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Student Name

**2007 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION**

**GENERAL MATHS – MULTIPLE CHOICE ANSWER SHEET**

**Section 1 (22 marks)**

**Attempt Questions 1 – 22**

**Allow about 30 minutes for this section**

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

- |     |                         |                         |                         |                         |
|-----|-------------------------|-------------------------|-------------------------|-------------------------|
| 1.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 2.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 3.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 4.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 5.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 6.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
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| 8.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 9.  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 10. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
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| 12. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 13. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 14. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 15. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 16. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 17. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 18. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 19. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 20. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 21. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 22. | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |

**Section 1****22 marks****Attempt Questions 1 – 22****Allow about 30 minutes for this section**

Use the Multiple Choice Answer Sheet provided

Select the alternative A, B, C, or D that best answers the question. Fill in the response oval completely.

**Sample**  $2 + 4 =$  (A) 2 (B) 6 (C) 8 (D) 9A  B  C  D 

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A  B  C  D If you have changed your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:A  B  C  D   
*correct* →**1.**  $9x^2 - 5x^2$  is correctly simplified to:(A)  $4x^4$  (B) 4 (C)  $4x$  (D)  $4x^2$ **2.** The tropical hothouse in the Sydney Botanic Garden is in the shape of a pyramid. If it has a square base of length 20 metres and a perpendicular height of 15 metres, what is the volume?(A)  $6000m^2$  (B)  $3000m^2$  (C)  $2000m^2$  (D)  $30000m^2$ **3.** The expression  $7 - (5 - x)$  simplifies to:(A)  $2 + x$  (B)  $35 + 7x$  (C)  $2 - x$  (D)  $35 - 7x$ **4.** A bacteria is growing according to the formula

$$N = 1\,000 \times 10^{0.0795t},$$

where N is the number of bacteria after 't' hours.

How many bacteria are there initially?

(A) 0 (B) 1 000 (C) 795 (D) 1 201

**USE THIS INFORMATION TO ANSWER QUESTIONS 5 AND 6**

Angelina is 170cm tall and weighs 54.5kg. She and Brad would like to have a baby. Her doctor has calculated her BMI (body mass index) using the formula

$$BMI = \frac{M}{h^2}, \text{ where } M \text{ is the weight of the person in kilograms}$$

and  $h$  is the height of the person in metres.

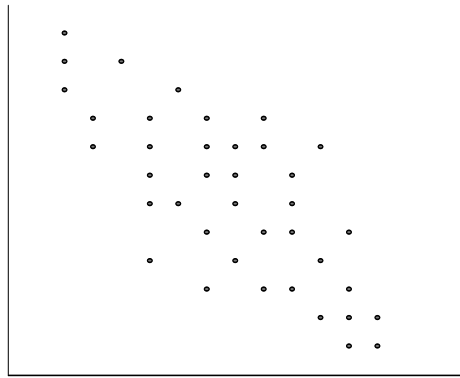
5. Angelina's BMI correct to 1 decimal place, is:  
(A) 18.9 (B) 32.1 (C) 54.5 (D) 18.8
6. Angelina's doctor has advised her that a BMI of 20 is best for mother and baby. Which is the correct calculation to obtain Angelina's ideal weight.  
(A)  $\frac{20}{1.7^2}$  (B)  $\frac{20}{170^2}$  (C)  $20 \times 1.7^2$  (D)  $20 \times 170^2$
7. Shoppers in a shopping mall were being surveyed about their preferred means of transport to work. The results of the survey are recorded in the table below.

|                | <b>Train</b> | <b>Bus</b> | <b>Car</b> | <b>Other</b> | <b>Total</b> |
|----------------|--------------|------------|------------|--------------|--------------|
| <b>Males</b>   | 54           | 27         | 48         | 21           | 150          |
| <b>Females</b> | 32           | 45         | 60         | 13           | 150          |
| <b>Total</b>   | 86           | 72         | 108        | 34           | 300          |

What is the probability that a person selected at random is a female who travels by car?

