

Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

**STRATHFIELD GIRLS HIGH  
SCHOOL**

**2008  
TRIAL HSC  
EXAMINATION**

# General Mathematics

## General Instructions

- Reading time – 5 minutes
- Working time – 2 ½ hours
- Start each question on a new page.
- All necessary working should be shown in every question.
- Full marks may not be awarded for careless or badly arranged work.
- Approved calculators may be used.
- A formula sheet is provided
- Write your name and teacher's name at the top of each page.

## Exam Requirements

- 1 examination paper
- 10 sheets of writing paper
- 1 formula sheet
- Multiple Choice Answer Sheet to be detached from back of exam
- 2 appendices to hand in

**Total marks - 100**

**Section I** Pages 2-8

**22 marks**

- Attempt questions 1-22
- Allow about 30 minutes for this section

**Section II** Pages 9-22

**78 marks**

- Attempt all questions 23-28
- Allow about 2 hours for this section

**Section I (22 marks) Answer on Multiple Choice Sheet**

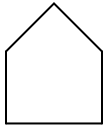
1. In a game of cricket, Jamie can bowl at an average speed of 96 km/hr. This speed in m/s is closest to:
- (A) 2.6 m/s
  - (B) 26.7 m/s
  - (C) 248.4 m/s
  - (D) 1600 m/s
2. Two cylindrical batteries below are similar in shape and have radius in the ratio 2:1



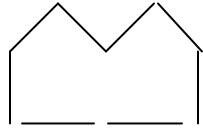
What is the ratio of the volumes of the batteries?

- (A) 2:1
  - (B) 4:1
  - (C) 6:1
  - (D) 8:1
3. Which of the following is equivalent to  $27x^6$
- (A)  $3^3(x^7 - x)$
  - (B)  $(3x^2)^3$
  - (C)  $\frac{27x^3}{x^2}$
  - (D)  $(9x^2)^3$
4. Find the value of  $\sqrt[3]{\frac{x^2 + y}{6}}$  correct to 1 decimal place when  $x=15$  and  $y=12$
- (A) 6.1
  - (B) 3.9
  - (C) 3.4
  - (D) 1.0

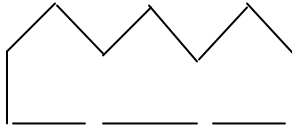
5. Matchsticks were used to make the following shapes



Shape 1



Shape 2



Shape 3

If the pattern is continued, how many matchsticks would shape 101 use?

- (A) 505  
(B) 503  
(C) 305  
(D) 300
6. The function  $2x^2 + y = 7$  is an example of which type of graph
- (A) linear  
(B) quadratic  
(C) hyperbolic  
(D) exponential
7. Maria invests \$250 per month in a fund with an interest rate of 6% p.a. compounded monthly.

How much would Maria have in her fund after 20 year?

- (A)  $250 \left\{ \frac{(1 + 0.06)^{20} - 1}{0.06} \right\}$
- (B)  $250 \left\{ \frac{(1 + 0.06)^{240} - 1}{0.06} \right\}$
- (C)  $250 \left\{ \frac{(1 + 0.005)^{20} - 1}{0.005} \right\}$
- (D)  $250 \left\{ \frac{(1 + 0.005)^{240} - 1}{0.005} \right\}$

8. The 'time and a half' rate of pay for casual work in a salon is \$18.60 per hour.

What is the normal rate of pay per hour?

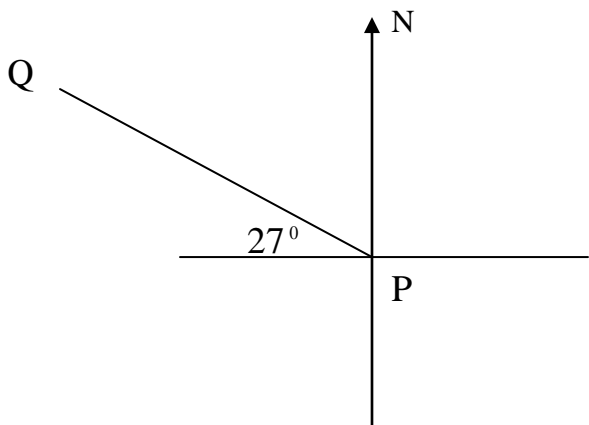
- (A) \$9.30
- (B) \$12.30
- (C) \$12.40
- (D) \$13.95

9. The distance from the Earth to the Sun is one Astronomical Unit (AU) which is 150 000 000 km.

If Saturn is 9.54 AU, the distance in kilometres in Scientific notation to three significant figures is

- (A)  $0.14 \times 10^{10}$
- (B)  $0.143 \times 10^{10}$
- (C)  $1.43 \times 10^9$
- (D)  $143 \times 10^7$

