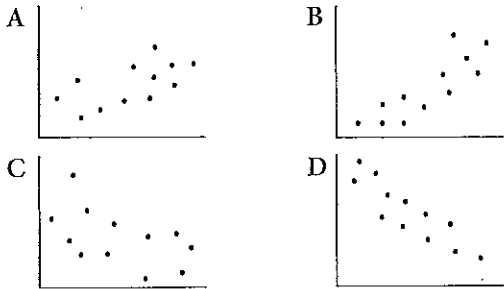


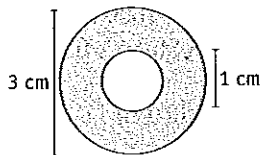
12 Will borrows \$24 000 and agrees to repay it over five years with equal monthly instalments. The flat rate of interest charged on the loan is 6% p.a. How much is each instalment?

- A \$520 B \$475
C \$464 D \$424

13 Which scatterplot shows weak negative correlation?



14 The diagram shows a washer that is 5 mm thick. Find its volume to one decimal place.



- A 3.1 cm^3 B 62.8 cm^3
C 31.4 cm^3 D 12.6 cm^3

15 Expand and simplify $4(x - 1) - 3(x - 2)$.

- A $x + 2$ B $x + 5$
C $x - 10$ D $x - 7$

16 Arrange the numbers 3.2×10^{-5} , 9.3×10^{-7} and 6×10^{-5} from lowest to highest.

- A 9.3×10^{-7} , 6×10^{-5} , 3.2×10^{-5}
B 9.3×10^{-7} , 3.2×10^{-5} , 6×10^{-5}
C 6×10^{-5} , 3.2×10^{-5} , 9.3×10^{-7}
D 3.2×10^{-5} , 6×10^{-5} , 9.3×10^{-7}

17 What sum of money (to the nearest dollar) could be invested now to be equivalent to an annuity of \$350 a quarter at 1.5% per quarter compound interest for five years?

- A \$6009 B \$7654
C \$8093 D \$13 783

18 A two-way table has been drawn up showing the results of a lie-detector test.

	Detected true	Detected false
True statement	84	16
False statement	36	124

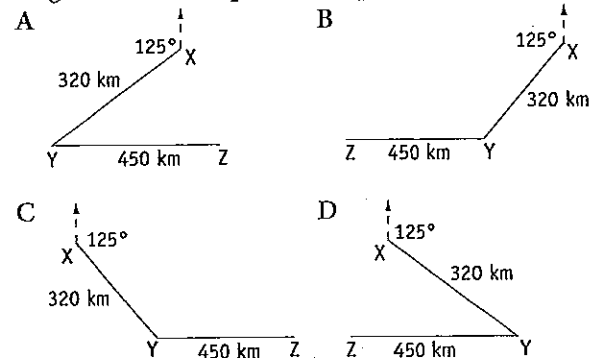
What is the probability that a statement was correctly detected?

- A $\frac{21}{65}$ B $\frac{31}{65}$ C $\frac{4}{5}$ D $\frac{6}{13}$

19 Olivia paid her credit card bill 25 days late. If the amount due was \$7600 and the interest rate was 0.048% per day, how much interest will Olivia have to pay?

- A \$91.73 B \$25.03
C \$912.00 D \$245.38

20 A plane left X and flew 320 km to Y on a bearing of 125° . From Y it flew due east 450 km to Z. Which diagram shows the path of the plane?



21 Given that $V = \frac{1}{3}\pi r^2 h$, which expression will give a correct value of r ?

- A $\sqrt{\frac{3V}{\pi h}}$ B $\frac{\sqrt{3V}}{\pi h}$
C $\sqrt{\frac{\pi h}{3V}}$ D $\frac{\pi h}{\sqrt{3V}}$

22 In a normal distribution, the mean is 64 and the standard deviation 12. Approximately what percentage of scores lie between 40 and 76?