- (A)  $\frac{9}{25}$  (B)  $\frac{1}{5}$  (C)  $\frac{1}{2}$  (D)  $\frac{1}{3}$
8. If  $d^2 = \frac{3h}{11}$ , what is the value of  $d$ , correct to 2 decimal places when  $h = 45$ .  
(A) 2.09 (B) 3.20 (C) 4.30 (D) 3.50
9.  $\frac{a^2b}{3} \times \frac{9y}{ab^2}$  is correctly simplified to  
(A)  $3y$  (B)  $\frac{3ay}{b}$  (C)  $9ay$  (D)  $\frac{3y}{a}$

10.

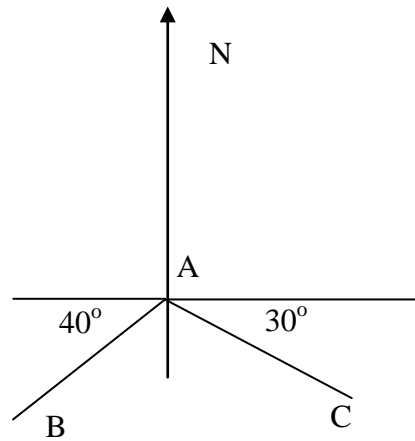


The correlation of the scores represented in the diagram would be closest to:

- (A) 1
- (B) -1
- (C) 0.7
- (D) -0.7

11. In the diagram, the bearing of B from A is :

- A. 230°
- B. 120°
- C. 040°
- D. 220°

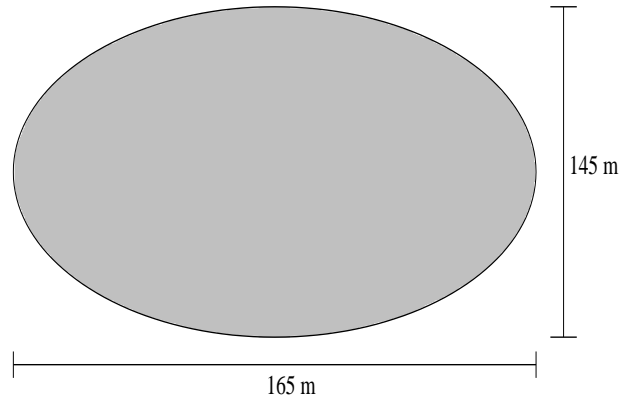


12.  $x$  varies directly as the square of  $y$ .

When  $x = 300$  and  $y = 5$ , then the value of  $x$  when  $y = 2$  is:

- (A) 4
- (B) 48
- (C) 24
- (D) 3

13. The Melbourne Cricket Ground is in the shape of an ellipse as illustrated in the diagram. Following the Commonwealth Games the ground had to be resurfaced with new grass. If the cost of the grass is \$5.40 per square metre, what is the total cost of resurfacing the ground, correct to the nearest \$100?



- (A) \$338 200                      (B) \$101 500  
(C) \$84 500                        (D) \$12 100
14. A mechanics bill for car repairs is \$814.32, including 10% GST.  
Calculate the GST component of the bill.
- (A) \$81.43                            (B) \$733.79  
(C) \$741.20                        (D) \$74.03
15. Ahmed has a credit card. He is charged 0.04% compound interest per day on outstanding balances.  
How much **interest** will Ahmed be charged on an amount of \$650, which is outstanding on his credit card for 25 days.
- (A) \$6.53                      (B) \$656.53                      (C) \$1732.79                      (D) \$660

16. Catherine has worked for 30 hours as shown in the following table.

| Hours worked at normal time | Overtime (Worked at time-and-a-half) | Total hours worked | Total pay |
|-----------------------------|--------------------------------------|--------------------|-----------|
| 24                          | 6                                    | 30                 | \$574.20  |

What is Catherine's hourly rate of pay?

- (A) \$19.14 (B) \$12.76 (C) \$17.40 (D) \$18.00
17. The income tax table below is used to calculate the amount Josef has to pay in tax.

| <i>Taxable Income</i> | <i>Tax Payable</i>                                |
|-----------------------|---|
| \$0 - \$20 000        | Nil   |
| \$20 001 - \$45 000   | Nil plus 10 cents for each \$1 over \$20 000      |
| \$45 001 - \$70 000   | \$2 500 plus 35 cents for each \$1 over \$45 000  |
| \$70 001 and above    | \$11 250 plus 52 cents for each \$1 over \$70 000 |

Josef receives a salary increase from \$43 000 to \$48 000.

