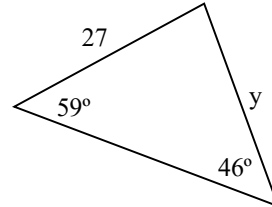


**Section I****22 marks**

**Section I is multiple choice and each question is worth 1 mark. Select the alternative A, B, C or D that best answers the question.**

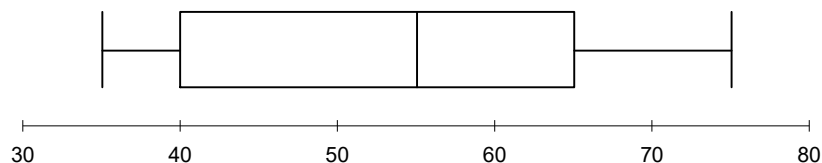
1. In the triangle shown the side marked y is given by the expression:

(A)  $\frac{27 \sin 46^\circ}{\sin 59^\circ}$       (B)  $\frac{27 \sin 59^\circ}{\sin 46^\circ}$   
(C)  $27 \sin 46^\circ$       (D)  $27 \sin 59^\circ$



2. A multinational company has decided to make an important announcement at midday, Greenwich Mean Time. What time will this be in New York 40°N, 75°W.
- (A) midday    (B) 7.00am    (C) 5.00pm    (D) 7.30pm
3. The position of two towns L and M are: L (12°S, 80°W) and M (26°N, 80°W). What is the angular difference in latitude between the two towns?
- (A) 38°      (B) 14°      (C) 68°      (D) 54°
4. A car travels 380km on 32L of petrol. Its average petrol consumption is closest to:
- (A) 0.08 km/L      (B) 8 km/L      (C) 8.4 L/100km      (D) 11.8 L/100km
5. A cleaning solution is mixed 1 part concentrate to 10 parts of water. To make up 20 litres of solution, we would need:
- (A) 2000 mL of concentrate      (B) 1818 mL of concentrate  
(C) 18 litres of water      (D) 22 litres of water

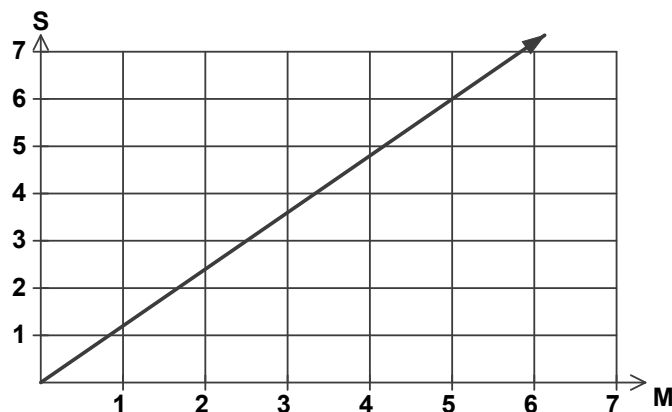
6. In the Australian population, 31% of people have Type A blood. If there are 3.1 million people in Sydney, the number with Type A blood is closest to:
- (A) 100 000                      (B) 1 million                      (C) 961 000                      (D) 96 100
7. The weight of boys at Newington College were measured and recorded. The data would be:
- (A) quantitative discrete                      (B) quantitative continuous
- (C) qualitative categorical                      (D) categorical and quantitative
8. In the stem and leaf plot shown, the missing number could be:
- (A) 2                                              5 | 0 3 7  
(B) 1 or 2                                      6 | 0 1 1 5 6  
(C) 2 or 3                                      7 | 0 1                      3 4 4 5  
(D) 1, 2 or 3                                      8 | 1 1 2 3
9. The average number of people attending each of the last four lectures was 20. In order to raise this average to 30, how many people must attend the next lecture?
- (A) 110                      (B) 25                      (C) 50                      (D) 70
10. The results of a test are displayed in a box and whisker plot.



Which of the following statements is false?