- A 68% B 95%
C 81.5% D 99.7%

Section II

Suggested time: 2 hours

Total: 78 marks

Attempt Questions 23–28

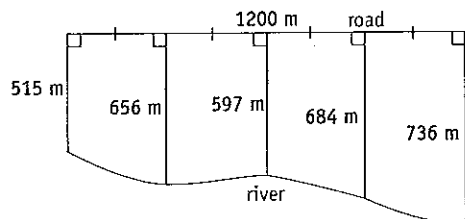
Show all working.

23 (13 marks)

- a A financial institution published the following table of home-loan repayments per \$1000 borrowed at various interest rates over various periods.

Repayments per \$1000 borrowed			
Period (years)	Interest rate		
	6%	7.5%	9%
7	\$14.61	\$15.34	\$16.09
12	\$9.76	\$10.55	\$11.38
15	\$8.44	\$9.27	\$10.14
25	\$6.44	\$7.39	\$8.39

- How much would the monthly repayments be on a \$70 000 loan over 12 years at 6% p.a. interest? 1 mark
 - How much interest would be paid on a \$110 000 loan over 25 years at 9% p.a. interest? 2 marks
 - Brock pays \$613.60 per month on his loan. If the loan is over 7 years at 7.5% p.a., how much did Brock borrow? 1 mark
 - Rebel was originally offered a loan of \$87 000 over 15 years at 7.5% p.a. Before she accepted the loan, interest rates rose. She finally took the loan over 15 years at 9% p.a. interest. How much extra were Rebel's monthly repayments? 1 mark
- b The diagram is a plan of a small farm, which is bounded on one side by a straight road and on the opposite side by a river.



- Use Simpson's rule twice to approximate the area of the farm in hectares. 2 marks
- The measurement along the road was not accurate. The actual measurement is 1206 m. How many square metres difference does this make to the area? 2 marks

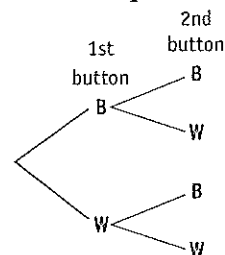
- c A back-to-back stem-and-leaf plot has been drawn showing the scores by students in two different classes, X and Y.

Class scores	
X	Y
9 3	4 6
7 7 2 0	5 1 4 8
9 8 5 4 1	6 0 3 5 6
8 6 5 3 2	7 1 2 4 7 8
9 6 5 3	8 2 4 4 7 9 9
4 1	9 0 3 5

- What is the range of scores in class X? 1 mark
- What is the median score in class Y? 1 mark
- Compare the results, referring to the shape and patterns of the display. 2 marks

24 (13 marks)

- a A box holds 5 black and 4 white buttons. Two buttons are selected at random, one after the other without replacement.



- Copy and complete the tree diagram by writing the probabilities on each of the branches. 2 marks
- What is the probability that the buttons are the same colour? 2 marks

- b i Complete the table of values for the expression $y = 15x - x^2$.

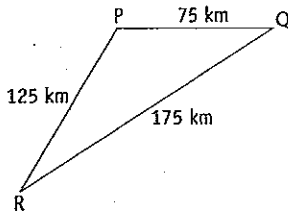
x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
y																

- 2 marks
 - Sketch the graph of $y = 15x - x^2$. 2 marks
 - For what value of x is y a maximum? Justify your answer. 1 mark
 - What is the maximum value of y ? 1 mark
- c In a test, the results are given as z -scores. Alison did the test and her z -score was 1.5.
- Explain the meaning of Alison's z -score. 1 mark
 - If Alison's raw score was 156 and the mean was 142, find the standard deviation. 2 marks

25

(13 marks)

- a In the diagram, P is 75 km due west of Q.
R is 125 km from P and 175 km from Q.

