2004
TRIAL HIGHER SCHOOL CERTIFICATE
EXAMINATION

General Mathematics

General Instructions

- o Reading Time- 5 minutes
- o Working Time - 2½ hours
- o Write using a blue or black pen
- o Calculators may be used
- o A Formulae Sheet is provided at the back of this paper which may be detached and used throughout the paper.

Section I pages 3 – 7

Total marks (**22**)

- o Attempt Questions 1-22
- o Answer on the Multiple Choice answer sheet provided.
- o Allow about 30 minutes for this section

Section II   pages 8 - 13

Total marks (**78**)

- o Attempt questions 23 – 28
- o Answer on the paper provided. Start a new sheet for each question.
- o Allow about 2 hours for this section

Section I

Total marks (22)

Attempt Questions 1-22

Allow about 30 minutes for this section

Use the multiple choice answer sheet.
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) 9

A ⭕   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 change 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:
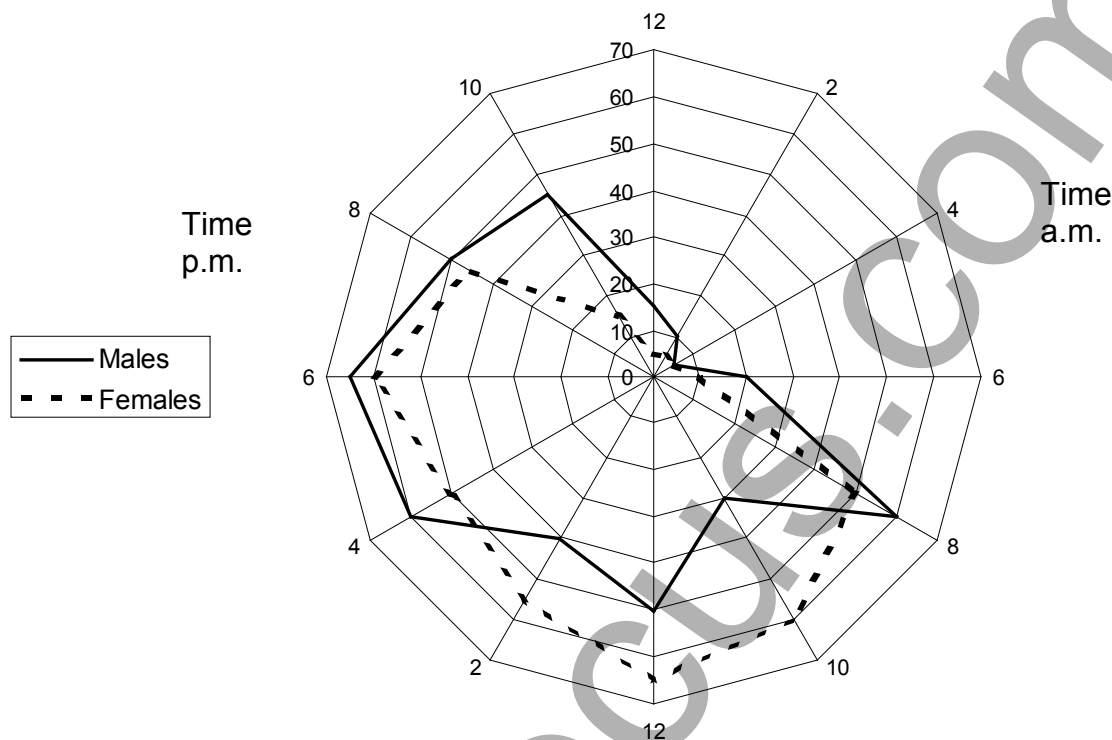
correct

A ⚫   B ✖   C ⭕   D ⭕

The stem and leaf plot below gives the ages of spectators at a basketball match. Use it to answer Questions 1 and 2

Stem	Leaves
0	1 2 5 7
1	2 3 3 5 7 7
2	2 3 4 4 5 5 6 8 9
3	1 2 2 2 3 5 8 9
4	1 1 2 2 3 4 7 8
5	2 3 4 5 8

1.   The median age of the spectators is:
   (A)   31
   (B)   31.5
   (C)   32
   (D)   30

2.   The percentage of spectators who were older than 43 was
   (A)   80%
   (B)   8%
   (C)   20%
   (D)   22.5%

3.   Jenny invests $2 500 for 2 years in an account which pays 6% p.a. compounded monthly. The amount of interest that she earns is :
   (A) $300
   (B) $309
   (C) $2 818
   (D) $318

4.   The simplification of $5(x-3)-2(x-4)$ is
   (A) $3x-23$
   (B) $3x-7$
   (C) $7x-23$
   (D) $7x-7$

5.   A straight line has an equation of $y=5x-3$. The gradient of this line is:

   (A)   5
   (B) -3
   (C) $\frac{5}{3}$
   (D) $\frac{3}{5}$

6.   The mass of a piece of steak is 500g to the nearest 10g.
   The percentage error of this measurement is:
   (A)   1%
   (B)   50%
   (C)   5%
   (D)   10%

3

7.   The radar chart shows the number of males and females in a convenience store at different times of a day.

Numbers in a Convenience Store

The time when the number of females was twice the number of males was:

(A)   6 a.m.
(B)   10 p.m.
(C)   10 a.m.
(D)   12 midday

8.   A sphere has a volume of 500 cm^3. What is the radius (correct to 2 decimal places)?
(A)   119.37cm
(B)   39.79cm
(C)   10.93cm
(D)   4.92cm

9.   A bag contains three times as many red marbles as blue marbles. If one marble is chosen at random, the probability that it will be a blue marble is:

(A) $\dfrac{1}{2}$

(B) $\dfrac{2}{3}$

(C) $\dfrac{1}{3}$

(D) $\dfrac{1}{4}$

10.

Not to scale
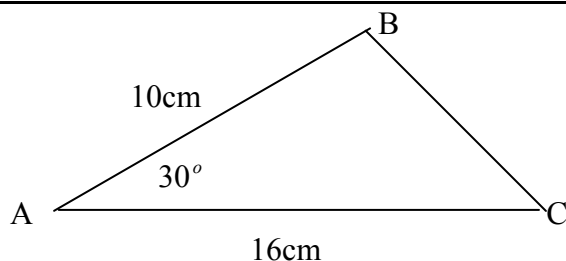
The area of $\Delta \; ABC$ is:
(A) 40cm^2
(B) 160cm^2
(C) 80cm^2
(D) 320cm^2

11.   Susan has a credit card on which no interest is charged for purchases made during

the month until the due date. After this a rate of 0.06% per day applies on the

outstanding balance for each day after the due date.