How much more will Josef pay in tax?

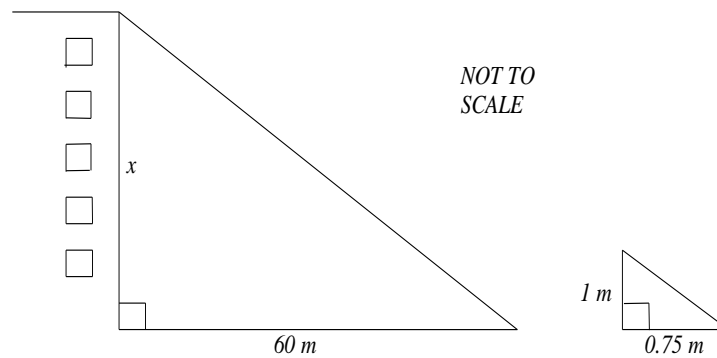
- (A) \$2 300 (B) \$3 550 (C) \$1 250 (D) \$5 850
18. A car was purchased by a firm for \$36 000. It depreciates by 25% in the first year and, in the second year, depreciates by 20% of its value at the end of the first year.

What will be the value of the car at the end of the second year?

- (A) \$21 600 (B) \$19 800  
(C) \$20 600 (D) \$16 200
19. The solution to  $\frac{2y-3}{5} = 7$  is:
- (A)  $y = 76$  (B)  $y = 20$  (C)  $y = 5$  (D)  $y = 19$

20. If  $a^5 = 15\,000$ , correct to 2 decimal places, the value of  $a$  is:
- (A) 3 000.00      (B) 759375.00      (C) 6.84      (D) 6.85

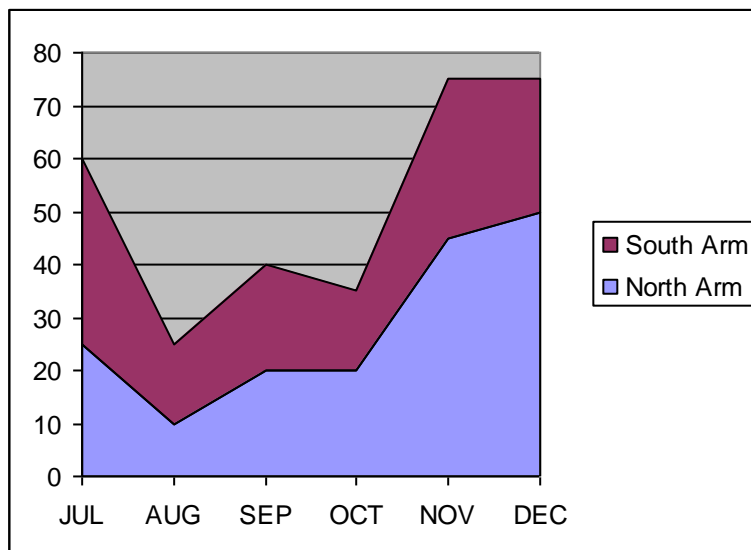
21. A building casts a shadow of 60 metres. At the same time a 1 metre stick casts a shadow of 0.75 metres as shown in the diagram.



Which calculation will give the height of the building?

- (A)  $\frac{0.75}{1} \times 60$       (B)  $\frac{1}{0.75} \times 60$       (C)  $\frac{0.75}{60} \times 1$       (D)  $\frac{1}{60} \times 0.75$

22. This area chart shows rainfall in millilitres for two regions of the Richmond River. What is the rainfall for November on South Arm?



- (A) 25millilitres      (B) 30millilitres      (C) 45millilitres      (D) 50millilitres

## Section II

78 marks

Attempt Questions 23 – 28

Allow about 120 minutes for this section

Answer each question on a SEPARATE page.

All necessary working should be shown in every question.