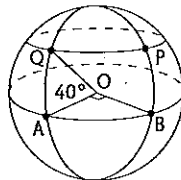


- i Use the cosine rule to find the size of angle QPR. 2 marks
 - ii Find the bearing of R from P. 1 mark
- b A tractor was bought for \$56 000 five years ago. It is being depreciated by the declining-balance method at 8% p.a.
- i What is the current value of the tractor? (Give the answer to the nearest \$100.) 1 mark
 - ii Use the estimation and refinement technique to determine the number of years before the value will fall below \$20 000. 2 marks
- c
- i How many different number plates are possible if the plates have two letters, two numbers (from 0 to 9) and two more letters? 1 mark
 - ii How many of these number plates will have the same letter four times? 2 marks
- d The number of beads (B) sewn on a wedding dress varies with the square of the length of the skirt (l cm). A skirt of length 30 cm has 1000 beads.
- i How many beads will be on a skirt of length 60 cm? 2 marks
 - ii How long is the skirt of a dress with 6250 beads? 2 marks

26

(13 marks)

- a A and B lie on the equator.
A and Q lie on the 20°W meridian. P and Q lie on the same parallel of latitude.
 $\angle AOB = 90^\circ$.
 $\angle AOQ = 40^\circ$.



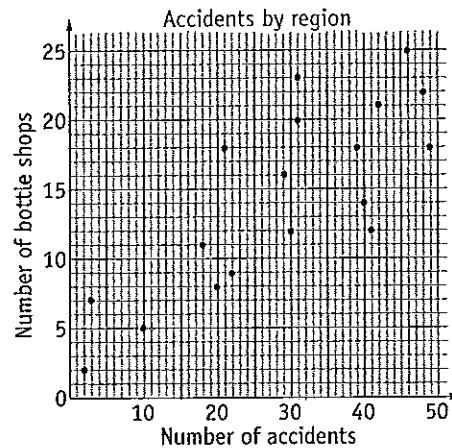
- i What is the longitude of B? 1 mark
- ii What are the position coordinates of P? 2 marks
- iii Given that the radius of the Earth is approximately 6400 km, what is the distance in kilometres between A and B? 1 mark
- iv A plane flies from P to B. If it flies at 500 knots, how long was the journey? ($1.852 \text{ km} = 1 \text{ M}$) 2 marks

- b i Fiona intends to invest \$500 every quarter into an account that pays 8% p.a. interest, compounded quarterly. What will her investment be worth at the end of six years? 2 marks
 - ii What single sum of money invested now would produce the same result? 2 marks
- c In the formula $F = \frac{kQq}{r^2}$, r is always positive and k is a constant.
- i Make r the subject of the formula. 1 mark
 - ii If $k = 9 \times 10^9$, $Q = 4 \times 10^{-12}$, $q = 1.2 \times 10^{-10}$ and $F = 2.7 \times 10^{-11}$, find r . 2 marks

27

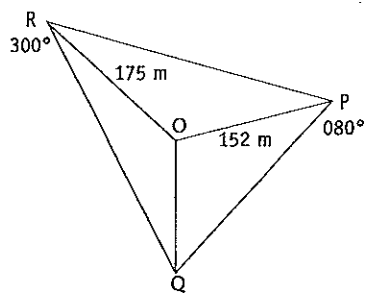
(13 marks)

- a Craig wants to borrow \$160 000. The reducible-interest rate is 7.2% p.a., charged monthly. The term of the loan is 20 years.
- i Find the amount of each monthly instalment. 3 marks
 - ii If the lending institution also charges a fee of \$15 per month, find the total amount that Craig pays in fees and charges (including interest) over the term of the loan. 2 marks
- b The scatterplot shows the number of car accidents over a certain period of time in particular regions and the number of bottle shops in those regions.



- i How many accidents occurred in the region that has 20 bottle shops? 1 mark
- ii Briefly describe the correlation. 1 mark
- iii Gary is a community leader in one of the regions. After studying the data, he proposed that bottle shops should be banned or restricted to reduce the number of accidents. Explain why Gary is wrong. 2 marks

- c A radial survey has been made of a triangular block of land. Q is 115 metres due south of O.



