Student Number ....

Barker College

2007
TRIAL
HIGHER SCHOOL
CERTIFICATE

General Mathematics

8:30 AM FRIDAY 10ᵗʰ AUGUST

Staff Involved:
- LMD*
- PJR*
- AJD
- TE
- JM
- WMD
- JWH
- GPF
- GIC
- JML

185 copies
General Instructions

- Working time – 2 hours 30 minutes

- Write using blue or black pen

- Make sure your Barker Student Number is on ALL answer pages handed in

- Approved calculators, graphic calculators and templates may be used

- Marks may be deducted for careless or poorly arranged work

- A Mathematical Formulae Sheet is provided for your general use

Total marks – 100

| Section I |

22 marks

- Attempt Questions 1 – 22
- Allow about 30 minutes for this section
- Answer this section on the Answer Sheet provided

| Section II |

78 marks

- Attempt Questions 23 – 28
- Show ALL necessary working
- Allow approximately 2 hours for this section
- Answer this section on the separate lined paper provided

3

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1. Describe the type of distribution that best matches the diagram below.
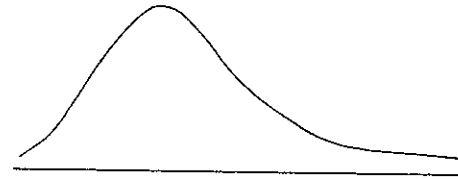

(A)   Positively skewed   (B)   Negatively skewed

(C)   Normal   (D)   Symmetrical

2. Savannah has a lolly jar containing 50 jelly snakes; 10 red snakes, 16 green snakes, 20 yellow snakes and 4 orange snakes.

   Rebecca does not like orange snakes so Savannah removes the orange snakes from the jar, and offers the jar to Rebecca to choose a snake at random. What is the probability Rebecca will choose a red snake?

(A) $\dfrac{1}{5}$ (B) $\dfrac{5}{23}$ (C) $\dfrac{10}{23}$ (D) $\dfrac{5}{46}$

3. Find $\angle ACB$ to the nearest degree
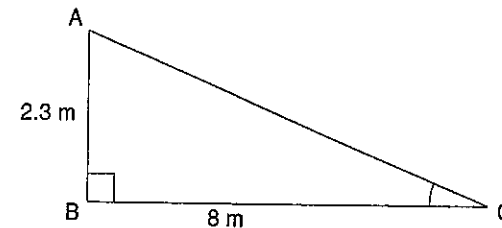
NOT TO SCALE

(A) $8°$ (B) $17°$ (C) $16°$ (D) $73°$

4. One week Rohaan worked 15 hours normal time and 3 hours time-and-a-half.
   In this week his gross pay was $364.65.
   What is his hourly rate of pay?

(A) $18.70   (B) $20.26   (C) $22.10   (D) $12.16

5

5. The step graph below shows the cost of postage for a large letter to be sent within Australia using a regular service. If Nick had two large letters to send, a 250g letter to Perth and a 200g letter to Canberra, how much change would he receive from $5?
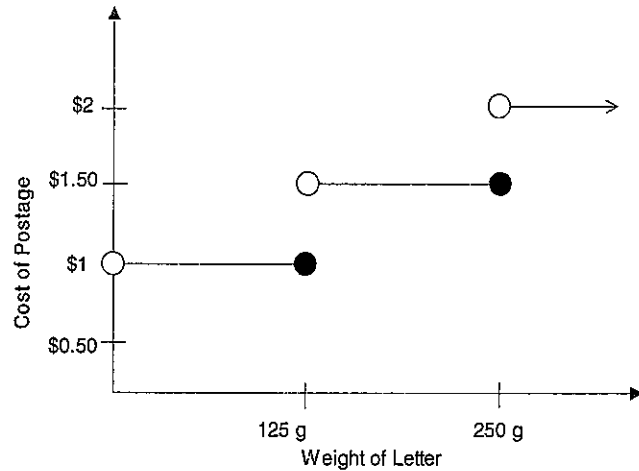
(A) $2.00   (B) $3.50   (C) $2.50   (D) $1.50