10. What is the bearing of Q from P?



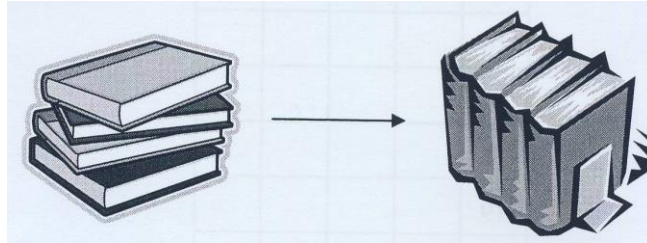
- (A)  $297^\circ$
- (B)  $117^\circ$
- (C)  $63^\circ$
- (D)  $27^\circ$

11. A median regression line is usually associated with what type of statistical graph?

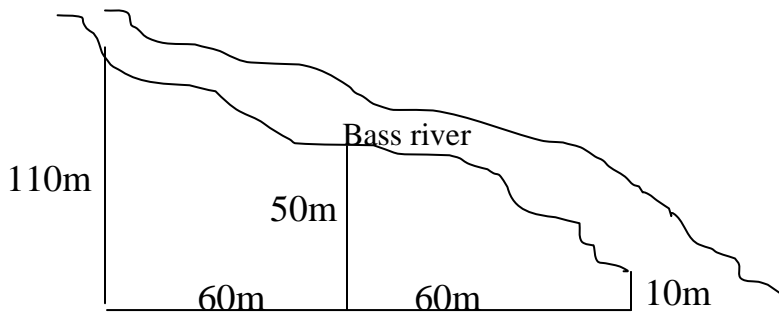
- (A) A frequency histogram
- (B) A cumulative frequency histogram
- (C) A scatterplot
- (D) A box and whisker plot

12. In how many ways can the four books below be arranged between the book ends?

- (A) 1
- (B) 4
- (C) 12
- (D) 24

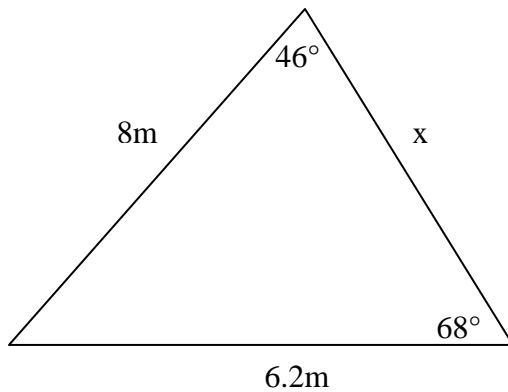


13. The area of this block of land is



- (A)  $3\,400\text{m}^2$
- (B)  $6\,400\text{m}^2$
- (C)  $10\,200\text{m}^2$
- (D)  $19\,200\text{m}^2$

14. Find the length of  $x$  to 2 significant figures.



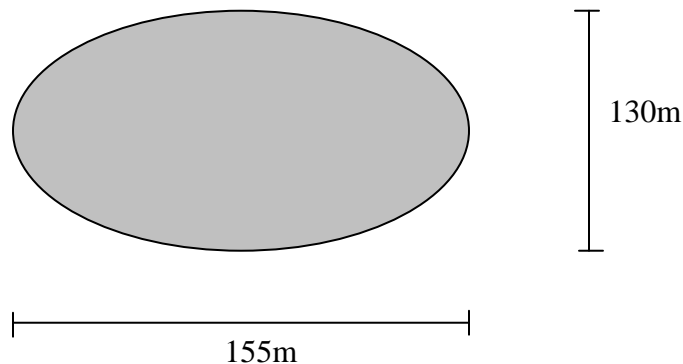
- (A) 6.2m
- (B) 7.9m
- (C) 10m
- (D) 23m

15. Observe the following scores  
8, 3, 5, 8, 12

Which of the following statistical measures has the greatest value for the scores shown?

- |           |            |
|-----------|------------|
| (A) Range | (C) Mean   |
| (B) Mode  | (D) Median |

16. A park in Homebush is in the shape of an ellipse. The council needs to resurface it with new grass which costs \$4.80 per square metre. What is the total cost of resurfacing the park, correct to the nearest \$10?



- (A) \$303 850  
 (B) \$151 930  
 (C) \$96 720  
 (D) \$75 960
17. The table below shows the results for a group of men and women, who had their eyes tested at an eye clinic on a particular day.

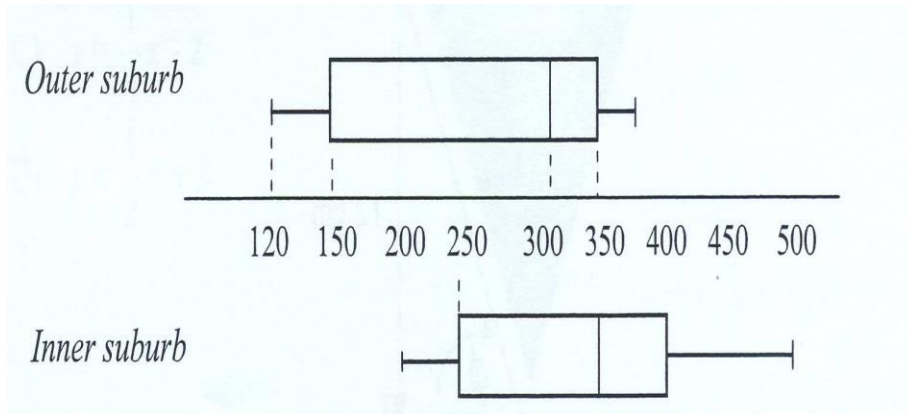
	<b>Passed eye test</b>	<b>Failed eye test</b>
<b>Men</b>	240	
<b>Women</b>		45

In conducting the test, it was found that 2 in every 5 men failed the eye test and 1 in every 5 women failed the eye test.