The section of Susan's statement for the month of July, shows all transactions
made in the month.

| Opening Balance : $0.00		
Date	Details	Amount
12/07/04	AAMI Insurance	$215.00
15/07/04	Midtown Butchers	$80.00
23/07/04	X-treme travel	$670.00
25/07/04	Snippets Hair Design	$45.00
Due Date 14/08/04	Daily percentage rate 0.06%	

If Susan pays her account in full on 25/8/04, how much interest will be
charged to her account ?

(A) $27.90

(B) $666.60

(C) $6.67

(D) $0.61

12.   Given that $x^2 = 2.45$, the value of x to 2 significant figures is :
(A)   1.56
(B)   1.6
(C)   6.0
(D)   1.2

13.   Jasmine invests $200 per month in an annuity for twenty years. The interest rate is
       12% per annum compounded monthly. What will be the value of this annuity at
       maturity at the end of twenty years? (to the nearest dollar)

       (A) $197851
       (B) $2179
       (C) $14410
       (D) $1.1 x 10^{15}

14.   Which of the following graphs could represent $y = 2^x$?

       (A)   (B)

       (C)   (D)
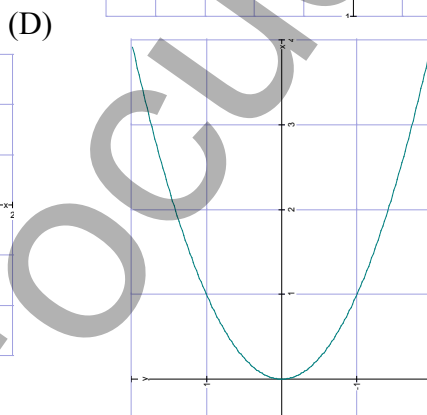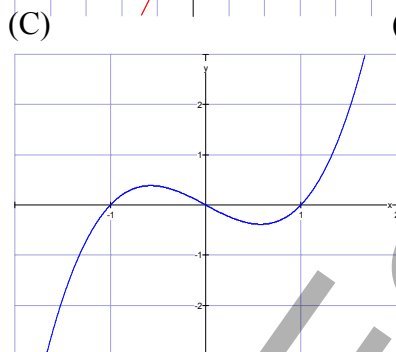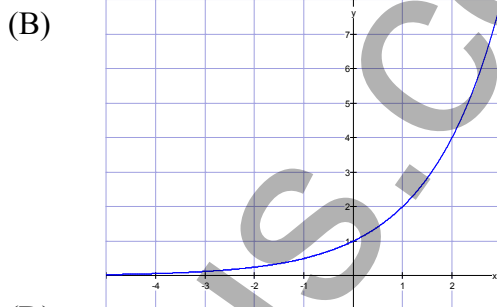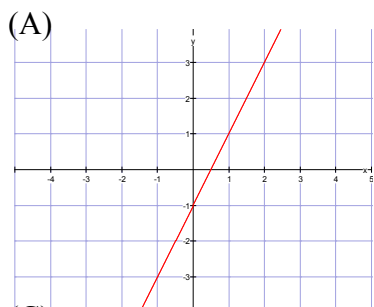
15.   To estimate the number of feral cats in a national park, rangers catch 15, tag them and
       then release them.
       A few days later they again catch 15 cats and note that only 3 of these were tagged.
       What would be the estimate of the number of cats in the park?

       (A)   60
       (B)   90
       (C)   45
       (D)   75

16.   The longitude of Adamstown is 15°W. It is known that the time at Browneville is
       three hours ahead of the time at Adamstown.
       The longitude of Browneville is:
       (A) 30°E
       (B) 60°W
       (C) 45°E
       (D) 45°W

17. After a class test, the mean and standard deviation of the marks were calculated and found to be 65 and 7 respectively.
    If Peter's mark converts to a Z-score of -2, what was his actual test mark?
    (A) 79
    (B) 63
    (C) 51
    (D) 67

18. The "Green Top" match company states that the average contents of a packet of matches is 50 with a standard deviation of 3.
    Approximately what percentage of boxes would contain more than 56 matches?
    (A) 5
    (B) 47½
    (C) 2½
    (D) 95

19. Brian works for 6 normal hours and 4 hours overtime at time and a half. He was paid a total of $120. What is his normal hourly rate of pay?
    (A) $10
    (B) $12
    (C) $15
    (D) $18

20. The formula $s = ut + \dfrac{1}{2}at^2$ is rearranged to make a the subject. The result is:

    (A) $a = \dfrac{2s - ut}{t^2}$

    (B) $a = \dfrac{2(s - ut)}{t^2}$

    (C) $a = \dfrac{2s + 2ut}{t^2}$

    (D) $a = t^2(2s - 2ut)$

21. The amount of heat felt from a fire varies inversely with the square of the distance from the fire.
    If the distance from the fire is doubled the amount of heat felt is:
    (A) Doubled
    (B) Halved
    (C) Multiplied by 4
    (D) Divided by 4

22. From a team of 15 players, a captain and vice-captain are to be selected.
    In how many different ways can these positions be filled?
    (A) 29
    (B) 105
    (C) 15
    (D) 210

Section II

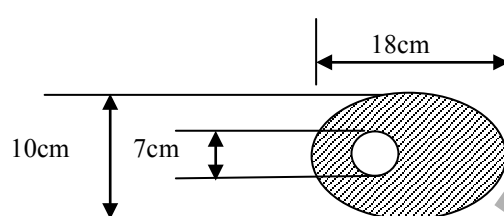**Total Marks (78)**
Attempt Questions 23 - 28
Allow about 2 hours for this section.

Answer all questions, starting each question on a new sheet of paper with your name and question number at the top of the page. Do not write on the back of sheets.

Question 23 (13 marks) Start a new sheet of paper.   **Marks**

(a)   A company logo, shown below, consists of an ellipse
          and a circle.

(i)   Calculate the shaded area of the logo correct to   **3**
          3 significant figures. .

(ii)   A solid shape with the above cross-section and a thickness   **1**
          of 3cm is made from timber. Find its volume. (nearest cm^3).

(iii)   If the timber used in (ii) has a density of 0.85 g/cm^3, what   **1**
          is the mass of the above solid (nearest gram).