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Marks

**Question 23 (13 marks)** Start a NEW page.

Marks

- a) A criminologist studying crime in East Anglia gathered data to see if there was a relationship between P, the number of police patrolling the suburb, and C, the number of crimes committed per week. Some of her results are illustrated in the table.

|   |     |       |     |     |     |    |      |    |    |
|---|-----|-------|-----|-----|-----|----|------|----|----|
| P | 10  | 16 *  | 18  | 20  | 23  | 26 | 30 * | 32 | 40 |
| C | 160 | 140 * | 124 | 120 | 108 | 90 | 80 * | 72 | 40 |

The graph of this data is attached at appendix 1

- i) What is the independent variable? **1**
- ii) The asterisked data \* has not been plotted. Plot these on the axes on appendix 1 **2**
- iii) A line of best fit has been drawn. Find the equation of the line. **2**
- iv) Predict the number of crimes expected if there are 45 police on duty. **1**
- b) The radius of the Earth is 6367km ( correct to the nearest kilometre)
- i) Calculate the surface area of the Earth, correct to the nearest million square kilometres. **2**
- ii) The surface area of the Pacific Ocean is 179 000 000 km<sup>2</sup>. What percentage of the Earth does it cover? **1**
- iii) The average (mean) depth of the Pacific Ocean is 3976m. Use  $V=Ah$  to calculate the volume of the Pacific Ocean in **cubic kilometres**. **2**
- iv) Write your answer in part (iii) to 3 significant figures. **1**
- v) Write your answer in part (iii) in scientific notation. **1**



**Question 24 (13 marks)** Start a NEW page.

**Marks**

- a) Angela has seen a car she would like to buy. The terms are \$9 600 cash or 20% deposit and the remainder to be paid off in 36 equal monthly instalments of \$271. Angela decides to buy the car on terms.

**8**

- i) Calculate the deposit.
- ii) What is the amount loaned to Angela?
- iii) Calculate the total instalments she pays.
- iv) Calculate the total interest charged.
- v) Calculate the annual flat **rate** of interest charged. Answer to the nearest whole number.
- vi) Angela will use the car for her business. For tax purposes, she needs to calculate depreciation by the declining balance method. This involves reducing its value, \$9 600, by 12% each year.
  - $\alpha$  Calculate the depreciation for the first year.
  - $\beta$  She will sell the car when its value reaches below \$5 000. When will she do this?

- b) Two islands A and B are 1445 kilometres apart. Island A has coordinates (10°S, 170°W). Island B is due North of A.

[1M = 1.852 km]

- i) Convert 1445 kilometres to nautical miles (M).
- ii) Calculate the coordinates of Island B.
- iii) A ship sails due North from A to B, at a speed of 40 knots. How long will it take to reach Island B? (Answer in days, hours and minutes.)

**5**

**Question 25 (13 marks)** Start a NEW page.**Marks**

- a) Sydney has coordinates (34°S, 151°E). On the other side of the Pacific Ocean, Santiago in Chile has coordinates (34°S, 70°W).

The small circle radius of latitude on which Sydney and Santiago lie is **5306** km (to nearest kilometre).

In order to calculate the distance from Sydney to Santiago along this line of latitude

- i) Explain why the shortest angular distance between the two cities is 139°. **1**
- ii) Calculate the shortest distance between the two cities, to the nearest kilometre. **2**
- (b) Benjamin has approval to purchase a unit for \$360 000. He elects to repay the loan over 25 years at a rate of 7.5 % p.a.

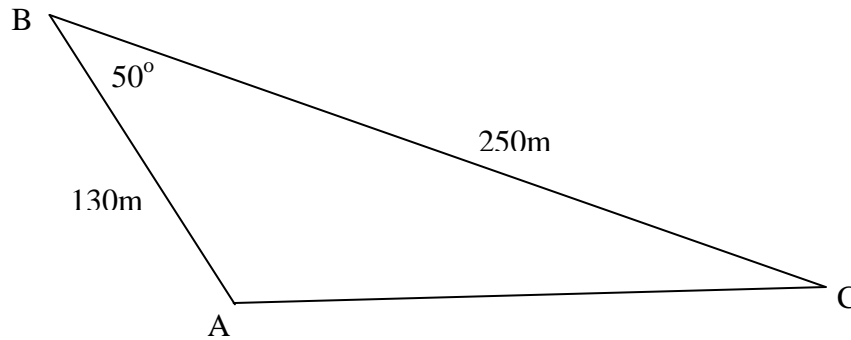
| MONTHLY REPAYMENT TABLE                     |                           |         |        |        |        |
|---|---------------------------|---------|--------|--------|--------|
| Principal and Interest per \$1000 borrowed. |                           |         |        |        |        |
| Interest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