6. The box-and-whisker plot below shows the results of a recent test for 120 Year 12 students. How many students scored between 40 and 60?
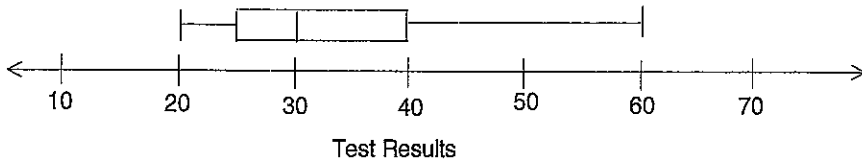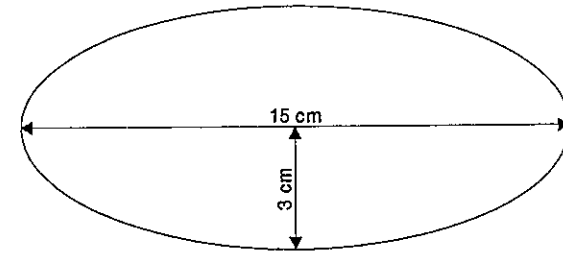

(A) 25   (B) 60   (C) 30   (D) Unknown

7. The value of the 2 in 2.01×10^{-3} is

(A) 200   (B) 2000   (C) 0.02   (D) 0.002

8. The area of this ellipse is given by

(A) $15 \times 3 \times \pi \ cm^2$ (B) $15 \times 6 \times \pi \ cm^2$

(C) $7.5 \times 3 \times \pi \ cm^2$ (D) $7.5 \times 6 \times \pi \ cm^2$

9. Which of these is an example of discrete numerical data?

(A) Eye colour   (B) Shoe size

(C) Length of foot   (D) Temperature

10. Make V the subject of the formula $\dfrac{V-b}{2+V} = 5b$

(A) $V = 5b(2+V)+b$ (B) $V = \dfrac{11b}{1-5b}$

(C) $V = 11b - 5Vb$ (D) $V = \dfrac{9b}{b-2}$

11. Oliver needs to select a squash team of three players from a group of ten players. How many different possible teams can he choose?

(A) 120   (B) 20   (C) 30   (D) 720

12. Simplify $3x^3 - 4x(x^2 - 4)$

(A) $16x - x^3$ (B) $12x^6 - 48x^4$ (C) $-x^3 - 16x$ (D) $-x^3 - 4$

13. Tim owned 500 shares.
When he sold them for $5.80 each, he paid a brokerage fee of 3% of the selling price.
After paying the brokerage fee, how much did Tim receive from the sale?

(A) $87

(B) $2900

(C) $2813

(D) $2987

14. A bowling ball is rolled off the top of a ramp and follows the path given by $h = -0.4d^2 + 10$, where h is the height in metres above the ground and d is the horizontal distance in metres away from the base of the ramp.

How far away from the base of the ramp does the bowling ball land?
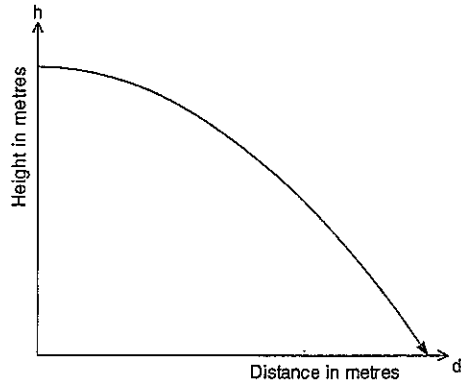
(A) 5 m (B) 10 m (C) 50 cm (D) 25 m

15. Find, to the nearest dollar using the table below, the amount you would have in an account earning 6% per annum at the end of 8 years, if you invested $3000 at the end of each year.