(b)   A street light on a pole is 15 metres above the ground. A person,
          standing nearby, who is 1.8 metres tall casts a shadow from the light
          which is 5.4 metres long.

(i)   Draw a sketch of this information.   **1**

(ii)   Calculate the distance of this person from the base of   **2**
          the light pole.

(i)   At what angle of elevation would the person look to focus   **2**
          directly on the light?

(c)   Kate leaves Sydney (longitude 150^oE) at 5.00pm on Monday, to
          fly to London (longitude 0°), a trip lasting 22 hours. On her
          arrival she rings her parents in Sydney.

(i)   What time is it in Sydney when her parents take the call?   **1**

(ii)   What is London time when Kate makes the call?   **2**

Question 24 (13 marks) Start a new sheet of paper.   **Marks**

    (a)   Henry runs a small family business, which he would like to
            expand. His financial adviser tells him that, if he expands, there
            is a 40% chance of losing $200 000 and a 60% chance of
            gaining $150 000.

            (i)   Calculate the financial expectation of this venture.   **2**

            (ii)   Based on this, would you recommend expansion?   **1**
                  Give reasons for your answer.

    (b)   Research is conducted to determine if there is any
            relationship between obesity and the number of hours children
            spend in front of a video screen. To this end a group of 13 year
            old children were surveyed and the average results are tabulated
   below.

Hours per day (H)	0.5	1	1.5	2	2.5	3	3.5	4	4.5
No. of kg above average weight (W)	0.50	1.00	1.25	1.85	2.2	2.50	3.20	3.40	3.65

            (i)   On the graph paper supplied, draw a scatter plot of this   **3**
                  information.

            (ii)   Describe the correlation between the two variables.   **2**

            (iii)   Do you think that there is a causal relationship between the   **1**
                  hours spent in front of a screen and the weight of the children ?
                  Explain.

            (iv)   On your scatter plot draw in a median regression line.   **2**

            (v)   Determine the equation of this regression line in the form   **2**
                  $W = mH + b$

Question 25 (13 marks) Start a new sheet of paper.   **Marks**

(a)   The surface of a farm dam is surveyed and a sketch is shown
             below.
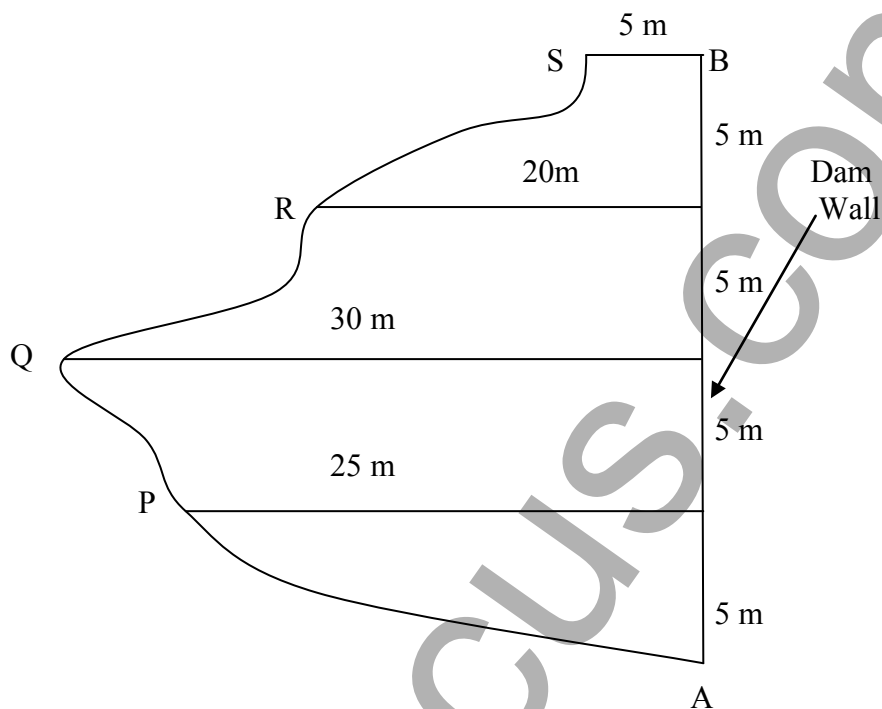
(i)   Write down what the surveyors field notebook entries
        would show.   **1**

(ii)   By using Simpson's Rule twice, calculate the
        approximate area of the surface of the dam.   **2**

(iii)   If the average depth of water in the dam is 2.5 metres,
        calculate the volume of water in the dam (in litres).   **2**

(iv)   If the wall develops a leak and water seeps out at a rate
        of 80 litres per hour, after how many days would the dam
        be empty.   **1**

Question 25 continues on the next page.

Question 25 (continued)

(b)   A solid metal cone has a radius of 10cm and a height of 25cm.

        (i)   Show that the volume of the cone is $2618cm^3$ (4 sig.figs).   **2**

        (ii)   If the cone is melted down and formed into a solid sphere   **2**
                 calculate the radius of the sphere. (3 sig. Figs).

(c)   An approximation for the speed *(s)* of an object thrown upward
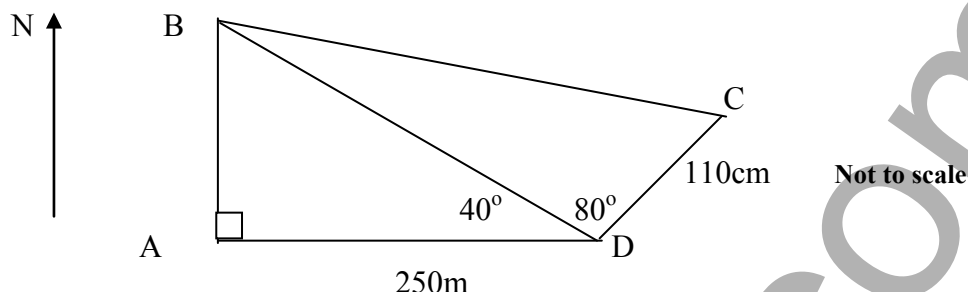   at a speed of 120 m/s is given by:

$$s = 120 - 10t$$

where *t* is the time(in seconds) after it is thrown.

        (i)   What is the speed of the object after 10 seconds?   **1**

        (ii)   When does its speed become zero?   **1**

   (iii)   Interpret the speed of the object after 15 seconds.   **1**

Question 26 (13 marks) Start a new sheet of paper.   **Marks**

(a)   A sketch of a paddock ABCD is shown below.