- i What is the bearing of Q from O? 1 mark
 ii What is the size of $\angle ROP$? 1 mark
 iii Find the length of the boundary RP. 2 marks



(13 marks)

- a Solve the equation $\sqrt{3x+4} = 5$. 2 marks
- b Tickets to a concert are cards that are either pale blue, pink or cream with either a black or gold outline. The printing on the cards is either black or silver. Equal numbers of the different types of tickets are sold for the concert.
- i How many different tickets are possible? 1 mark
 ii If 60 members of the audience are randomly selected, how many would you expect to have a ticket with no black on it? 2 marks
- c i Use the estimation and refinement technique to find the value, to the nearest whole number, of n for which $(1.08)^n = 2$. 1 mark
 ii Lisa invests \$5000 in an account earning 8% p.a. interest, compounded annually. After approximately how many years will it double in value? 1 mark
 iii After how many years will Lisa's investment be worth approximately \$160 000? 1 mark

- d A sample of 150 packets of toothpicks were examined and the number in each packet was recorded.

Number in packet	147	148	149	150	151	152	153	154	155	156	157
Number of packets	2	5	10	16	23	37	22	18	12	4	1

- i Find the mean number of toothpicks per packet. 1 mark
 ii Find the sample standard deviation. (Give the answer to 2 decimal places.) 1 mark
 iii What percentage of packets held more than 155 toothpicks? 1 mark
 iv The manufacturer of the toothpicks claims that the contents of each packet is 150. Assuming that the contents of the packets are normally distributed, with mean and standard deviation as calculated above, approximately what percentage of packets will have less than 150 toothpicks? 2 marks

Go to p 295 for **Quick Answers**
 or to pp 364–7 for **Worked Solutions**

EXAMINATIONS

Examination 1 p273

1 Ordered selections of 3 from 5
 $= 5 \times 4 \times 3$
 $= 60$

D

2 If $x = 4$ and $y = 5$,
 $\frac{1}{2}xy^2 = \frac{1}{2} \times 4 \times 5^2$
 $= 50$

B

3 $z = 1.4$, $\bar{x} = 69$, $s = 5$

$$z = \frac{x - \bar{x}}{s}$$

$$1.4 = \frac{x - 69}{5}$$

$$7 = x - 69$$

$$x = 76$$

Mary's score is 76%.

C

4 Narrabri (30°S, 150°E),
 St Petersburg (60°N, 30°E)
 Degrees difference = $150^\circ - 30^\circ$
 $= 120^\circ$
 Time difference = $(120 \div 15)$ hours
 $= 8$ hours
 St Petersburg is 8 hours behind
 Narrabri. It is 6 am.

B

5 $M = \$100$, $r = 0.0041666\dots$, $n = 48$

$$A = M \left[\frac{(1+r)^n - 1}{r} \right]$$

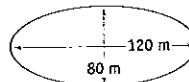
$$= \$100 \left[\frac{(1.0041666\dots)^{48} - 1}{0.0041666\dots} \right]$$

$$= \$5301.488511\dots$$

$$= \$5300 \text{ (nearest \$10)}$$

D

6 $A = \pi ab$
 $= \pi \times 60 \times 40$
 $= 7539.822369\dots$
 $= 7540 \text{ (nearest unit)}$
 Area = 7540 m^2



A

7 Financial expectation
 $= \frac{1}{1000} \times \$700 + \frac{1}{1000} \times \$200 - \$1$
 $= -\$0.10$

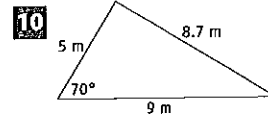
B

8 Loss in value = $\$9350 - \2900
 $= \$6450$
 Yearly loss = $\$6450 \div 6$
 $= \$1075$

D

9 8 2 7 9 5 7 4
 Mean = $42 \div 7$
 $= 6$
 The mean is not equal to 7.