Future Value of an ordinary annuity with a contribution of $1 per period								
Period, n	Interest rate per period, I%							
	1%	2%	3%	4%	5%	6%	8%	10%	12%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0800	2.1000	2.1200
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2464	3.3100	3.3744
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.5061	4.6410	4.7793
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.8666	6.1051	6.3528
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.3359	7.7156	8.1152
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.9228	9.4872	10.0890
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975	10.6366	11.4359	12.2997
9	9.3685	9.7546	10.1591	10.5828	11.0266	11.4913	12.4876	13.5795	14.7757
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808	14.4866	15.9374	17.5487
11	11.5668	12.1687	12.8078	13.4864	14.2068	14.9716	16.6455	18.5312	20.6546
12	12.6825	13.4121	14.1920	15.0258	15.9171	16.8699	18.9771	21.3843	24.1331

(A) $29 692

(B) $29 693
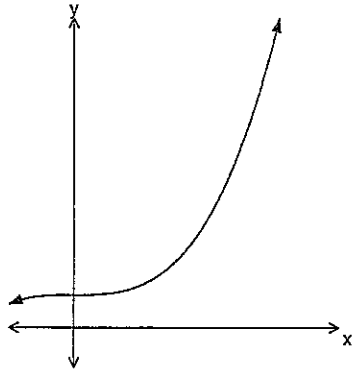
(C) $22 006

(D) $22 007

16. Which of these graphs could be the graph of $2y + x - 6 = 0$?

(A)

(B)

(C)

(D)
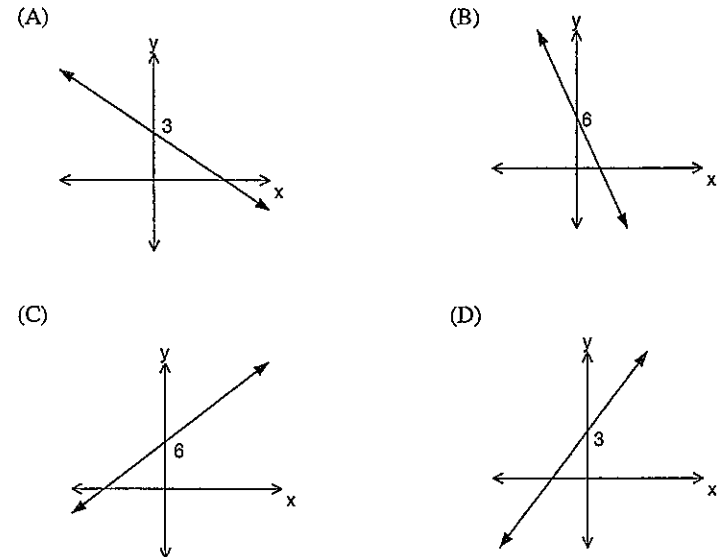
17. A coloured die has 3 red faces, 2 white faces and 1 blue face. If this die is rolled 400 times, how many times can the blue face be expected to be on the upper face?

(A)   15   (B) 67   (C) 80   (D) 150

18. What is a possible equation of the function shown?

(A) $y = x + 2$ (B) $y = 2x^3 + 2$ (C) $y = 2x + 2$ (D) $y = 2^x - 1$

19. Find the value of x to three decimal places given that rectangle A is similar to rectangle B.

NOT TO SCALE

(A)   1.665 cm   (B)   9.667 cm   (C)   9.375 cm   (D)   9.500 cm

20. In a raffle with 1st prize being $1000 and 2nd prize being $500, Kathryn buys 3 tickets.
If there are 100 tickets in total, the probability that Kathryn wins at least $500 is

(A) $\dfrac{3}{100}$ (B) $1 - \dfrac{97}{100} \times \dfrac{96}{99}$ (C) $\dfrac{97}{100} \times \dfrac{3}{99}$ (D) $\dfrac{3}{100} \times \dfrac{2}{99}$

21. The scores 14, 13, 17 and x have a mean of 14.
Another score, y, is added and the mean now becomes 15.
Find the value of y.