Using the data from the table, how many men and women had their eyes tested during the day?

- (A) 320  
 (B) 340  
 (C) 580  
 (D) 625
18. Emily receives a z-score of 1.7 in an Assessment Task. If the mean of the task was 55 with a standard deviation on 15, what was her raw score?
- (A) 29.5  
 (B) 70.5  
 (C) 80.5  
 (D) 89.5

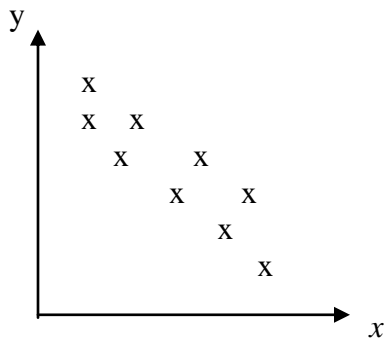
19. The double box-and-whisker plot below shows the number of letters posted daily in an inner-city suburb compared to an outer suburb.



Which of the following statements correctly compares the data collected?

- (A) The median number of letters posted was the same for both suburbs.
- (B) The letters posted from the outer suburb had a greater inter-quartile range.
- (C) There were more letters posted from the inner-city suburb than the outer suburb.
- (D) The number of letters posted in the inner-city suburb had a smaller range.

20. Which correlation coefficient best represents this scatterplot?



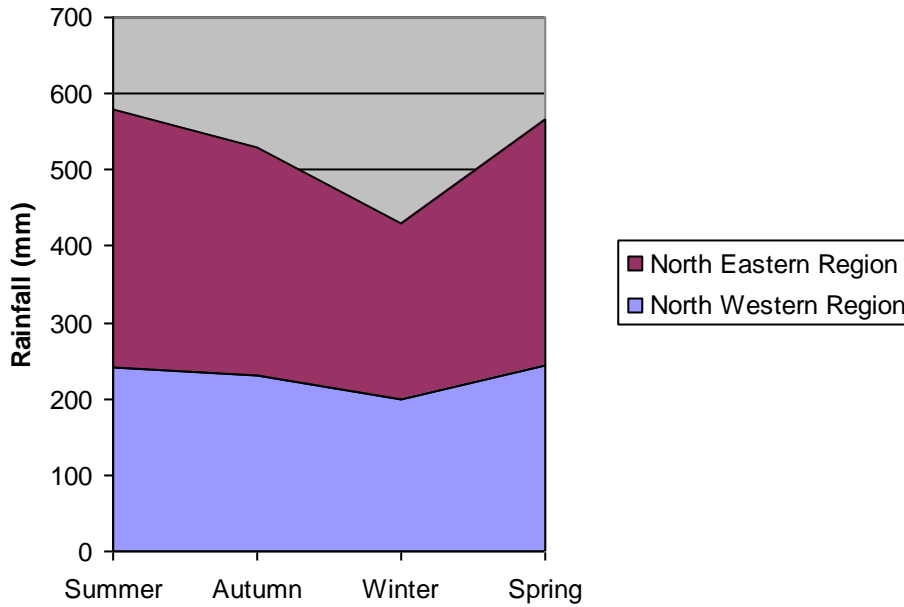
- (A) 0.4
- (B) 0.7
- (C) -0.3
- (D) -0.75

21. A line in the x-y co-ordinate system parallel to the line  $y = -4x + 2$ , could have which of the following equations?

- (A)  $y = -4x - 2$
- (B)  $y = -2x - 4$
- (C)  $y = \frac{1}{4}x - 2$
- (D)  $y = \frac{1}{2}x + 2$

22. The following area chart represents the amount of rainfall in the Northern regions of NSW in 2005

**Rainfall in Northern NSW Regions**



Which of the following statements is false?