- (A) 50% of the scores lie between 40 and 65  
(B) 50% of the scores are above 55  
(C) 25% of the scores are below 40  
(D) 95% of the scores are below 65

11. A steel manufacturer makes a batch of steel rods to a length of 65cm. The standard deviation of a large sample was found to be 0.6cm. In a batch of 5000 rods, how many would you expect to have a length less than 64.4cm?
- (A) 1600                      (B) 1000                      (C) 800                      (D) 500
12. Before tax a person earns \$485 for working a week that included 36 hours at normal time and 2 hours overtime at time-and-a-half. The hourly wage rate was:
- (A) \$13.47                      (B) \$12.76                      (C) \$12.44                      (D) \$12.13
13. A diamond ring cost \$2000 in 1985. If its value increased by 2.7%p.a., its value 20 years later would be found by calculating:
- (A)  $$(2000 \times 1.27 \times 20)$                       (B)  $$(0.027 \times 2000)^{20}$   
(C)  $$(1.027)^{20} \times 2000$                       (D)  $$2000 \times (0.0127)^{20}$
14. Mitchell spent \$220 on clothes using his credit card. He is charged 23% p.a. with interest compounded daily. After 30 days, he will owe:
- (A) \$389                      (B) \$227                      (C) \$270.60                      (D) \$224.20
15. A flat tax rate is added to the marked price (M) of goods, to give the selling price (S), as shown in the graph.



The tax rate is:

- (A) 45%                      (B) 1.2%                      (C) 60%                      (D) 20%

16. If  $y = 5 - 2x$ , the value of  $x$  when  $y = 6$  is:
- (A) 1                      (B) -1                      (C) 0.5                      (D) -0.5
17. M varies directly as P. If  $M = 24$  when  $P = 10$ , then when  $P = 25$ ,  $M = ?$
- (A) 9.6                      (B) 60                      (C) 2.4                      (D) 10.4
18. If  $V = \frac{2\pi r}{t}$  then:
- (A)  $r = \frac{tV\pi}{2}$                       (B)  $Vt - 2\pi = r$                       (C)  $t = \frac{2\pi V}{r}$                       (D)  $t = \frac{2\pi r}{V}$
19. Expand and simplify the following  $3x^2(x^2 - 1) - 4x^2$
- (A)  $-4x^2$                       (B)  $3x^4 + 7x^2$                       (C)  $3x^4 - 7x^2$                       (D)  $10x^2$
20. In how many different ways can the letters of the word MATH be arranged in a line?
- (A) 3                      (B) 6                      (C) 12                      (D) 24
21. Angela is going to choose three names from eight out of a hat and arrange them in order from left to right. How many different arrangements can she make?
- (A) 336                      (B) 56                      (C) 60                      (D) 10
22. A raffle has 8 tickets numbered 1 to 8 and 8 prizes. The tickets are drawn one at a time without replacement. The probability that the tickets will be drawn in the order 1, 2, 3, 4, 5, 6, 7, 8 is:
- (A)  $\frac{1}{8!}$                       (B)  $8 \times \frac{1}{8}$                       (C)  $\frac{1}{8}$                       (D)  $\left(\frac{1}{8}\right)^8$

**Section II**

**Section II is extended response, show all necessary working. The marks for each question in Section II are indicated at the start of the question.**

| <b>Question 23</b> | <b>(13 marks)</b>                                                                                                                                                                                                                                            | <b>Marks</b> |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| (a)                | Elise borrowed \$18 000 to buy equipment she needed to start up a new fashion business. The finance company charged her 8% p.a. flat rate interest on the loan. Elise was required to repay the loan plus interest in equal monthly repayments over 3 years. |              |
| (i)                | Altogether how much interest does Elise have to pay on her 3 year loan?                                                                                                                                                                                      | 2            |
| (ii)               | Calculate the size of Elise's monthly repayments.                                                                                                                                                                                                            | 2            |
| (b)                | A single income family has saved \$24 000 towards the cost of a home unit which they are able to purchase for \$110 000.                                                                                                                                     |              |
| (i)                | How much will they have to borrow?                                                                                                                                                                                                                           | 1            |
| (ii)               | The interest rate on the loan is 7.30% p.a. and they are advised to take the loan over 25 years. How much will each monthly instalment be?                                                                                                                   | 2            |
| (iii)              | How much money will have been paid in instalments after one year?                                                                                                                                                                                            | 1            |
| (c)                | The main cash register at 'The Big E Burger Complex' cost \$6200. The company's accountant plans to calculate the straight line depreciation on the register at 6% p.a.                                                                                      |              |
| (i)                | Calculate the decrease in value of the cash register at the end of year 1.                                                                                                                                                                                   | 1            |
| (ii)               | What will be the salvage value of the cash register after 4 years?                                                                                                                                                                                           | 2            |
| (iii)              | The company policy is to scrap the cash register when its salvage value drops below \$2150. How many years will it take for the salvage value of the register to drop below \$2150?                                                                          | 2            |

**Question 24** (13 marks) **Start this question on a new page.**

- (a) This graph shows the salvage value of the stove and grill at ‘The Rib Cage Café’, using straight line depreciation.