- (i) Using the table above, calculate Benjamin's monthly repayment. **1**
- (ii) Benjamin earns \$110 000 per annum. What is his monthly earnings? **1**
- (iii) Lending institutions require repayments be 30% or less of monthly earnings. Can Benjamin afford to repay the loan? Explain. **2**
- (iv) How much will he pay over the period of the loan? **1**
- (v) How much interest will he pay? **1**
- (vi) If he wishes to repay the loan over 15 years, at the same interest rate, what will his monthly repayments be? **1**
- (vii) Do these repayments meet the 30% affordability formula? Explain. **1**
- c) A soccer match is being played in Venezuela, on the 17<sup>th</sup> August at 1000 hours local time and telecast live in Sydney (AEST) and in London (GMT). Given that the time in Venezuela is GMT -4 hours and Sydney is GMT +10 hours. At what time will the match be shown in Sydney? **2**

**Question 26 (13 marks)** Start a NEW page.

**Marks**

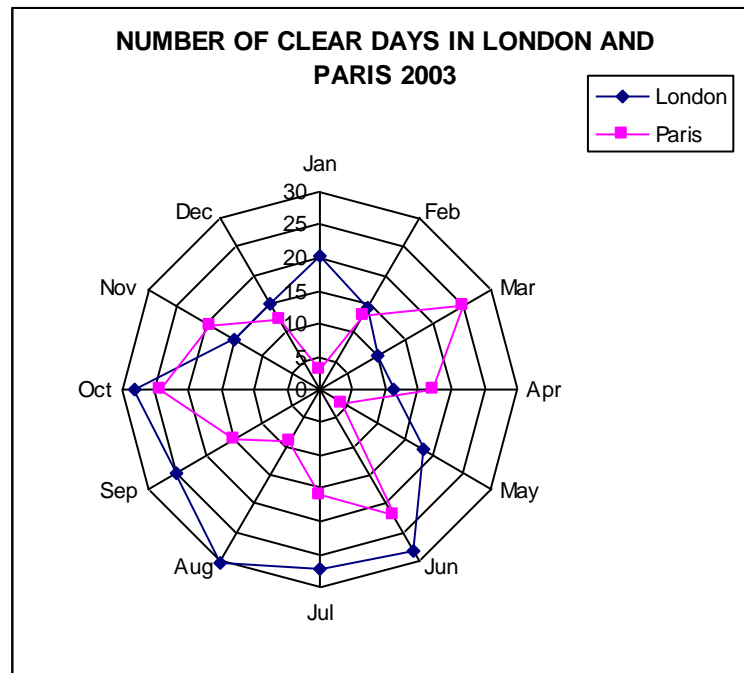
a) Brad and Angie have bought a triangular block of land. The plan is shown below.



The length of the street frontage AC is missing.

- i) Calculate AC to the nearest tenth of a metre (1 decimal place). 3
  - ii) Calculate the area of the block to the nearest square metre. 2
  - iii) Convert this to hectares (to two decimal places). 1
  - iv) Corner A is obtuse. Use the sine rule to calculate the size of angle BAC. Answer to the nearest degree. 3
- b) Francois and Jean are travelling to London and Paris on a two month visit to their grandparents. 2

Explain which two consecutive months would be best for a clear day visit.



- c) Given  $R = \sqrt[3]{\frac{3V}{4\pi}}$ , find the value of V, if  $R = 8.9$ , correct to one decimal place. 2

**Question 27 (13 marks)** Start a NEW page.

- a) The new owner of a Strathfield coffee shop recorded the number of hot chocolate drinks sold on 10 consecutive days along with the maximum temperature in degrees Celsius that day. Her results are shown in the table below:

| Temperature (T) | Number of hot chocolates sold (N) |
|-----------------|-----------------------------------|
| 23              | 62                                |
| 26              | 30                                |
| 16              | 97                                |
| 24              | 40                                |
| 12              | 103                               |
| 18              | 74                                |
| 14              | 108                               |
| 26              | 20                                |
| 23              | 69                                |
| 30              | 20                                |