(A)   12   (B)   15   (C)   14   (D)   19

22. Alan chooses to invest $10 000 at the end of each year into an account earning interest at a rate of 9.5% per annum.
How long will it take for him to save $150 000?

(A)   5 years   (B)   12 years   (C)   10 years   (D)   15 years

Section II
78 marks
Attempt Questions 23 – 28
Allow about 2 hours for this section
All necessary working should be shown in every question.

Start your answer to each question on a separate A4 sheet of paper.

_____

Marks

Question 23 (13 marks) **[START A NEW PAGE]**

(a) If $a = 3.2$ and $b = -16.2$, find the value of $\dfrac{a+b^2}{a+b}$ correct to three decimal plases. **2**

(b) Solve $\dfrac{14}{3h} + \dfrac{8}{3} = 5$ **2**

(c) Julian threw a ball from the top of a look out tower.
The height of the ball from the ground in metres (h) after t seconds is given by
$h = -5t^2 + 20t + 25$

(i) Copy and complete the table of values for t = 2 and t = 4. **2**

t	0	1	2	3	4	5
h	25	40		40		0

(ii) Why is $t \geq 0$ at all times? **1**

(iii) On the graph paper provided at the back of this paper, carefully plot the points and neatly draw the curve. **2**

(iv) Use the graph to determine the maximum height of the ball. **1**

(v) What does the intercept with the vertical axis, h, represent? **1**

(vi) How long was the ball in the air? **1**

(d) The number of revolutions a wheel makes varies directly with the distance it rolls. **1**
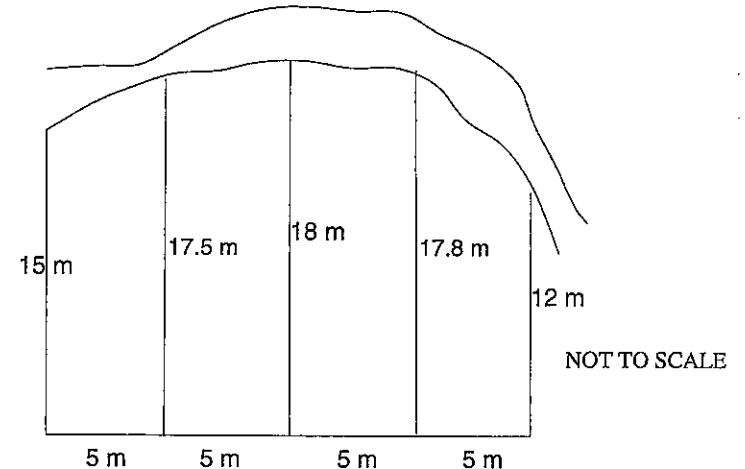A bike wheel revolves 156 times in 12 minutes. How long will it take for the wheel to revolve 247 times?

End of Question 23

13

Marks

Question 24 (13 marks) **[START A NEW PAGE]**

(a) Find the volume of this trapezoidal prism. **2**

NOT TO SCALE
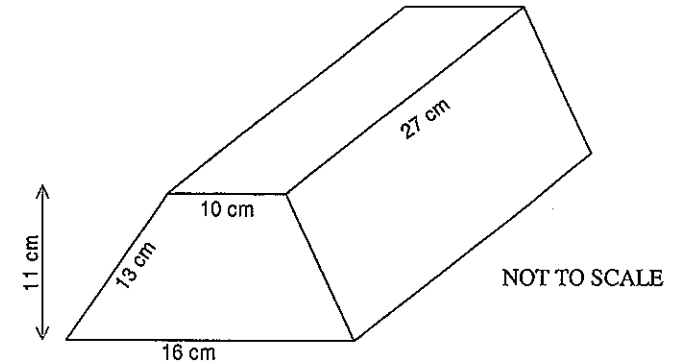
(b) Use two applications of Simpson's Rule to approximate the area of this field **3**