(i)   Show that the length of BD is 326m (nearest metre).   **1**

(ii)   Using the cosine rule calculate the length of the side BC.   **2**

(iii)   Calculate the area of triangle BDC (nearest m^2)   **1**

(iv)   If the bearing of C from D is 050° write down the bearings of B and A from D.   **2**

(b)   A club has 12 members on its executive, three of whom are Joe, Sue and Ian.

(i)   In how many ways can the President, Secretary and Treasurer be chosen from these 12 people?   **1**

(ii)   A sub-committee of 3 people is to be chosen from the executive. How many distinct sub-committees are possible?   **2**

(iii)   What is the probability that Joe, Sue and Ian will fill the positions on the sub-committee   **1**

(c)   A car has a 95% chance of starting when the key is turned in its ignition. What is the probability (as a decimal) that :

(i)   It will not start on the first turn of the key?   **1**

(ii)   It will start on the second turn of the key?   **1**

(iii)   It will start on the first or second turn of the key?   **1**

Question 27 (13 marks) Start a new sheet of paper. **Marks**

(a) The box and whisker plots shown below, compare the marks of students in two classes.
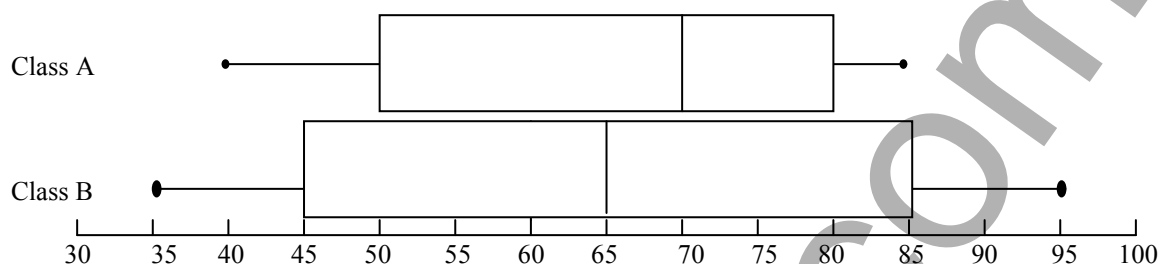
(iv) What is the lowest mark in class A ? **1**

(v) What is the median for class B ? **1**

(vi) What is the range of class B ? **1**

(vii) What is the interquartile range of class A ? **1**

(viii) Compare the skew (or otherwise) of the two classes' results. **1**

(b) A company uses the declining balance method to calculate the salvage value of its plant. If the rate of depreciation is 20% per annum, after how many years will the value fall below half of its original value? **3**

(c) When training "sniffer" dogs used for drug detection, a trial was set up. The results are shown below.
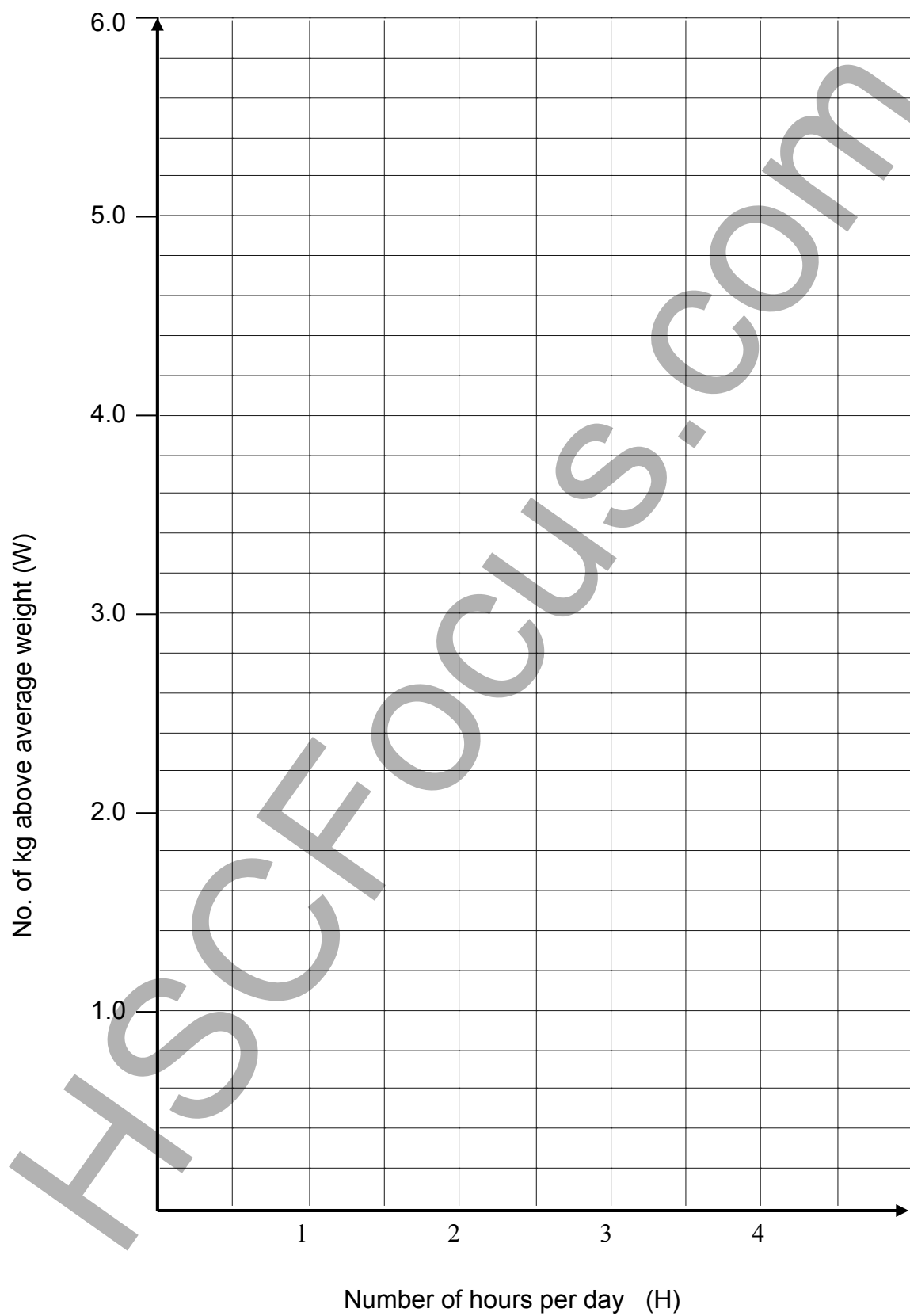
	Drugs Detected	Drugs Not Detected	Total
Bags with drugs	64	16	80
Bags without drugs	21	49	70
Total	85	65	150