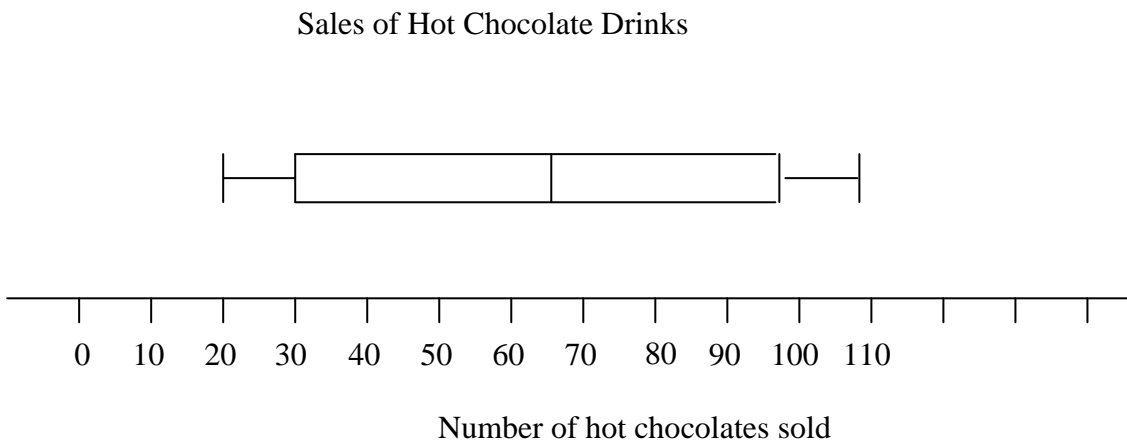
- i) A scatterplot of this data is attached at appendix 2. Two of the median points have been plotted. Plot the complete the median regression line using a ruler and a pencil. Do not erase any of your steps. **3**
- ii) The shop owner concluded “colder days cause higher sales of hot chocolates”. Explain why her comment is not necessarily correct. **2**
- iii) What is the (mean) number of hot chocolates sold over the 10 days. **1**
- iv) The shop owner uses 200 mLs of milk in each hot chocolate. How much milk should she order for the next day if it is predicted to reach only  $13^{\circ}C$  ? Justify your answer. **2**

**QUESTION 27 IS CONTINUED ON THE NEXT PAGE**

**(Question 27 continued)**

**Marks**

- b) The number of hot chocolates sold is displayed in the box-and-whisker plot below.



- i) What was the least number of Hot Chocolates sold over the 10 days? **1**
- ii) The number of Hot Chocolates sold at a coffee shop in Burwood on the same days has a five number summary of 50,70,80,95,105. What is the interquartile range of this distribution? **1**
- iii) Comment on the differences between the number of hot chocolates sold at the two coffee shops by comparing the spread of the distributions. **1**
- c) The age and gender of the people who buy a hot chocolate at the Strathfield coffee shop was recorded on a typical day and is shown in the two-way table below.

|        | Adult | School age | Total |
|--------|-------|------------|-------|
| Male   | 29    | 52         | 81    |
| Female | 11    | 16         | 27    |
| Total  | 40    | 68         | 108   |

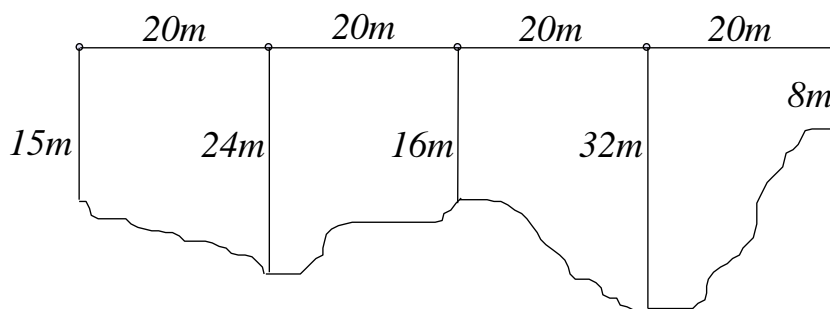
- i) What fraction of people who bought hot chocolates were adults? **1**
- ii) With which group of people were hot chocolates most popular on this day? **1**