NOT TO SCALE

(c) In a cycle race Henri cycles at an average speed of 11.5 m/s.
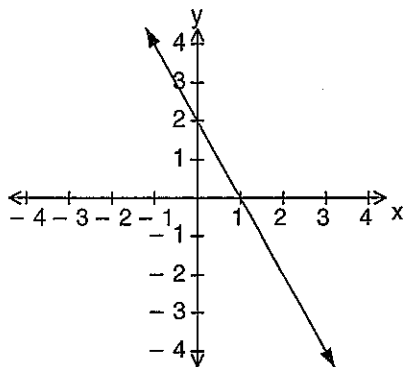
(i) Convert this speed to kilometres per hour, giving your answer to one decimal place. **2**

(ii) If the cycle race is 123 km long, how long does Henri take to complete the race? Give your answer to the nearest minute. **1**
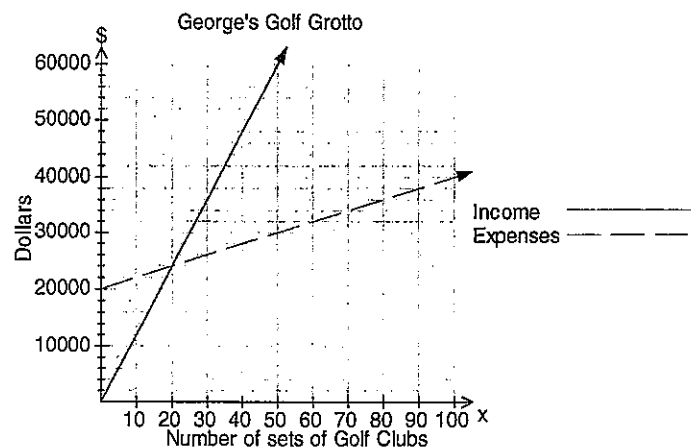
Question 24 continues on the next page

14

(d)   Find the equation for this linear function   2

(e)   The graph below shows the average income and expenses per month at George's
      Golf Grotto.

(i)   What are George's expenses when fifty sets of golf clubs are sold?   1

(ii)   What is George's profit when he sells fifty sets of golf clubs?   1

(iii) How many sets of golf clubs must George sell to break even?
       Explain your answer.   1

End of Question 24

**Question 25** (13 marks)   **[START A NEW PAGE]**

(a)   Find the amount of interest earned when $4 500 is invested for 5 years at 4.5% pa   3
      compounded quarterly.

(b)   The price of a $300 iPod is increased by 10% and then decreased by 5%.
      What is the single, equivalent overall percentage increase or decrease on the price of this
      iPod?   2

(c)   A laptop with a purchase price of $4 155 is depreciated by $425 per year.

      (i)   What is the salvage value of the laptop after 3 years?   1

      (ii)   After how many full years will the laptop be valued at $0?   2

(d)   Sam wants to have a superannuation amount of $700 000 when he retires in 25 years time.
      At an interest rate of 9.5% per annum, how much will he need to contribute
      at the end of each year? Give your answer to the nearest cent.   2

(e)   Determine the single amount of money Nick would need to invest at 4.2% per annum,
      compounding monthly, in order to provide for a series of monthly payments of $400
      for 20 years. Give your answer to the nearest cent.   3

End of Question 25

Question 26   (13 marks)   **[START A NEW PAGE]**

(a)   500 yabbies were caught from a dam, tagged and released into the same dam.   **2**

     Some time later, a sample of 800 yabbies was taken.

     In this sample, 105 tagged yabbies were found.

     Estimate, to the nearest whole yabbie, the number of yabbies in the dam.

(b)   The following cumulative frequency histogram shows the results of a survey of the number of hours of TV watched by a group of Year 11 students in one week.