(i) What percentage of bags containing drugs were correctly detected? **1**

(ii) What was the overall accuracy rate throughout the trial as a percentage? **2**

(iii) Assume that the dogs maintained the same degree of accuracy after the trial.
If three bags containing drugs are brought past the dogs, what is the probability that the drugs in at least one of the bags will be detected? **2**
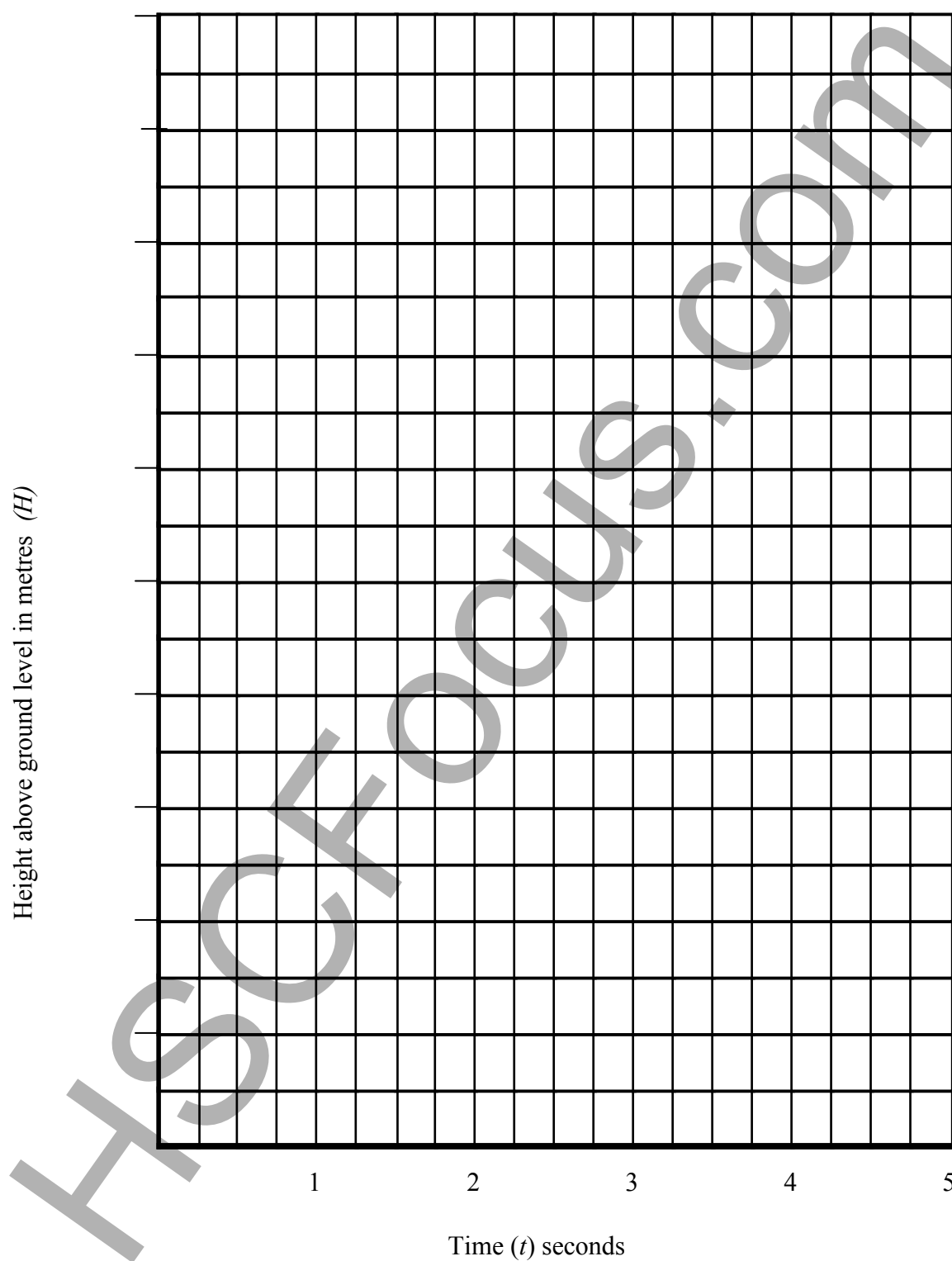
13

Question 28 (13 marks) Start a new sheet of paper.   **Marks**

(a) The latitude and longitude of Townsville and Hobart
are (19°S 147°E), (43°S 147°E) respectively.

   (i)   What is the angular distance between Hobart   **1**
          and Townsville?

   (ii)   Using the radius of the Earth as 6 400 km, calculate the   **1**
          shortest distance in km between Hobart and Townsville.

   (iii) A plane flys at 300 km/h from Hobart and Townsville   **1**
          Find the time of the flight (to the nearest minute).

(b) Michelle borrowed $120 000 to buy a car. It is to be repaid in   **3**
monthly instalments with interest charged at 9% p.a.
compounding monthly over 6 years. Use the present
value formula to find the amount of each instalment.

(c) When a rock is thrown upward from a point above ground level, the
height (H) above ground level in metres at a time (t) seconds after it
has been thrown can be represented by the formula :
$$H = 5 + 4t - t^2$$

   (i)   Copy and complete the table below   **2**

t (s)	0	1	2	3	4	5
H (m)						

   (ii)   On the graph paper supplied, draw a sketch of this   **2**
          relationship.

   (iii) From what height was the rock thrown?   **1**

   (iv)   What was the maximum height reached ?   **1**

   (v)   From your graph, estimate the time at which the height is   **1**
          2.75 metres.