A



$$A = \frac{1}{2}ab \sin C$$

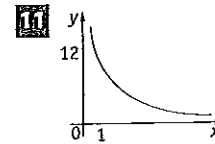
$$= \frac{1}{2} \times 5 \times 8.7 \times \sin 70^\circ$$

$$= 21.14308397\dots$$

$$= 21.1 \text{ (1 d.p.)}$$

The area is 21.1 m^2 .

A



$y = \frac{12}{x}$ is a hyperbola.
 x cannot be equal to 0.

B

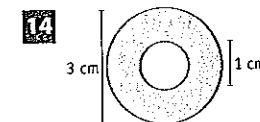
12 $I = Prn$
 $= \$24\,000 \times 0.06 \times 5$
 $= \$7200$
 Total to repay = $\$24\,000 + \7200
 $= \$31\,200$
 Each instalment = $\$31\,200 \div 60$
 $= \$520$

A



C shows weak negative correlation.

C



$$A = \pi(R^2 - r^2)$$

$$= \pi \times (1.5^2 - 0.5^2)$$

$$= 6.283185\dots$$

$$V = Ah$$

$$= 6.283185\dots \times 0.5$$

$$= 3.14159\dots$$

$$= 3.1 \text{ (1 d.p.)}$$

The volume is 3.1 cm^3

A

15 $4(x-1) - 3(x-2) = 4x - 4 - 3x + 6$
 $= x + 2$

A

16 9.3×10^{-7} , 3.2×10^{-5} , 6×10^{-5}
 [As decimals expressed with the same number of digits, the numbers are 0.00000093, 0.00003200 and 0.00006000]

B

17 $M = \$350$, $r = 0.015$, $n = 20$

$$N = M \left[\frac{(1+r)^n - 1}{r(1+r)^n} \right]$$

$$= \$350 \left[\frac{(1.015)^{20} - 1}{0.015(1.015)^{20}} \right]$$

$$= \$6009 \text{ (nearest dollar)}$$

A

18		Detected true	Detected false
	True statement	84	16
	False statement	36	124

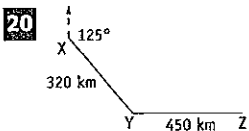
Number correctly detected = $84 + 124$
 $= 208$

Total statements = $208 + 16 + 36$
 $= 260$

$P(\text{correctly detected}) = \frac{208}{260}$
 $= \frac{4}{5}$ C

19 $A = \$7600(1.00048)^{25}$
 $= \$7691.73$ (nearest cent)

Interest = $\$7691.73 - \7600
 $= \$91.73$ A



The correct diagram is C. C

21 $V = \frac{1}{3}\pi r^2 h$
 $3V = \pi r^2 h$
 $r^2 = \frac{3V}{\pi h}$
 $r = \sqrt{\frac{3V}{\pi h}}$ ($r > 0$) A

22 40 is two standard deviations below the mean.
 76 is one standard deviation above the mean.
 68% of scores lie within one standard deviation of the mean.
 95% of scores lie within two standard deviations.
 $95\% - 68\% = 27\%$ lie between 1 and 2 standard deviations.
 Percentage = $68\% + \frac{1}{2}$ of 27%
 $= 81.5\%$ C

23 a

Period (years)	Repayments per \$1000 borrowed		
	Interest rate		
	6%	7.5%	9%
7	\$14.61	\$15.34	\$16.09
12	\$9.76	\$10.55	\$11.38
15	\$8.44	\$9.27	\$10.14
25	\$6.44	\$7.39	\$8.39

i 12 years at 6%
 Repayments = $70 \times \$9.76$
 $= \$683.20$ ✓

ii 25 years at 9%
 Repayments = $110 \times \$8.39$
 $= \$922.90$ ✓

Total paid = $\$922.90 \times 25 \times 12$
 $= \$276\,870$

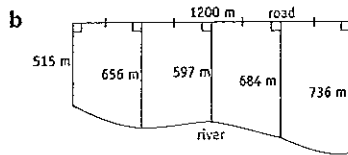
Interest = $\$276\,870 - \$110\,000$
 $= \$166\,870$ ✓