Cumulative Frequency Histogram
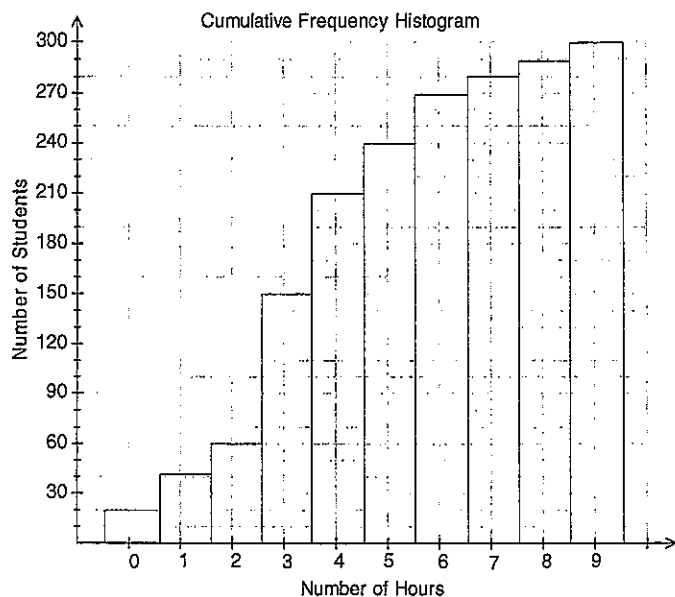
(i)   How many students were surveyed?   **1**

(ii)   How many students watched 3 hours of TV?   **1**

(iii)   What is the median number of hours of TV watched by this group of Year 11 students?   **1**

(iv)   Find the interquartile range.   **1**

Question 26 continues on the next page

(c)   Weekly sales from two stores selling watches were recorded and compared in a back-to-back stem and leaf plot.

Store 1		Store 2
8 6 6 6 5 2	1	2 4 5 8 8
6 4 3 2	2	0 2 4 5 5 5 6 7 8 9
9 8 2	3	1 2 4
5 3 2 1 1 0	4	0 2
1	5	

(i)   Find the mode for each store.   **1**

(ii)   Which of the two stores has the largest range over the recorded period? Show your working.   **1**

(iii)   Calculate the mean and sample standard deviation for each store.   **3**

(iv)   Which store performed the most consistently over these 20 weeks? Justify your answer.   **1**

(d)   This radar chart shows the annual rainfall of NSW and Queensland for the last 10 years

Annual Rainfall 1997 - 2006
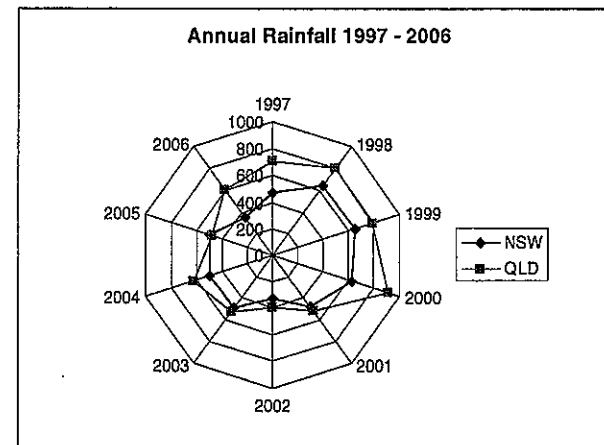
The greatest difference in annual rainfall between NSW and Queensland occurred in which year?   **1**

End of Question 26

Question 27   (13 marks)   [START A NEW PAGE]

(a)   A box contains 8 red and 11 green marbles.
      Julia randomly selects three marbles one at a time and without replacement.
      What is the probability she selects green, red and green in that order?   2

(b)   A new scanning device to be used to detect the presence of aggressive cancer cells in patients
      was tested on a sample of people. Some of the people tested had aggressive cancer cells and
      some of the people did not have aggressive cancer cells.
      The results are represented in this two way table.

	Test Results		
	Accurate	Not Accurate	Total
People with aggressive cancer cells	248	2	250
People without aggressive cancer cells	A	12	250
	486	14	500

      (i)   What is the value of A?   1

      (ii)   How many people participating in the testing had an accurate test result? 1

      (iii) A person is chosen at random from those that participated in the test.
             What is the probability that person does not have aggressive cancer cells and
             has had an accurate test result?   2

(c)   Maggie is planning to open a new business making and selling baby clothes.
      Her financial advisor believes she has a 30% chance of making a $90 000 profit and a 70%
      chance of losing $30 000 over the first year of operation.