- (A) The rainfall increased in Spring for both regions
- (B) There was more rainfall in the North Eastern Region
- (C) There was about 420mm of rain in Winter in the North Eastern Region
- (D) It rained more consistently in the North Western Region



## Section II

**Total marks (78)**

**Attempt Questions 23-28**

**Allow about 2 hours for this section**

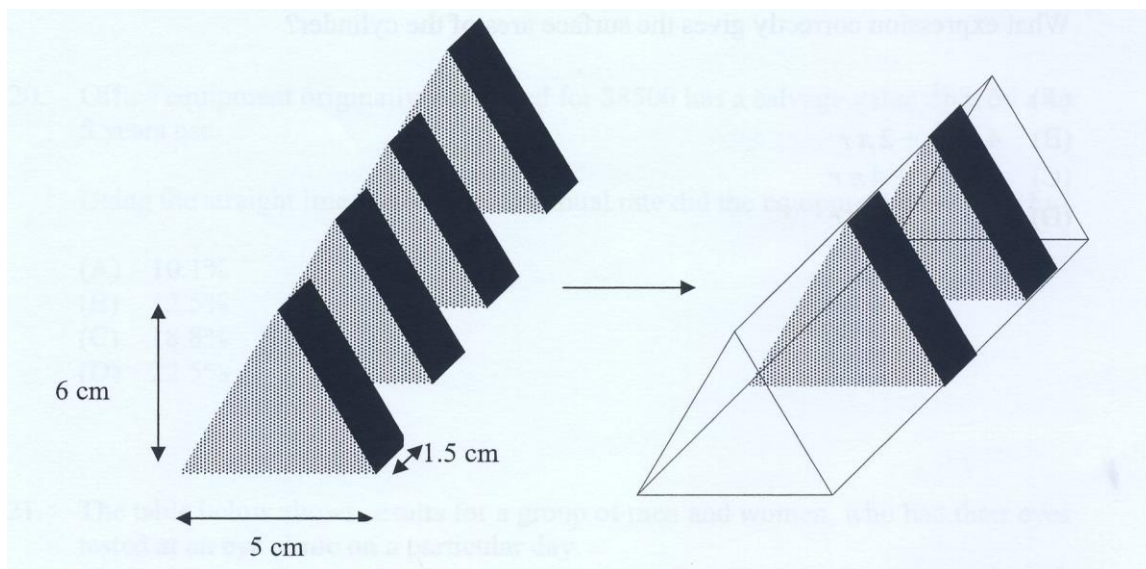
Answer each question on the paper provided, beginning each new question on a new page.

All necessary working should be shown in every question

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### Question 23 (13 marks)

- (a) Solve for  $x$ :  $\frac{5x-3}{4} = 13$  **2**
- (b) 20 identical triangular prism blocks from a building kit are to be placed inside the clear large triangular prism containers, filling it to capacity.



As shown above, the clear container has exactly the same base and height as each of the blocks.

- (i) What is the volume of each block? **1**
- (ii) Calculate the volume of the clear container. **1**

(iii) Cartons of 10 containers of building blocks are shipped to an education store at a cost of \$85 per carton. The store needs 1000 blocks to build a display.

- (I) How many blocks in 10 containers? **1**
- (II) What is the cost of the blocks for the display? **2**

(c) The table shows the monthly repayment for a loan of \$1000 for varying reducible interest.

<b>MONTHLY REPAYMENT TABLE</b>					
Principal and Interest per \$1000 borrowed.					
<b>Interest Rate (% p.a.)</b>	Period of loan (in years)				
	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>25</b>
<b>6.5</b>	\$19.57	\$11.35	\$8.71	\$7.46	\$6.75
<b>7</b>	\$19.80	\$11.61	\$9.00	\$7.75	\$7.07
<b>7.5</b>	\$20.04	\$11.87	\$9.27	\$8.06	\$7.39
<b>8</b>	\$20.28	\$12.13	\$9.56	\$8.36	\$7.72