Grid paper for Question 24 (b) (i)

No. of kg above average weight (W)

Number of hours per day   (H)

Grid paper for Question 28 (b) (ii)

Height above ground level in metres *(H)*

Time (*t*) seconds

1   2   3   4   5

Formulae Sheet

Area of an annulus

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

R = radius of outer circle
r = radius of inner circle

Area of an ellipse

$$A = \pi ab$$

a = length of semi-major axis
b = length of semi-minor axis

Area of a sector

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

θ = number of degrees in central angle

Arc length of a circle

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

θ = number of degrees in central angle

Surface area of a sphere

$$A = 4\pi r^2$$

Simpson's rule for area approximation

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

h = distance between successive measurements
d_f = first measurement
d_m = middle measurement
d_t = last measurement

Volume

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

Cylinder $V = \pi r^2 h$

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

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

A = area of base
h = perpendicular height

Mean of a distribution

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

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

x = individual score
$\bar{x}$ = mean

Formula for z-scores

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

s = standard deviation

Probability of an event

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

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

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 quantity
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 = contribution per period, paid at the end
   of the period

Present value (N) of an annuity

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

or

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

Straight-line formula for depreciation

$$S = V_0 - Dn$$

S = salvage value of asset 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 asset after n periods
r = percentage interest rate per period,
   expressed as a decimal

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

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

Gradient of a straight line

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

Gradient–intercept form of straight line

$$y = mx + b$$

m = gradient
b = y-intercept

Multiple Choice Answer Sheet

Name _____

Completely fill the response oval representing the most correct answer.

1.   A ○   B ○   C ○   D ○

2.   A ○   B ○   C ○   D ○

3.   A ○   B ○   C ○   D ○

4.   A ○   B ○   C ○   D ○

5.   A ○   B ○   C ○   D ○

6.   A ○   B ○   C ○   D ○

7.   A ○   B ○   C ○   D ○

8.   A ○   B ○   C ○   D ○

9.   A ○   B ○   C ○   D ○

10.   A ○   B ○   C ○   D ○

11.   A ○   B ○   C ○   D ○

12.   A ○   B ○   C ○   D ○

13.   A ○   B ○   C ○   D ○

14.   A ○   B ○   C ○   D ○

15.   A ○   B ○   C ○   D ○

16.   A ○   B ○   C ○   D ○

17.   A ○   B ○   C ○   D ○

18.   A ○   B ○   C ○   D ○

19.   A ○   B ○   C ○   D ○

20.   A ○   B ○   C ○   D ○

21.   A ○   B ○   C ○   D ○

22.   A ○   B ○   C ○   D ○

WESTERN REGION

2004
TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

General Mathematics

SOLUTIONS

General Mathematics   Trial HSC Examination 2004

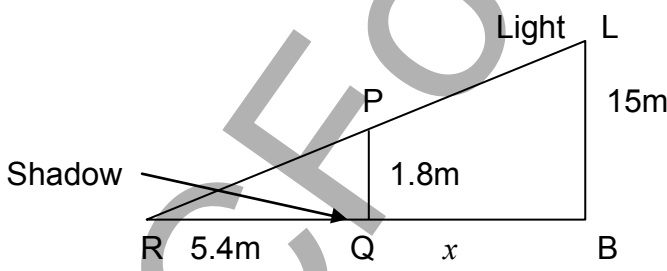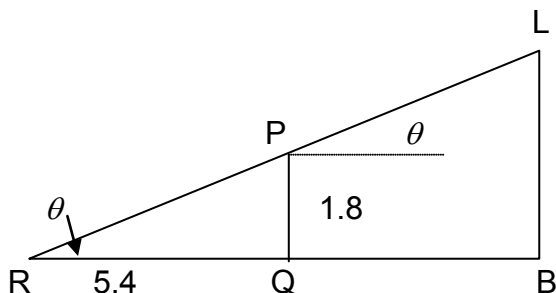## **Multiple Choice Answer Sheet**

Name _____Marking Sheet___

Completely fill the response oval representing the most correct answer.