- |       |                                                                                                                                          |   |
|-------|------------------------------------------------------------------------------------------------------------------------------------------|---|
| (i)   | What was the original value of the stove & grill?                                                                                        | 1 |
| (ii)  | By what amount did the owners of the Café decide to decrease the value of the stove & grill each year?                                   | 1 |
| (iii) | When the salvage value reaches \$1400 the owner plans to buy a new stove & grill. After how many years will the salvage value be \$1400? | 1 |
| (iv)  | What is the gradient of the line of depreciation?                                                                                        | 2 |
| (v)   | What is the equation of the straight line depreciation graph?                                                                            | 2 |

**Question 24 continued****Marks**

- (b) The cost per student for an excursion is inversely proportional to the number of students taking the trip. When 16 people go on the excursion, the cost per student is \$12.

- (i) Show that  $C = \frac{192}{n}$  where \$C\$ is the cost per student and  $n$  the number of students taking the excursion. **1**

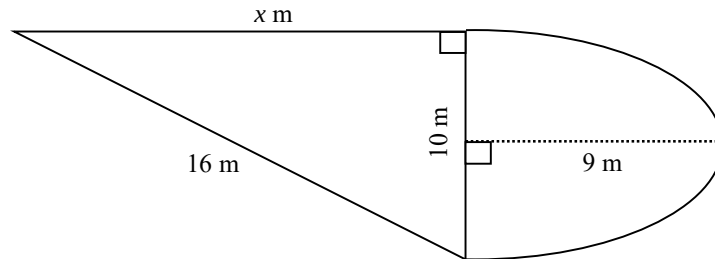
- (ii) Copy and complete the table of values in your exam booklet for the equation  $C = \frac{192}{n}$ . **1**

|     |   |   |    |    |
|-----|---|---|----|----|
| $n$ | 4 | 8 | 12 | 16 |
| $C$ |   |   |    |    |

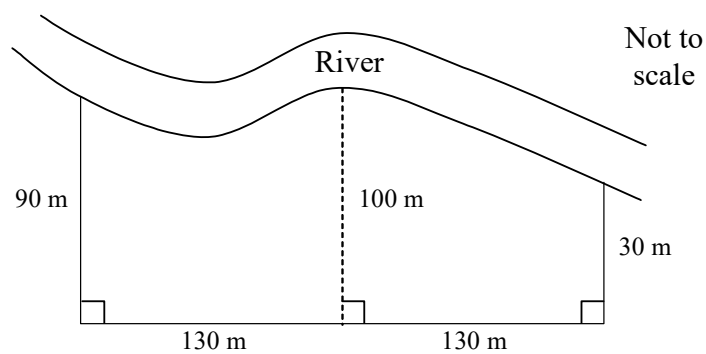
- (iii) On half a page in your exam booklet, draw the graph of  $C = \frac{192}{n}$ , where  $n > 0$ . **2**
- (c) State the y-intercept of the straight line  $\frac{x+y}{2} = 5$ . **2**

**Question 25** (13 marks)**Start this question on a new page.****Marks**

- (a) Dirk and Marnie have just finished building an outdoor recreation patio. It consists of a right angle triangle and a curved section in the shape of half an ellipse.

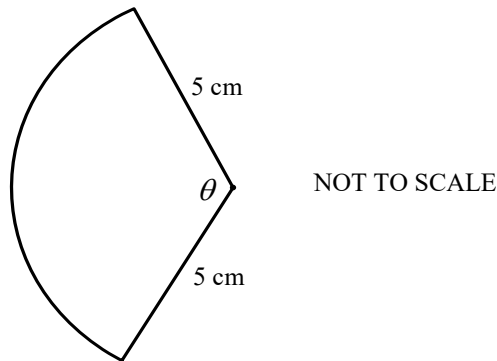


- (i) Calculate the value of  $x$ , correct to 1 decimal place. 2
- (ii) Find the total area of the recreational patio. Answer correct to the nearest square metre. 2
- (b) Three straight sides and a river, as shown, border a field. Use one application of Simpson's Rule to calculate the area. Give your to the nearest square metre. 2