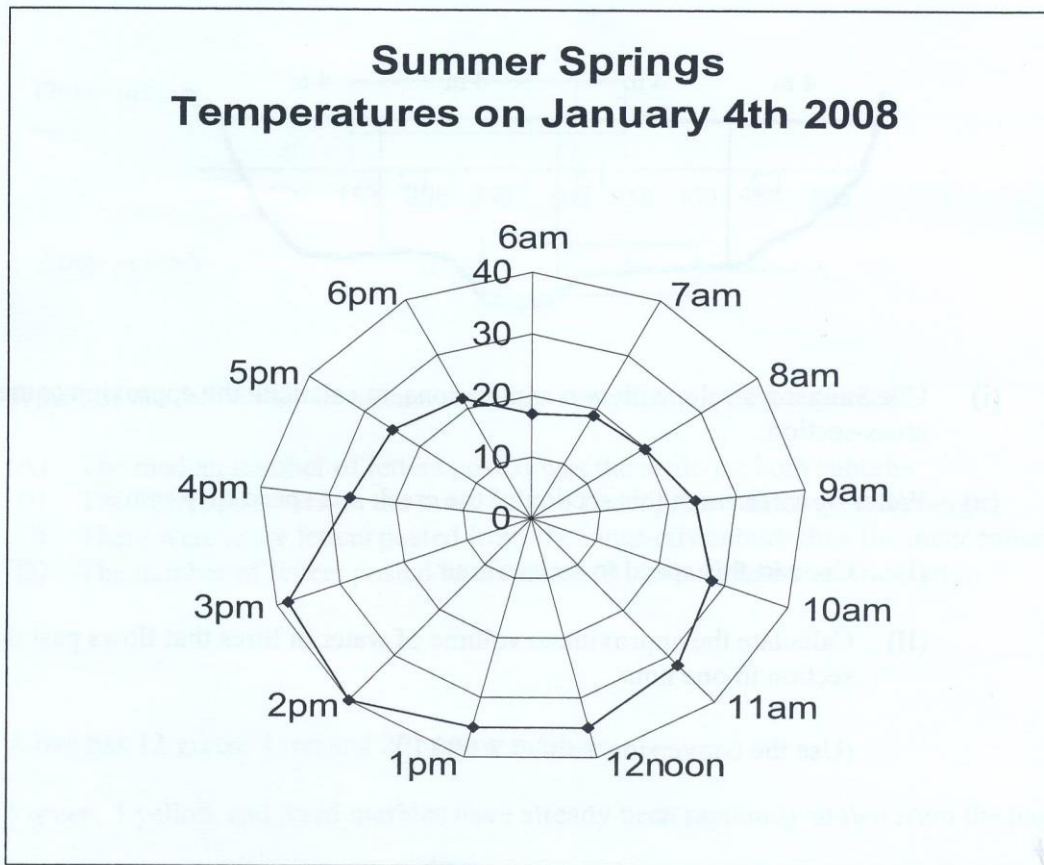
Annie wants to buy a property for \$275 000. She is considering the 7.5% p.a. reducible interest for a 20 year term. Using the table above, calculate the following:

- (i) Annie's monthly repayment. **2**
- (ii) The total amount repaid **2**
- (iii) The total interest paid for the whole term? **2**

**End of Question 23**

**Question 24 (13 marks) Start a new page**

- (a) The radar chart below shows the temperatures over a 12 hour period during the hottest day recorded in January in the town of Summer Springs.



- (i) What was the approximate range in temperature during the 12 hours? **1**
- (ii) What was the temperature at 7.30 am? **1**
- (iii) What was the approximate median temperature during the 12 hour period? **1**
- (iv) Sunrise on January 4<sup>th</sup> was at 5.50 am. What would you expect the temperature to have been at sunrise? **1**

- (b) Georgia is on holidays in Summer Springs and decides to use her credit card for some purchases. Her credit card has an interest free period of 40 days and an interest rate of 11.9 % p.a.

She makes the following purchases for the period 1 January to 31 January.

5 <sup>th</sup> Jan	Swim wear	\$210.75
11 <sup>th</sup> Jan	Cruise	\$330.25
18 <sup>th</sup> Jan	Souvenirs	\$178.96
26 <sup>th</sup> Jan	Hotel	\$810.44

- (i) What is the daily interest rate as a decimal to three significant figures? **1**
- (ii) Georgia pays her account in full on the 21<sup>st</sup> of February.

Copy and complete the table below and answer the following questions

Purchase amount	No. of days interest	Interest to 21 <sup>st</sup> February
\$210.75		
\$330.25		
\$178.96		
\$510.44		

**2**

- (I) How much interest did she pay in total for her January purchases? **2**
- (II) How much did she pay altogether? **2**

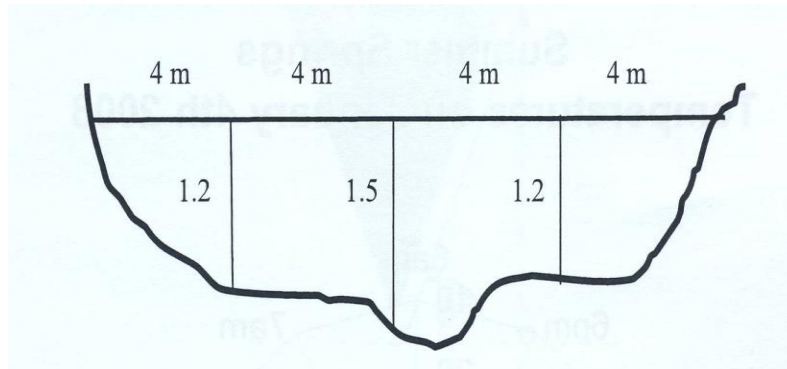
- (c) If the probability that it will rain on any day in Summer at Summer Springs is 0.4,

- (i) What is the probability that it will rain on two consecutive days? **1**
- (ii) What is the probability that it will rain on one of the two consecutive days?  
(Hint: use a tree diagram or table) **1**

**End of Question 24**

**Question 25 (13 marks) Start a new page**

- (a) The diagram below shows the cross-section of a creek with depths perpendicular to the creek bed shown in metres, at horizontal intervals of 4 metres.