iii 7 years at 7.5%
 Repayments = \$15.34 per \$1000
 $\$613.60 \div \$15.34 = 40$
 Brock borrowed \$40 000 ✓

iv At 7.5%:
 Repayments = $87 \times \$9.27$
 $= \$806.49$

At 9%:
 Repayments = $87 \times \$10.14$
 $= \$882.18$

Extra repayments
 $= \$882.18 - \806.49
 $= \$75.69$ ✓



i $h = 1200 \div 4$
 $= 300$

$A \approx \frac{h}{3}(d_f + 4d_m + d_1)$
 $= \frac{300}{3}(515 + 4 \times 656 + 597)$
 $+ \frac{300}{3}(597 + 4 \times 684 + 736)$ ✓
 $= 780\,500$

Area $\approx 780\,500 \text{ m}^2$
 $= 78.05 \text{ ha}$ ✓

ii $h = 1206 \div 4$
 $= 301.5$

Actual area = $(780\,500 \div 300) \times 301.5$
 $= 784\,402.5$ ✓

Difference = $784\,402.5 - 780\,500$
 $= 3902.5$

The difference is 3902.5 m². ✓
 [Or: Use Simpson's rule again with the different measurement.]

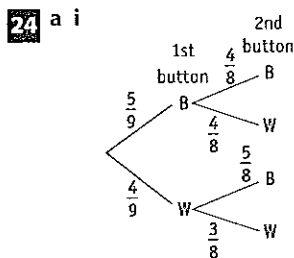
c

X	Y
9 3	4 6
7 7 2 0	5 1 4 8
9 8 5 4 1	6 0 3 5 6
8 6 5 3 2	7 1 2 4 7 8
9 6 5 3	8 2 4 4 7 9 9
4 1	9 0 3 5

i X: range = $94 - 43$
 $= 51$ ✓

ii Y: median = $\frac{74 + 77}{2}$
 $= 75.5$ ✓

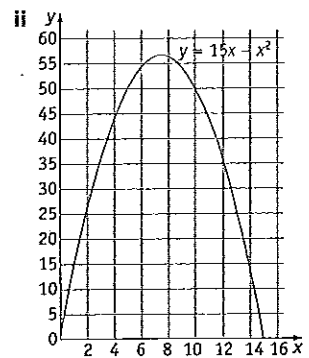
iii Class Y did better than class X with more higher scores and a higher median. ✓
 The results in class X are symmetrical but those in Y are skewed. ✓



ii $P(\text{same colour}) = P(\text{BB}) + P(\text{WW})$
 $= \frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{3}{8}$ ✓
 $= \frac{4}{9}$ ✓

b i $y = 15x - x^2$

x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
y	0	14	26	36	44	50	54	56	54	50	44	36	26	14	0	0



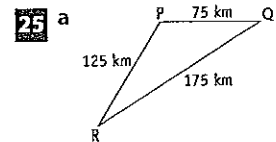
iii y is a maximum when $x = 7.5$. The graph is symmetrical. The maximum will be in the middle of $x = 7$ and $x = 8$. ✓

iv When $x = 7.5$,
 $y = 15 \times 7.5 - 7.5^2$
 $= 56.25$
 The maximum value of y is 56.25. ✓

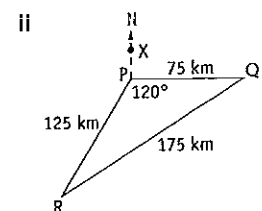
c i Alison's raw score is $1\frac{1}{2}$ times the standard deviation above the mean. ✓

ii Difference in scores = $156 - 142$
 $= 14$ ✓

$14 = 1.5s$
 $s = 14 \div 1.5$
 $= 9.3333 \dots$
 The standard deviation is $9\frac{1}{3}$. ✓



i $\cos P = \frac{q^2 + r^2 - p^2}{2qr}$
 $= \frac{125^2 + 75^2 - 175^2}{2 \times 125 \times 75}$ ✓
 $= -0.5$
 $P = 120^\circ$ ✓