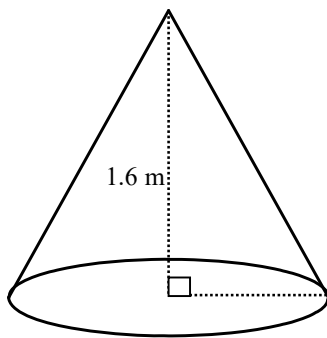


**Question 25 continued****Marks**

- (c) If the area of this sector is  $8.5 \text{ cm}^2$ , find  $\theta$  correct to the nearest minute. **3**



- (d) A load of sand delivered from a lorry falls in the shape of a cone as shown in the diagram below. The base of the cone is a circle with circumference 6.4 metres.



- (i) Show that the radius of the base circle is 1.02m (to 3 significant figures) **2**
- (ii) Calculate the volume of sand in the cone to 3 significant figures **2**

**Question 26 (13 marks) Start this question on a new page.****Marks**

- (a) The coach kept a record of the number of goals scored by each player during yesterday's water polo training session. The results are shown below.

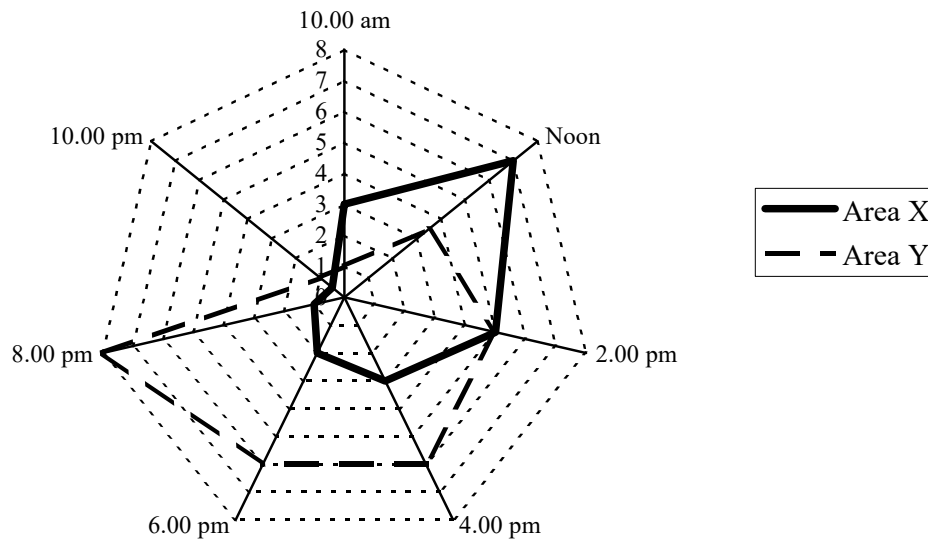
4, 5, 5, 7, 8, 10, 11, 15, 16

- (i) Sketch a box and whiskers plot to display this data. **2**
- (ii) What is the mode of this data? **1**
- (iii) Is the data symmetrical, positively skewed or negatively skewed? Give a reason for your answer. **2**

**Question 26 continued****Marks**

- (b) Seal Bay, a small beach side town, always has two celebrations on Australia Day, one in area X and one in area Y. To help plan their Australia Day work rosters, the local police are using this graph of last year's crowd numbers and times.

**Last year's crowd numbers at Seal Bay Australia Day celebrations  
(hundreds of people)**



- (i) At 4.00 pm, how many people were in area X? **1**
- (ii) At what time did both area X and area Y have the same crowd numbers? **1**
- (iii) One of the areas hosts a beach BBQ and the other a fireworks display in the park. Which area, area X or area Y, do you think hosts the fireworks display? Give a reason for your answer. **2**

**Question 26 continued****Marks**

- (c) This table shows the hours of employment of the working population of Golden Grove.

|                | <i>Men</i> | <i>Women</i> | <i>Total</i> |
|----------------|------------|--------------|--------------|
| Shift work     | 780        | 210          | 990          |
| Standard hours | 420        | 540          | 960          |
| Total          | 1200       | 750          | 1950         |

- (i) What is the ratio of men working standard hours to women working shift work? Answer in simplest form. **2**
- (ii) What percentage of the women are shift workers? **2**