- (i) Use the Simpson's rule, with two applications, to calculate the approximate area of this cross-section. **2**
- (ii) Water flows through this section of the creek at a speed of 40cm/s.
- (I) Convert this speed to metres/hour. **1**
- (II) Calculated the approximate volume of water in litres that flows past this section in one hour. **2**

(Use the conversion  $1 \text{ m}^3 = 1000 \text{ L}$ )

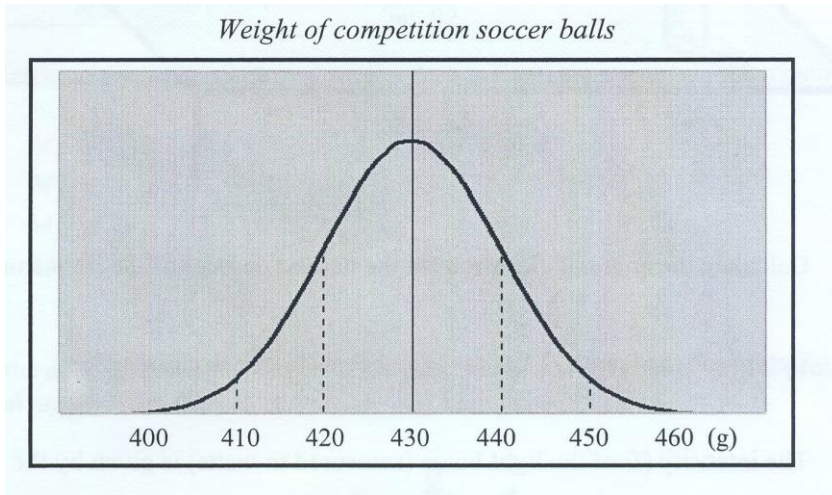
- (b) The surface of a competition soccer ball has 20 regular hexagons and 12 regular pentagons.



Each hexagon has an approximate area of  $65 \text{ cm}^2$ . Each pentagon has an area of  $21.7 \text{ cm}^2$ .

- (i) Determine the total surface area of the soccer ball to the nearest square cm. **1**
- (ii) Use the formula: Surface Area ( $S$ ) =  $4 \pi r^2$  to calculate the radius of the ball to the nearest centimetre? **2**

(iii) Competition rules ensure that the soccer balls have a weight within certain limits.



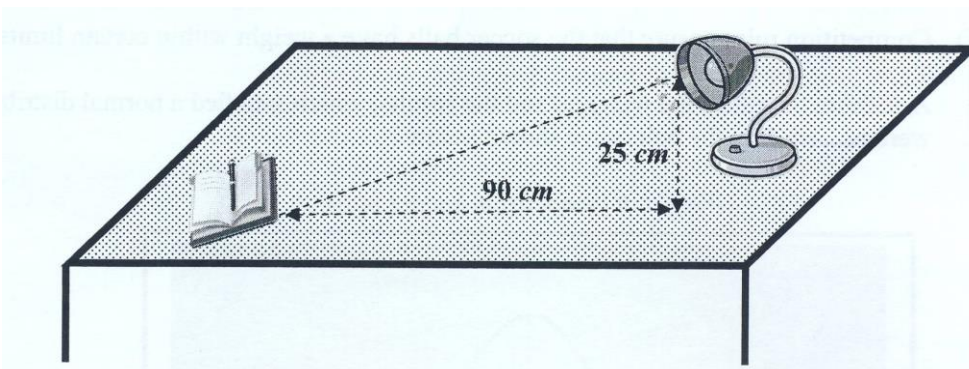
Use the information on the bell curve to answer the following:

- (a) What was the mean weight of soccer balls tested? **1**
- (b) What was the standard deviation? **1**
- (c) What z-score corresponds to a weight of 410g? **1**
- (d) Competition rules require that the weights of the balls are between 410g and 450g.  
What percentage of the balls tested would satisfy these requirements? **1**
- (e) What is the probability that, if a ball was randomly selected from those tested, it would weigh more than 450g? **1**

**End of Question 25**

**Question 26 (13 marks) Start a new page**

- (a) The lamp on the desk below is 90cm from the book and stands 25cm vertically.



- (i) Calculate the angle of elevation (to the nearest degree) of the light from the book? 2
- (ii) Determine the length ( $L$ ) of the light beam (to one decimal place)? 2
- (iii) The intensity of the light beam (measured in watts) is given by the formula:

$$I = \frac{523,500}{L^2}$$

Use this formula to determine the intensity of the beam at the book. 1

- (iv) When the lamp is moved closer to the book, the new angle of elevation is  $20^\circ$ .  
How far (correct to one decimal place) was the lamp moved towards the book? 3

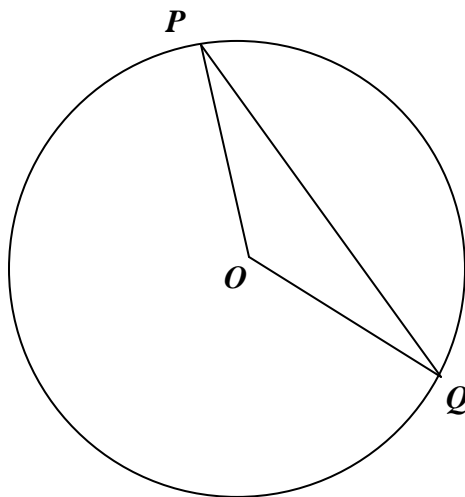
- (b) Mark just bought a LCD TV for \$4800 on the following terms: 25% deposit, followed by equal monthly repayments for \$186 for two years.