1. A ○   B ●   C ○   D ○
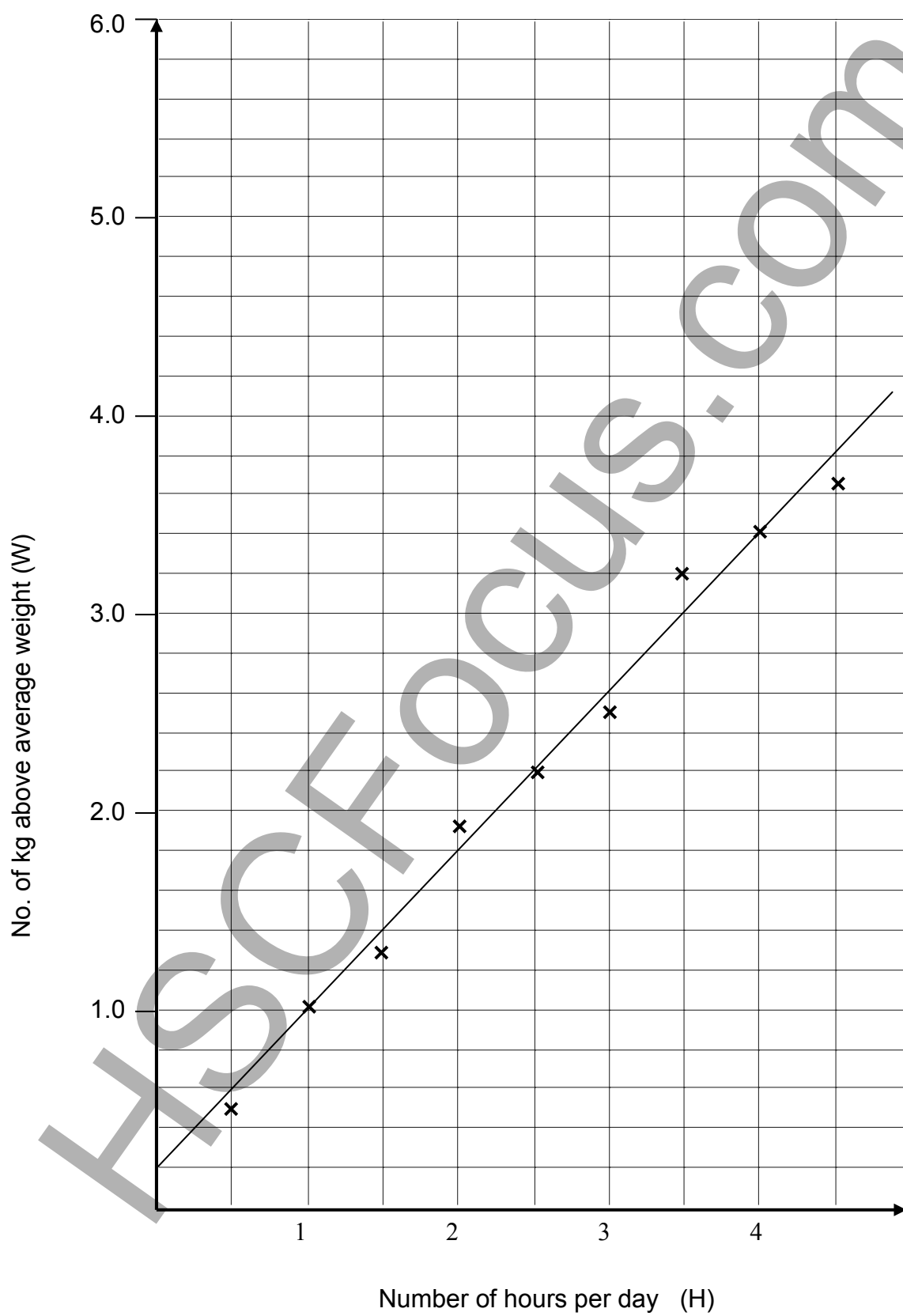
2. A ○   B ○   C ●   D ○

3. A ○   B ○   C ○   D ●

4. A ○   B ●   C ○   D ○

5. A ●   B ○   C ○   D ○

6. A ●   B ○   C ○   D ○

7. A ○   B ○   C ●   D ○

8. A ○   B ○   C ○   D ●

9. A ○   B ○   C ○   D ●

10. A ●   B ○   C ○   D ○

11. A ○   B ○   C ●   D ○

12. A ○   B ●   C ○   D ○

13. A ●   B ○   C ○   D ○

14. A ○   B ●   C ○   D ○

15. A ○   B ○   C ○   D ●

16. A ○   B ●   C ○   D ○

17. A ○   B ○   C ●   D ○

18. A ○   B ○   C ●   D ○

19. A ●   B ○   C ○   D ○

20. A ○   B ●   C ○   D ○

21. A ○   B ○   C ○   D ●

22. A ○   B ○   C ○   D ●

	SECTION II	MARK	COMMENTS

23 (a) (i)	Ellipse A = πab
	            = $\pi \times 9 \times 5$
	            = 141.4 cm^2
	
	Circle A = πr^2
	            = $\pi \times 3.5^2$
	            = 38.48 cm^2
	
	∴ Shaded area
	      = 141.4– 38.48
	      = 103 cm^2 (3 sig figures)
		1
		
		1
		
		1
			
			1 for rounding

(ii)	$V = Ah$
	   $= 102.89 \times 3$ (nearest cm^3)
	   $= 309 cm^3$
		1	

(iii)	Mass = 309 x 0.85
	      = 262.65
	      = 263g (nearest gram)
		1	

(b) (i)		1	
(ii)	Let $QB = x$ and by Similar $\Delta's$ $\dfrac{RB}{RQ} = \dfrac{LB}{PQ}$ (Ratio of corresp. sides) $\dfrac{x+5.4}{5.4} = \dfrac{15}{1.8}$ $x + 5.4 = 45$ $x = 39.6$ Distance is 39.6m	2	Any true method

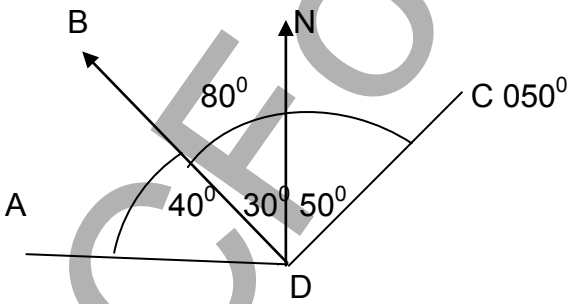|	SECTION II	MARK	COMMENTS
(iii)	 Let angle of elevation be θ as shown. $\angle PRQ = \theta$ $\tan \theta = \dfrac{1.8}{5.4}$ $= 0.\dot{3}$ $\theta = 18.435^0 (3dp)$ Angle of elevation is 18° (nearest degree)	2	Any correct method
(c) (i)	Call time Sydney = 5pm Mon + 22 hrs = 3pm Tuesday	1	
(ii)	Longitude difference = 150° Time difference = 150 x 4 min. = 600 min. = 10 hrs	1	
	London is 10hrs behind Sydney $\therefore$ Call time in London = 3pm Tuesday – 10 hrs = 5am Tuesday	1	
24 (a) (i)	Financial Expectation = 0.6 x \$150 000 - 0.4 x \$200 000 = \$10 000	2	1 correct method
(ii)	Recommendation is to expand as he would be expected to make money, however the expected gain is quite small compared to the possible losses.	1	

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	SECTION II	MARK	COMMENTS
(b) (i)	On graph paper see next page.	3	1 off for each wrong plot.
(ii)	This is a strong positive correlation.	2	$<$ 1 – positive 1 – strong
(iii)	Time with video screen does not cause obesity. It brings about less time doing physical activity which in turn can contribute to obesity.	1	Accept any reasonable explanation
(iv)	See page 5 Median Points $M_1 = (1,1), M_2 = (2.5, 2.2)$ $M_3 = (4, 3.4)$	2	
(v)	Gradient $(M_1 \rightarrow M_3) = \dfrac{2.4}{3}$ $\qquad\qquad m = 0.8$ No need to move line $\dfrac{1}{3}$ of way to M_2 $\therefore W = 0.8H + b$ As line passes through (1, 1) $1 = 0.8 \times 1 + b \quad \therefore b = 0.2$ Or by extending line to axis to get 0.2. $\therefore$ Eqn is $\therefore W = 0.8H + 0.2$	2	Gradient – 1 b – can be read off graph

Grid paper for Question 24 (b) (i)

No. of kg above average weight (W) vs Number of hours per day (H)