**Question 27 (13 marks) Start this question on a new page.**

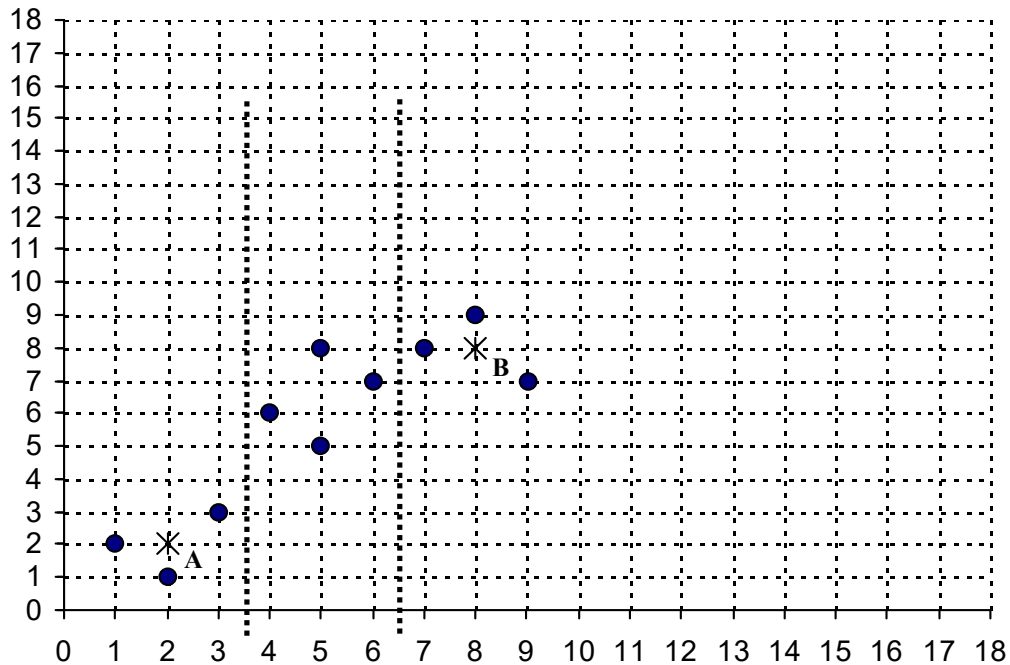
- (a) This table shows Anna's marks in the Trial HSC in History and English.

|         | <i>Anna's Mark</i> | <i>The group's mean</i> | <i>The group's standard deviation</i> |
|---------|--------------------|-------------------------|---------------------------------------|
| History | 70                 | 58                      | 12                                    |
| English | 80                 | 65                      | 10                                    |

- By giving reasons, and showing full working using z-scores, explain clearly in which subject was Anna's marks the best, compared with the rest of the group. **3**
- (b) Joseph works as a quality control engineer in a factory which packs paper clips. In a quality control check Joseph counted the number of paper clips packed in a sample of boxes. He found the mean number of paper clips per box was 102 and the standard deviation was 3.
- (i) What percentage of boxes contained between 99 and 105 clips? **1**
- (ii) What percentage of boxes contained more than 105 clips? **1**
- (iii) When Joseph counted the contents of a box and recorded it as 116 he thought he had made a mistake. Do you think he made an error? Explain your answer **2**

**Question 27 continued****Marks**

- (c) This graph shows 10 points on a scatter plot. The points have been divided into lower, middle and upper sections.



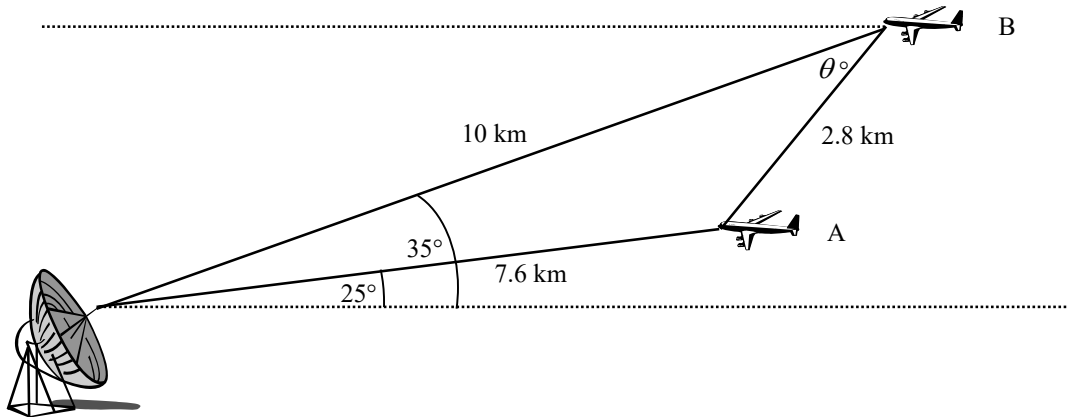
Kevin is going to construct a median regression line using these points. Kevin calculates the points A and B as shown in the diagram above.