- (i) How much deposit did Mark pay? 1
- (ii) What is the total interest she will pay? 2
- (iii) What is the annual flat interest rate she is charged? 2

**End of Question 26**

**Question 27 (13 marks) Start a new page**

- (a) Two points on a circular sports ground at  $P$  and  $Q$  are shown in the diagram, where  $O$  is the centre of the ground and  $\angle POQ = 120^\circ$ . The radius of the ground is 40 metres.



- |       |   |   |
|-------|---|---|
| (i)   | Use the <u>Cosine rule</u> to calculate the length between $P$ and $Q$ to the nearest metre.  | 2 |
| (ii)  | Calculate the area of the <u>triangle POQ</u> to the nearest square metre.<br>(Use the formula for area of a triangle on the formula sheet) | 1 |
| (iii) | What is the size of $\angle QPO$ ?  | 1 |
| (iv)  | $P$ is at the <u>north</u> of the ground and $Q$ is <u>east</u> of $P$ .<br>What is the bearing of $P$ from $Q$ ?                           | 1 |



(b) The data in the table below shows two variables:

- 1) The percentage of children under the age of 1 year who have been immunised against measles.
- 2) The death rate for 5000 children under 5 years in one year.

Nation	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Immunised (%)	65	75	62	31	53	45	93	55	37	85	65	90	98	82
Death rate	60	46	132	146	182	160	31	170	210	69	80	36	25	61

- (i) What do the results of Nation G suggest? **1**
- (ii) These results have been plotted on a scatterplot in appendix 1 (page 20). The lower median (M1) and upper median (M3) have also been plotted with a big cross (+)
- Determine the coordinates of the middle median point (M2) and mark it on the graph. **2**
- (iii) Using a pencil and ruler, draw the median regression line on the scatterplot in appendix 1. (do not erase any working out) **1**
- (iv) Calculate the gradient and write the equation of the median regression line. **2**
- (v) Describe the correlation between these variables. (explain giving reasons) **2**

**End of question 27**

**Question 28 (13 marks) Start a new page**

- (a) A musical instrument has a number of different length strings; the shortest is 30cm, and the longest is 50cm.

The total length ( $T$ ) of all the strings on the instrument is 1 240 cm

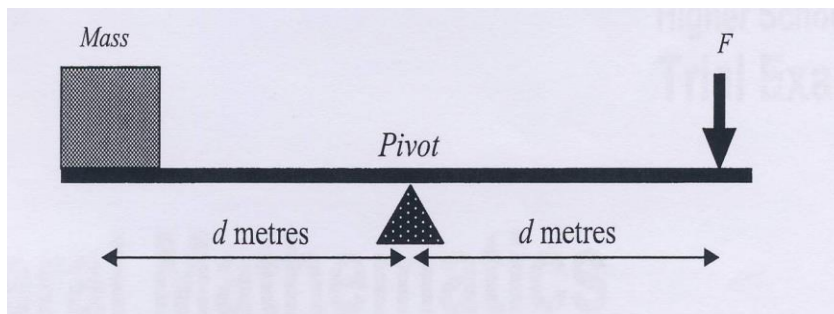
The formula  $T = \frac{n(a+b)}{2}$  is used to relate the total length of the strings.

(the shortest length string ( $a$ ), the longest length ( $b$ ) and the number of strings ( $n$ ))

- (i) Change the subject of the formula to  $n$ . 2
- (ii) How many strings are there on the instrument? 1
- (iii) The strings on the instrument increase from the shortest to the longest, by the same amount.

Determine what this increase in length is between the strings. 2

- (b) To balance a 350 kg mass at the end of a plank, a force ( $F$ ) is applied on the other side of the pivot point.



The force in kilograms that needs to be applied to balance the 350 kg mass is inversely proportional to the distance ( $d$ ) it is from the pivot point and is given by:

$$F = \frac{k}{d} \quad \text{where } k \text{ is constant}$$

- (i) If  $d = 2$  metres, show that the value of  $k$  in the above formula is 700. 1
- (ii) What force ( $F$ ) is needed to balance the 350 kg mass if it is 2.5m from the pivot? 1