		SECTION II	MARK	COMMENTS
25 (a)	(i)	$$\begin{array}{c} \boxed{B} \\ \begin{array}{cc|c} S & 5 & 20 \\ R & 20 & 15 \\ Q & 30 & 10 \\ P & 25 & 5 \\ & & 0 \end{array} \\ \boxed{A} \end{array}$$	1	
	(ii)	$A \doteq \dfrac{h}{3}\left[d_f + 4d_m + d_L\right]$ $A \doteq \dfrac{5}{3}\left[0 + 4 \times 25 + 30\right] + \dfrac{5}{3}\left[30 + 4 \times 20 + 5\right]$ $\doteq 216\frac{2}{3} + 191\frac{2}{3}$ Area $= 408\frac{1}{3}\,\text{m}^2$	2	
	(iii)	V = Ah $= 408\frac{1}{3} \times 2.5$ Volume = 1 021 m^3 $\therefore$ Amount of water 1 021 000 L (4 s.f)	2	1 correct volume 1 for capacity
	(iv)	Time to empty = 1 021 000 $\div$ 80 = 12 760hours = 532 days $\therefore$ It would be empty after 532 days.	1	
(b)	(i)	$V = \frac{1}{3}\pi r^2 h$ $= \frac{1}{3} \times \pi \times 10^2 \times 25 = 2617.99\ldots$ Volume = 2618cm^3 (4 sig Figs)	2	
	(ii)	$V = \frac{4}{3}\pi r^3$ 2618 $= \frac{4}{3}\pi r^3$ $r^3 = 2618 \div \left(\frac{4}{3}\pi\right)$ $\therefore r = \sqrt[3]{2618 \div \left(\frac{4}{3}\pi\right)} = 8.5498\ldots$ Radius = 8.55cm (3 sig Figs)	2	

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	SECTION II	MARK	COMMENTS
25 (c) (i)	$s = 120 - 10 \times 10$ $= 120 - 100$ $= 20$ Speed is 20 m/s upward.	1	Mark for 20
(ii)	$0 = 120 - 10t$ $10t = 120$ $t = 12$ After 12 seconds.	1	
(iii)	$s = 120 - 10 \times 15$ $= 120 - 150$ $= -30$ Speed is 30 m/s downward.	1	Mark given for interpreting the speed as opposite in direction to original speed.

	SECTION II	MARK	COMMENTS
26 (a) (i)	$\dfrac{BD}{250} = \dfrac{1}{\cos 40^0}$ $BD = \dfrac{250}{\cos 40^0}$ $= 326.3518....$ Length BD = 326m (nearest m)	1	If done by scale drawing ok
(ii)	$d^2 = b^2 + c^2 - 2bc \cos D$ $= 110^2 + 326^2 - 2 \times 110 \times 326 \cos 80^0$ $= 105921.95...$ $d = \sqrt{105921.95...}$ $= 325.456....$ Length of BC = 325m (nearest m)	2	1 correct method but wrong answer
(iii)	ΔBDC Area $= \frac{1}{2} b.c. \sin D$ $= \frac{1}{2} x 110 \times 326 \times \sin 80^0$ $= 17657.603...$ $\therefore$ Area = 17658m^2 (nearest m^2)	1	
(iv)	 LNDB = $80^0 - 50^0 = 30^0$ Bearing of B from D = $360^0 - 30^0$ $= 330^0$ Bearing of A from D = $330^0 - 40^0$ $= 290^0$	1 1	
26 (b) (i)	Total arrangements = 12 x 11 x 10 = 1320	1	
(ii)	No. of groups = 1320 ÷ 3! = 220	2	

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	SECTION II	MARK	COMMENTS
(iii)	Prob of 3 specific people on committee = $\dfrac{1}{220}$	1	

(c) (i)	P(not start on first) = 1 – P(start on first)
	        = 1- 0.95
	        =0.05
		1	

(ii)	P(start on second) = P(not start on first)$\times$ P(start on first)
	        = 0.05 $\times$ 0.95
	        = 0.0475
		1	

(iii)	P(start on first or second) = P(start on first) + P(start on second)
	        = 0.95 + 0.0475
	        = 0.9975
		1	

	SECTION II	MARK	COMMENTS
27 (a) (i)	45	1	
(ii)	60	1	
(iii)	Range = 95 – 35 = 60	1	
(iv)	Interquartile range = 80 – 50 =30	1	
(v)	Class A is negatively skewed while B is symmetric (possibly normal)	1	
(b)	$S = V_0(1-r)^n$ $r = 0.2 \quad S = \frac{1}{2}V_0$ $\frac{1}{2}V_0 = V_0(1-0.2)^n$ $0.5 = (0.8)^n$ By trial and error $n = 3.1$ $\therefore$ This occurs after 4 years.	3	1- correct formula $1 – 0.5=0.8^n$
(c) (i)	Correctly detected with drugs = $\frac{64}{80} \times 100$ = 80%	1	
(ii)	Correctly diagnosed = 64 + 49 = 113 $\therefore$ Accuracy rate = $\frac{113}{150} \times 100$ = $75\frac{1}{3}$ %	1 1	
(iii)	Prob of not detecting drugs in bags containing drugs = 20% = 0.2 Prob of no detection = 0.2 x 0.2 x 0.2 = 0.008 Prob of at least 1 detection = 1-0.008 =0.992	1 1	% is ok

	SECTION II	MARK	COMMENTS
28 (a) (i)	Angular distance = 24^0	1	
(ii)	$\therefore$ Distance = $\dfrac{24}{360} \times 2 \times \pi \times$ 6 400 km = 2680.8 km (nearest km)	1	
(iii)	Time = Dist / speed = $\dfrac{2680.8}{300}$ =8.96 = 8 hours and 56 min	1	
(b)	r= 9/12 = 0.0075 n = 12 $\times$ 6 =72 months $N = M\left\{\dfrac{(1+r)^n -1}{r(1+r)^n}\right\}$ $120000 = M\left\{\dfrac{(1.0075)^{72} -1}{0.0075(1.0075)^{72}}\right\}$ $120000 = M\{55.47\}$ $M = \dfrac{120000}{55.47}$ $= 2163$ Repayment is \$2163 per month (nearest \$)	1 1 1	1 – for substitution or changing subject of the formula 1 rearranging or sub 1 solving
(c) (i)	<table><tr><td>T (sec)</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>H (metres)</td><td>5</td><td>8</td><td>9</td><td>8</td><td>5</td><td>0</td></tr></table>	2	1 off for each error
(ii) (iii)	See next page Rock thrown from a height of $\underline{\underline{5m}}$	2 1	Give full mark if they graph incorrect table correctly Give marks if they read incorrect graph correctly.
(iv)	Maximum height of $\underline{\underline{9m}}$	1	
(v)	Height 2.75m after $\underline{\underline{4.5\sec}}$	1	

Grid paper for Question 28 (b) (ii)

Height above ground level in metres *(H)*

Time (*t*) seconds

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