346.64 = \$102.59$  more interest. ✓

d i  $P = \$33\,300$ . ✓

$$Q = \$31\,604.79$$
 (from calculation),

or  $\$31\,600$  from reading graph. ✓

- ii From the graph, either 6 or 7 years. (There is around a  $\$7000$  difference.) ✓

iii This is the time when, using either method, the dollar depreciation of the car is the same. ✓

iv The value will never be zero using the declining-balance method. ✓

This is because it loses a percentage amount of the previous period's value, so it will approach zero but never equal zero. ✓