Let X be a point due north of P .
 P is due west of Q . $\angle XPQ = 90^\circ$
 Reflex angle $XPR = 90^\circ + 120^\circ$
 $= 210^\circ$
 The bearing of R from P is 210° . ✓

b i $V_0 = \$56\,000$, $r = 0.08$, $n = 5$
 $S = V_0(1-r)^n$
 $= \$56\,000(1-0.08)^5$
 $= \$36\,908.5653 \dots$
 $= \$36\,900$ (nearest \$100) ✓

ii $\$20\,000 = \$56\,000(0.92)^n$ ✓
 $n = 13$ [by calculator]
 The tractor will fall below \$20 000 after 13 years. ✓

c i Possible arrangements
 $= 26 \times 26 \times 10 \times 10 \times 26 \times 26$
 $= 45\,697\,600$ ✓

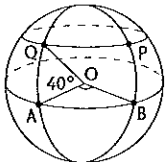
ii There are 26 possibilities for the repeated letter.
 For each of these, there are 100 possibilities for the two numbers (10×10). ✓
 Number of arrangements = 26×100
 $= 2600$ ✓

d i $B = kl^2$
 When $l = 30$, $B = 1000$
 $1000 = k \times 30^2$
 $= 900k$
 $k = \frac{1000}{900}$
 $= \frac{10}{9}$ ✓
 $B = \frac{10}{9}l^2$

When $l = 60$,
 $B = \frac{10}{9} \times 60^2$
 $= 4000$ ✓
 There will be 4000 beads.

ii $B = \frac{10}{9}l^2$
 When $B = 6250$
 $6250 = \frac{10}{9}l^2$
 $l^2 = 6250 \div \frac{10}{9}$
 $= 5625$
 $l = \sqrt{5625}$ ($l > 0$)
 $= 75$
 The skirt is 75 cm long. ✓

26 a



- i Longitude of A is 20°W .
 $\angle AOB = 90^\circ$
 Longitude of B is 70°E . ✓
- ii $P(40^\circ\text{N}, 70^\circ\text{E})$ ✓✓

iii $l = \frac{\theta}{360} 2\pi r$
 $= \frac{90}{360} \times 2 \times \pi \times 6400$
 $= 10\,053.096\,49 \dots$

The distance from A to B is approximately 10 050 km. ✓

iv Angular difference from P to B = 40°
 Approximate distance
 $= 40 \times 60$ nautical miles
 $= 2400$ M ✓
 Plane flies at 500 knots
 Time = $(2400 \div 500)$ hours
 $= 4.8$ hours
 $= 4$ hours and 48 min ✓

b i $M = \$500$, $r = 0.02$, $n = 24$
 $A = M \left[\frac{(1+r)^n - 1}{r} \right]$
 $= \$500 \left[\frac{(1.02)^{24} - 1}{0.02} \right]$ ✓
 $= \$15\,211$ (nearest dollar) ✓

ii $N = \frac{A}{(1+r)^n}$
 $= \frac{\$15\,211}{(1.02)^{24}}$ ✓
 $= \$9457$ (nearest dollar) ✓

c i $F = \frac{kQq}{r^2}$
 $Fr^2 = kQq$
 $r^2 = \frac{kQq}{F}$
 $r = \sqrt{\frac{kQq}{F}}$ ($r > 0$) ✓

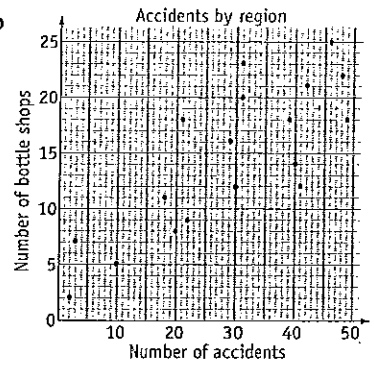
ii If $k = 9 \times 10^9$, $Q = 4 \times 10^{-12}$,
 $q = 1.2 \times 10^{-10}$ and $F = 2.7 \times 10^{-11}$,
 $r = \sqrt{\frac{9 \times 10^9 \times 4 \times 10^{-12} \times 1.2 \times 10^{-10}}{2.7 \times 10^{-11}}}$ ✓
 $= 0.4$ ✓