- (i) What are the coordinates of the corresponding point C in the middle section? 2
- (ii) The equation of the median regression line is approximated by 1
- $$y = x + \frac{1}{2}$$
- Use the equation to predict the value of  $x$  when  $y = 4$ .
- (d) Mark had a combination lock on his suitcase which has 3 wheels each with 10 digits 0 to 9.
- (i) How many three digit numbers are possible? 2
- (ii) If it took on average 4 seconds to get each possible 3 digit number, how long would it take to get all possible combinations? Give your answer in hours, minutes and seconds. 1

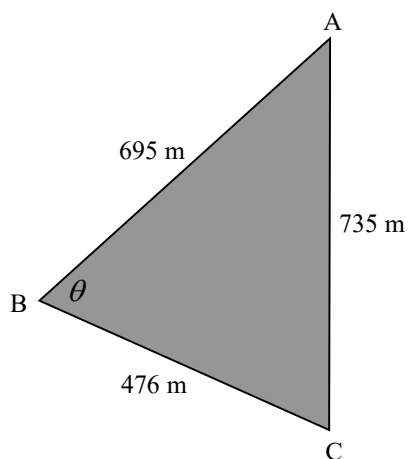


**Question 28 continued****Marks**

- (c) Two aeroplanes are approaching an airport as shown. At the time shown in the diagram, the radar identifies one plane (A) at an angle of elevation of  $25^\circ$  and 7.6 km from the airport. Another plane (B) on the same approach path is 10 km away at an angle of  $35^\circ$  from horizontal. Plane A and Plane B are 2.8 km apart.



- (i) What is the angle of depression of the radar disc from Plane B? **1**
- (ii) What is the angle of depression of Plane A from Plane B? **2**  
 Answer to the nearest degree.  
 (HINT: Find the angle marked  $\theta$  in the diagram first)
- (d) A triangular farm allotment was surveyed and the measurements were found to be as shown on the diagram (not to scale).



- (i) Find the size of  $\angle ABC$ . **2**  
 (nearest degree)
- (ii) Find the area of the allotment, to the nearest hectare. **3**

End of Paper.

**YEAR 12 GENERAL  
TRIAL SOLUTIONS 2005**

**SECTION I**

- |      |       |       |       |       |
|------|-------|-------|-------|-------|
| 1. B | 6. C  | 11. C | 16. D | 21. A |
| 2. A | 7. B  | 12. C | 17. B | 22. A |
| 3. A | 8. D  | 13. C | 18. D |       |
| 4. C | 9. D  | 14. D | 19. C |       |
| 5. B | 10. D | 15. D | 20. D |       |

**SECTION II**

**QUESTION 23**

- a) i)  $I = Prn$  (1)  
 $\therefore I = \$18000 \times 0.08 \times 3$   
 $I = \$4320$  (1)
- (ii) Total Repaid:  $\$18\,000 + \$4320$   
 $= \$22\,320$  (1)  
 Monthly Repayment  $= \$22\,320 \div 36$   
 $= \$620$  (1)
- b) i) Amount Borrowed  $= \$110\,000 - \$24\,000$   
 $= \$86\,000$  (1)
- ii)  $n = 300$  ( $25 \times 12$ )  
 $I = 0.608\dot{3}$  ( $7.3 \div 12$ ) (1)  
 $PV = \$86\,000$   
 $PMT = 0$   
 $FV = 0$   
 $\therefore$  We find  $PMT = \$624.39$  (1)
- (iii) After 1 year:  $\$624.39 \times 12$   
 $= \$7492.68$  (1)
- c) i)  $6\% \times \$6200$   
 $= \$372$  (1)
- ii)  $S = Vo - Dn$   
 $= \$6200 - \$372 \times 4$  (1)  
 $= \$4712$  (1)
- iii)  $S = Vo - Dn$   
 $\$2150 = \$6200 - \$372n$  (1)  
 $\$372n = \$4050$   
 $n = \$4050 \div \$372$   
 $n = 10.89$   
 $\therefore$  It will take about 11 years (1)