      (i)   Calculate the financial expectation involved with Maggie's decision to open   2
             her new business.

      (ii)   Do you recommend she opens her new business? Explain your answer.   1

(d)   There are 6 numbers to be drawn out of 45 possible numbers in Saturday's lotto draw.
      Michael buys one ticket listing 6 numbers and has to get all 6 numbers to win.
      Luckily he does not have to get them in the right order.
      What is the probability of Michael winning on Saturday?   2

(e)   A restaurant offers 6 entrees, 10 main courses and 4 desserts.

      (i)   How many different three course meals could be selected?   1

      (ii)   Aaron eats at the restaurant two nights in a row and chooses a dessert at random.
             What is the probability he chose the chocolate mousse both times?   1
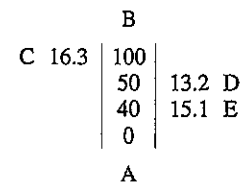
End of Question 27

19

Question 28   (13 marks)   [START A NEW PAGE]

(a)   How many litres are there in 3.5 cubic metres of water?   1

(b)   The length of a soccer pitch is measured as 98 metres and its width as 51 metres. Both
      measurements are to the nearest metre.

      (i)   What is the absolute error involved the measurements?   1

      (ii)   Between what two values could the length of the field lie?   1

      (iii) Find the upper limit of the area of the soccer field.   2

      (iv)   The ground needs new grass and the cost of laying new grass is $5.50 per square
             metre plus labour at $20/hour.
             What is the maximum cost of laying new grass on the field if it takes
             6 hours to complete the work?   2

(c)   A survey was taken of a field and the surveyor sketched the following field diagram. All
      measurements are in metres.

```
                  B
       C  16.3  | 100 |
               |  50 | 13.2  D
               |  40 | 15.1  E
               |   0 |
                  A
```

      (i)   Sketch a diagram of the field.   1

      (ii)   Calculate the area of the quadrilateral ABDE.   2

(d)   Ben walks 4 km from home on a bearing of 078°, then turns and walks due south for   3
      3 km.

      (i)   Sketch a diagram to represent the above information.   1

      (ii)   If Ben were then to walk back home in a straight line, what distance would
             he have to walk? Give your answer to 3 significant figures.   2