27 a i

$N = \$160\,000$, $r = 0.006$, $n = 240$
 $N = M \left[\frac{(1+r)^n - 1}{r(1+r)^n} \right]$
 $\$160\,000 = M \left[\frac{(1.006)^{240} - 1}{0.006(1.006)^{240}} \right]$ ✓
 $\$160\,000 = M \times 127.008\,4321 \dots$ ✓
 $M = \$160\,000$
 $+ 127.008\,4321 \dots$
 $= \$1259.76$ (nearest cent) ✓

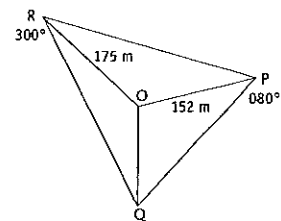
ii Total paid each month
 $= \$1259.76 + \15
 $= \$1274.76$
 Total repaid = $\$1274.76 \times 240$
 $= \$305\,942.40$ ✓
 Total charges
 $= \$305\,942.20 - \$160\,000$
 $= \$145\,942.40$ ✓

b



- i 31 accidents occurred in the region that has 20 bottle shops. ✓
- ii There is moderately strong positive correlation. ✓
- iii The bottle shops don't cause the accidents. ✓
 It might be, for example, that there are more bottle shops and more accidents in regions with higher populations. ✓

c i



Q is due south of O.
 The bearing of Q from O is 180° . ✓

- ii $\angle ROP = (360 - 300)^\circ + 80^\circ$
 $= 140^\circ$ ✓
- iii Let x m be the length of RP.
 By the cosine rule:
 $x^2 = 175^2 + 152^2 - 2 \times 175 \times 152$
 $\times \cos 140^\circ$ ✓
 $= 94\,482.56437 \dots$
 $x = 307.380\,1626 \dots$ ($x > 0$)
 The length of the boundary RP is 307 m, to the nearest metre. ✓

28 a

$\sqrt{3x+4} = 5$
 $3x+4 = 25$
 $3x = 21$
 $x = 7$ ✓

b i Types = $3 \times 2 \times 2$
 $= 12$ ✓

ii Three different tickets without black
 $P(\text{ticket without black}) = \frac{3}{12}$
 $= \frac{1}{4}$ ✓
 Expected number = $\frac{1}{4} \times 60$
 $= 15$ ✓

c i $(1.08)^n = 2$
 $1.08^n = 1.999\,004\,627 \dots$
 $n = 9$ ✓

ii $A = P(1 + r)^n$
 $= \$5000(1.08)^n$
 It will double in value when
 $(1.08)^n = 2$
 i.e. in nine years. ✓

iii The money doubles every nine years.
 $\$5000$ doubles 5 times to produce $\$160\,000$
 It will take $9 \times 5 = 45$ years for the amount to be worth approximately $\$160\,000$. ✓
 [Or: use the estimation and refinement technique again.]

d i $\bar{x} = 152$ [by calculator] ✓

ii $\sigma_{n-1} = 2.003\,352\,894 \dots$
 $= 2.00$ (2 d.p.) ✓

iii Number of packets = $4 + 1$
 $= 5$
 Percentage of packets = $\frac{5}{150} \times 100\%$
 $= 3\frac{1}{3}\%$ ✓

iv 150 is one standard deviation below the mean. ✓
 68% are within 1 standard deviation of the mean.
 Percentage outside of 1 standard deviation = $100\% - 68\%$
 $= 32\%$
 Half of these are below 150.
 16% of packets will have less than 150 toothpicks. ✓