**QUESTION 24**

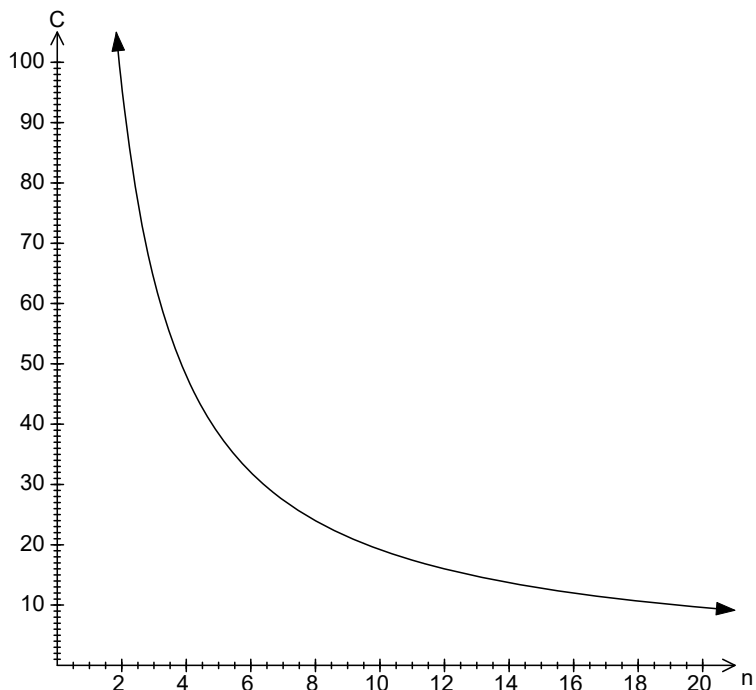
- a) i)  $\$4200$  (1)
- ii)  $\$400$  (1)
- iii) 7 years (1)
- iv) Gradient  $= -400$  (2) 1 mark for  $-400x$
- v)  $S = -400n + 4200$  (2) 1 mark for  $y = -400x$   
 OR  
 $y = -400x + 4200$
- b) i)  $C = \frac{k}{n}$   
 $12 = \frac{k}{16}$   
 $k = 192$  (1)
- $\therefore C = \frac{192}{n}$

### QUESTION 24 cont.

b) ii) (1)

|     |    |    |    |    |
|-----|----|----|----|----|
| $n$ | 4  | 8  | 12 | 16 |
| $C$ | 48 | 24 | 16 | 12 |

iii) (2)



c)  $\frac{x+y}{2} = 5$

$x + y = 10$  (1)

$y = -x + 10$

$\therefore$  y-int = (0, 10) (1) Accept  $y = 10$  OR y-int = 10

### QUESTION 25

a) i)  $16^2 = x^2 + 10^2$  (1)

$x = \sqrt{16^2 - 10^2}$

$x = 12.5$  m (1)

ii)  $A = \frac{1}{2} \times 10 \times 12.5 + \frac{1}{2} \times \pi \times 9 \times 5$  (1)

$A = 133.1858 \dots$

$A = 133$  m<sup>2</sup> (1)

b)  $A = \frac{h}{3}(d_1 + 4d_2 + d_3)$

$A = \frac{130}{3}(90 + 4 \times 100 + 30)$  (1)

$A = 22\,533\frac{1}{3}$

$A = 22\,533$  m<sup>2</sup> (1)

c)  $A = \frac{\theta}{360} \times \pi r^2$

$8.5 = \frac{\theta}{360} \times \pi \times 5^2$  (1)

$\frac{\theta}{360} = \frac{8.5}{\pi \times 5^2}$

$\theta = 360 \left( \frac{8.5}{\pi \times 5^2} \right)$

$\theta = 38.96113007$  (1)

$\theta = 38^\circ 58'$  (1)