**Question 28 (13 marks)** Start a NEW page.

- a) Annika was asked to make up a table of values and plot the graph of  $h = 4t - t^2 + 1$ . Bradley was asked to do the same thing for  $h = 1 - t(t - 4)$ . For both  $h$  represents the height in metres of a ball ( which has been thrown straight up into the air) after  $t$  seconds. Both **correctly** calculated the same table of values and graph.

|     |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|
| $t$ | 0 | 1 | 2 | 3 | 4 | 5 |
| $h$ | 1 | 4 | 5 | m | 1 | n |

- (i) Calculate the values of m and n in the table. Write these on your answer page. 2
  - (ii) Use the table of values to graph the function at appendix 3. Include your answers from part (i) also. 3
  - iii) Explain why Annika and Bradley came up with the same table of values. 2
  - iv) This formula models the path of a ball thrown at the ceiling of the gym to dislodge another ball stuck in the rafters which are 4.5metres high. Did it hit the ceiling? 1
  - v) What are the limitations of this model of the motion of a ball thrown upwards. 2
- (e) The diagram represents the cross-section of a ravine. Use Simpson's Rule and five function values to find the area of the figure represented in the diagram. 3



\*\*\*\*\*END\*\*\*\*\*

**FORMULAE SHEET**

**Area of an annulus**

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

$R$  = radius of the outer circle

$r$  = radius of the inner circle

**Area of an ellipse**

$$A = \pi ab$$

$a$  = length of the semi-major axis

$b$  = length of the semi-minor axis

**Area of a sector**

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

$\theta$  = number of degrees on central angle

**Arc length of a circle**

$$l = \frac{\theta}{360} 2\pi r$$

$\theta$  = number of degrees on central angle

**Simpson's rule for area approximation**

$$A \approx \frac{h}{3} (d_f + 4d_m + d_l)$$

$h$  = distance between successive measurements

$d_f$  = first measurement

$d_m$  = middle measurement

$d_l$  = last measurement

**Surface area**

Sphere  $A = 4\pi r^2$

Closed cylinder  $A = 2\pi rh + 2\pi r^2$

$r$  = radius

$h$  = perpendicular height

**Volume**

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

Cylinder  $V = \pi r^2 h$

Pyramid  $V = \frac{1}{3} Ah$

Sphere  $v = \frac{4}{3} \pi r^3$

$r$  = radius

$h$  = perpendicular height

$A$  = area of base

**Sine rule**

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

**Area of a triangle**

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

**Cosine rule**

$$c^2 = a^2 + b^2 - 2ab \cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

### Simple interest

$$I = Prn$$

$P$  = Initial quantity

$R$  = percentage interest rate per period,  
expressed as a decimal

$n$  = number of periods

### Compound interest

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

$A$  = final balance

$P$  = initial balance

$n$  = number of compounding periods

$r$  = percentage interest rate per compounding  
period, expressed as a decimal

### Future value (A) of an annuity

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

$M$  = contributions pr period, paid at the end of  
the period

### Present value (N) of an annuity

$$N = M \left\{ \frac{(1 + r)^n - 1}{r(1 + r)^n} \right\} \quad \text{or}$$

$$N = \frac{A}{(1 + r)^n}$$

### Straight –line formula for depreciation

$$S = V_0 - Dn$$

$S$  = Salvage value of assets after  $n$  periods

$V_0$  = purchase price of the asset

$D$  = amount of depreciation apportioned per  
Period

$n$  = number of periods

### Declining balance formula for depreciation

$$S = V_0(1 - r)^n$$

$S$  = Salvage value of assets after  $n$  periods

$r$  = percentage interest rate per period,  
expressed as a decimal.

### Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$  = mean

$x$  = individual score

$n$  = number of scores

$f$  = frequency

### Formula for a z-score

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

$s$  = standard deviation

### Gradient of a straight line

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

### Gradient-intercept form of a straight line

$$y = mx + b$$

$m$  = gradient

$b$  = y-intercept

### Probability of an event

The probability of an event where outcomes  
are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$