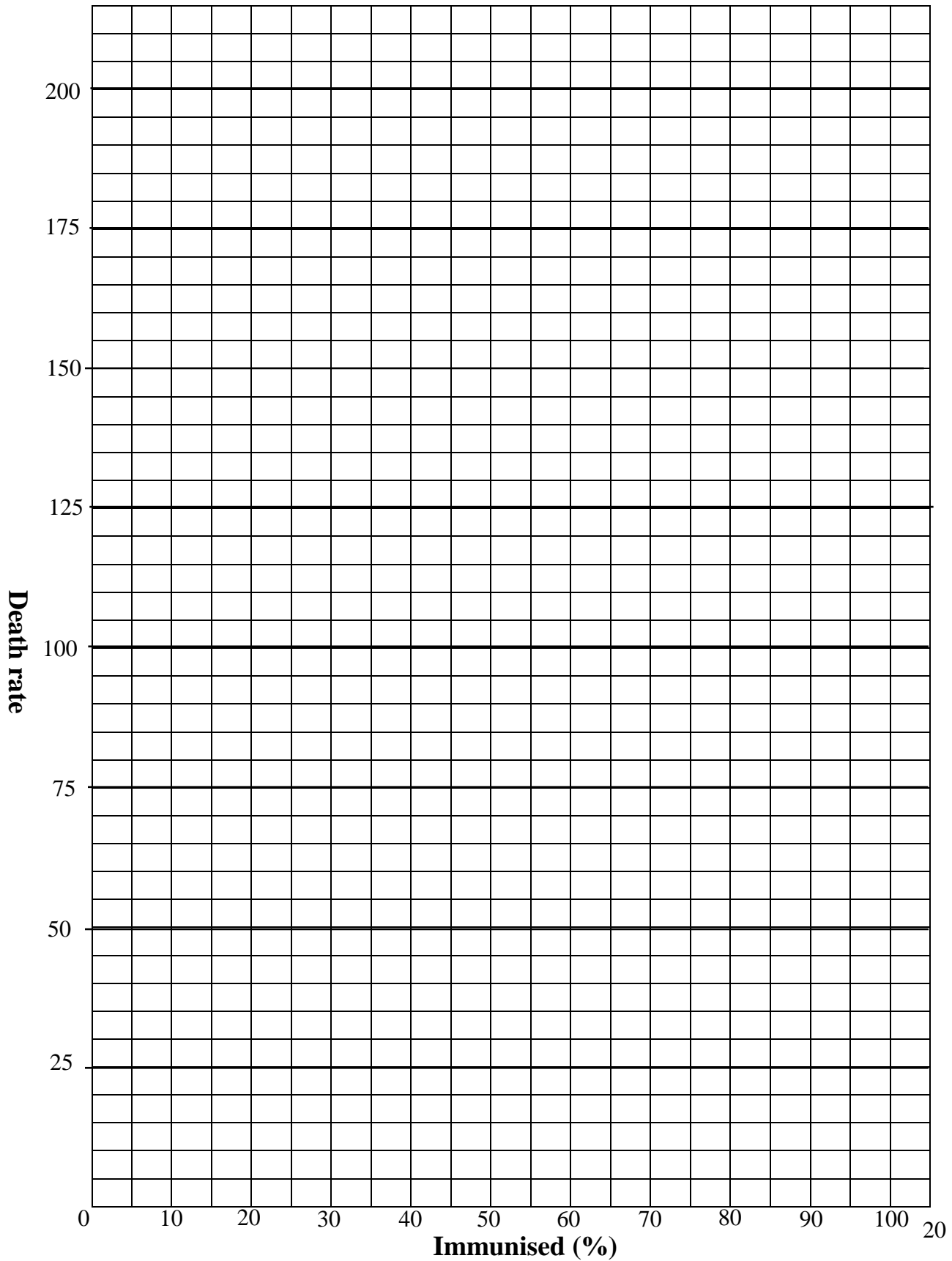
- (iii) In appendix 2 (page 21), Complete the table and Draw the graph of the relationship between force  $F$  and distance  $d$ .  
(Use  $F$  on the vertical axis and  $d$  on the horizontal axis) **3**
- (iv) How far would a 90 kg man need to stand on the plank to balance the 350 kg mass? **1**
- (v) Can the 350 kg mass ever be balanced by applying a force exactly on the pivot?  
Give a reason for your answer. **2**

**END OF EXAMINATION**

Student Name \_\_\_\_\_

Class teacher \_\_\_\_\_

**APPENDIX 1:FOR QUESTION 27b(ii)and(iii)(Hand in with solutions)**





Student Name \_\_\_\_\_

Class teacher \_\_\_\_\_

**Section I**

**Total marks (22)**

**Attempt Questions 1-22**

**Allow about 30 minutes for this part**

Select the alternative A,B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

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	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1</b>				
<b>2</b>				
<b>3</b>				
<b>4</b>				
<b>5</b>				
<b>6</b>				
<b>7</b>				
<b>8</b>				
<b>9</b>				
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<b>15</b>				
<b>16</b>				
<b>17</b>				
<b>18</b>				
<b>19</b>				
<b>20</b>				
<b>21</b>				
<b>22</b>				

**Teacher use only**

Q.	Mark
<b>MC</b>	
<b>23</b>	
<b>24</b>	
<b>25</b>	
<b>26</b>	
<b>27</b>	
<b>28</b>	
<b><u>Total</u></b>	