**QUESTION 25 cont.**

d) i)  $C = 2\pi r$

$$6.4 = 2 \times \pi \times r \quad (1)$$

$$r = \frac{6.4}{2\pi}$$

$$r = 1.018591636$$

$$r = 1.02 \text{ m} \quad (1)$$

ii)  $V = \frac{1}{3}\pi r^2 h$

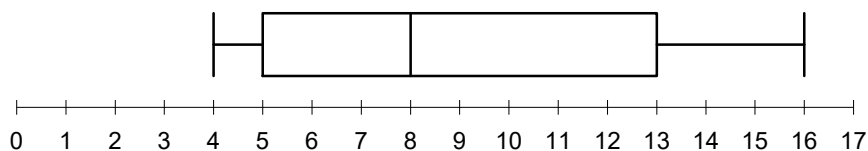
$$V = \frac{1}{3} \times \pi \times 1.02^2 \times 1.6 \quad (1)$$

$$V = 1.74 \text{ m}^3 \quad (1)$$

**QUESTION 26**

**Boxplot for Data**

a) i)



**(2)** 1 mark  
if no scale  
shown

ii) Mode = 5 **(1)**

iii) Positively skewed as the median **(2)**  
is closer to lower quartile than upper  
quartile.

b) i) 300 people **(1)**

ii) 2.00 pm **(1)**

iii) Area Y as it drew a large crowd at 8.00 pm in the evening for a major event. **(2)** 1 mark if  
Area Y only

c) i) 420 : 210 **(1)**

$$= 2 : 1 \quad (1)$$

ii)  $\frac{210}{750} \times 100 \quad (1)$

$$= 28\% \quad (1)$$

## QUESTION 27

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

$$\text{History} \quad z = \frac{70 - 58}{12}$$

$$z = \frac{12}{12}$$

$$z = 1 \quad (1)$$

$$\text{English} \quad z = \frac{80 - 65}{10}$$

$$z = \frac{15}{10}$$

$$z = 1.5 \quad (1)$$

∴ Anna's result in English is better as her z-score is higher. (1)

$$b) i) 68\% \quad (1)$$

$$ii) 16\% \quad (1)$$

iii) Yes he made an error. The value 116 is more than 3 standard deviations above the mean. The chance of this score occurring is only 0.15%. It is therefore an outlier. {(2) Give full marks only if they realise it is outside three S.D.}

$$c) i) C(5, 6.5) \quad (2)$$

1 mark for correct x-value

1 mark for correct y-value

$$ii) y = x + \frac{1}{2}$$

$$4 = x + \frac{1}{2}$$

$$x = 3\frac{1}{2} \quad (1)$$

$$d) i) 10 \times 10 \times 10 \quad (1)$$

$$= 1000 \quad (1)$$

(1 mark for  $10 \times 9 \times 8$ )

$$ii) 1000 \times 4 = 4000 \text{ seconds}$$

$$4000 \div 60 \div 60$$

$$= 1 \text{ hour } 6 \text{ min } 40 \text{ sec} \quad (1)$$

## QUESTION 28

$$a) \sin 3^\circ = \frac{150}{d} \quad (1)$$

$$d = \frac{150}{\sin 3^\circ}$$

$$d = 2866.1 \text{ m OR } 2.9 \text{ km} \quad (1)$$

$$b) i) \angle AOB = 215^\circ - 85^\circ$$

$$\angle AOB = 130^\circ \quad (1)$$

$$ii) AB^2 = 110^2 + 82^2 - 2 \times 110 \times 82 \times \cos 130^\circ \quad (1)$$

$$AB = 174.4129825$$

$$AB = 174 \text{ m} \quad (1)$$

$$c) i) \text{Angle of Depression} = 35^\circ \quad (1)$$

$$d) i) \cos \theta = \frac{695^2 + 476^2 - 735^2}{2 \times 695 \times 476} \quad (1)$$

$$\theta = 75^\circ \quad (1)$$

$$ii) \frac{\sin \theta}{7.6} = \frac{\sin 10^\circ}{2.8} \quad (1)$$

$$\sin \theta = \frac{7.6 \times \sin 10^\circ}{2.8}$$

$$\theta = 28^\circ$$

$$\therefore \text{Angle of Depression} = 28^\circ + 35^\circ = 63^\circ \quad (1)$$

$$ii) A = \frac{1}{2} \times 695 \times 476 \times \sin 75^\circ \quad (1)$$

$$A = 159773.7909 \text{ m}^2 \quad (1)$$

$$\div 10000$$

$$\therefore 15.977 \text{ hectares} = 16 \text{ hectares} \quad (1)$$