End of Question 28

End of Paper

20

Formulae Sheet

Area of an annulus

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

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

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

θ = number of degrees in central angle

Simpson's rule for area approximation

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

h = distance between successive measurements

d_f = first measurement

d_m = middle measurement

d_l = last measurement

Surface area

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

Closed Cylinder $\quad A = 2\pi rh + 2\pi r^2$

r = radius

h = perpendicular height

Volume

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

Cylinder $\quad V = \pi r^2 h$

Pyramid $\quad V = \dfrac{1}{3}Ah$

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

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

$$A = P\left(1 + r\right)^n$$

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

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

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

Present value (N) of an annuity

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

or

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

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

$$S = V_0\left(1 - r\right)^n$$

S = salvage value of asset after n periods

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

Mean of a Distribution

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

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

$\bar{x}$ = 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

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

Gradient–intercept form of straight line
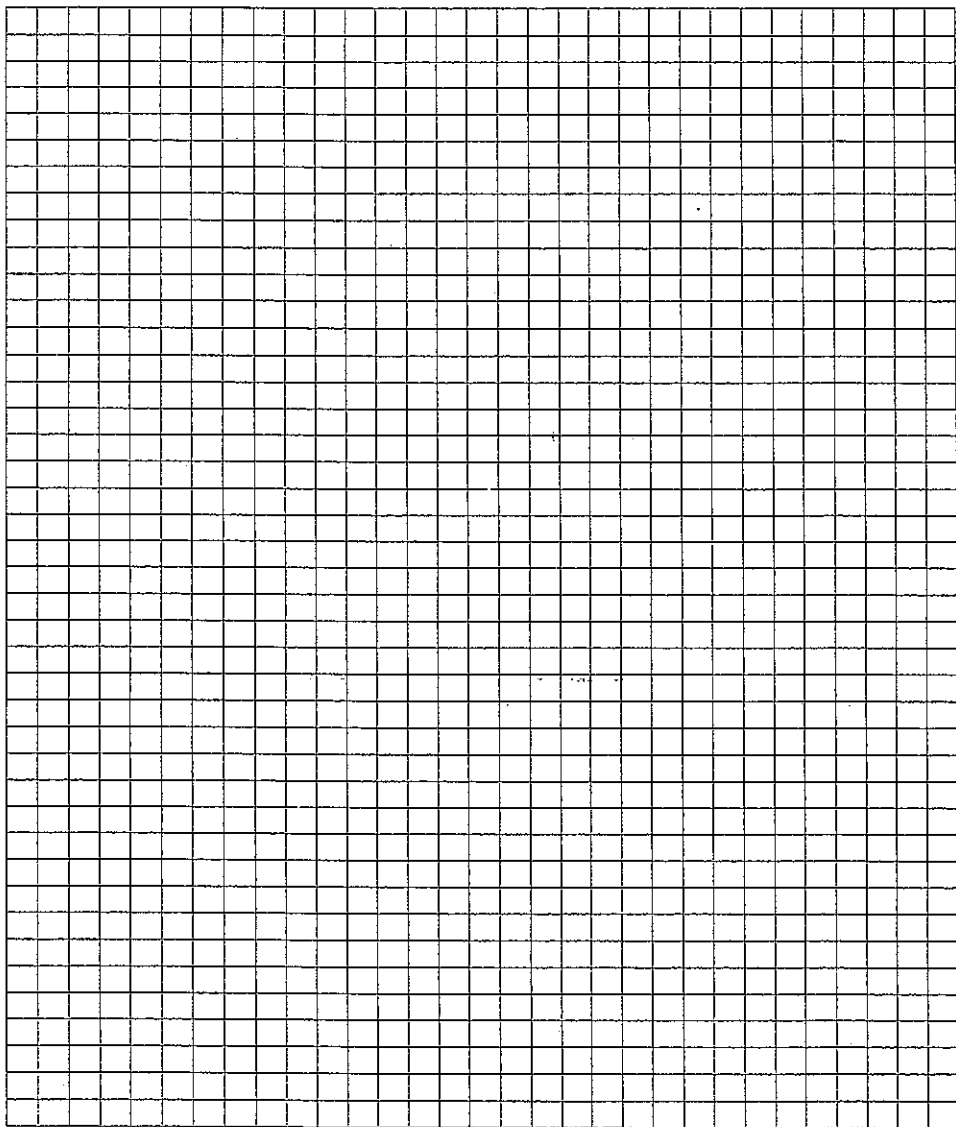
$$y = mx + b$$

m = gradient

b = y-intercept

Probability of an event

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

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

Student Number ....

Graph paper for Question 23

2007 General Mathematics Trial HSC

Section I

1) Positively skewed (A)

2) $P(\text{red}) = \frac{10}{46}$
   $= \frac{5}{23}$ (B)

3) $\tan\theta = \frac{2\cdot3}{8}$
   $\therefore A\hat{C}B = 16°2'23\cdot8''$
   $\doteqdot 16°$ (C)

4) Hours $= 15 + 3\times1\cdot5$
   $= 19\cdot5$
   $\therefore$ Hourly rate $= \frac{364\cdot65}{19\cdot5}$
   $= \$18\cdot70/\text{hr}$ (A)

5) $1\cdot50 + 1\cdot50 = \$3$
   $\therefore$ Change from \$5 is \$2 (A)

6) 25% between 40 and 60
   $\therefore \frac{1}{4}$ of 120 $= 30$ (C)

7) $2\cdot01 \times 10^{-3}$
   $= 0\cdot00201$ (D)

8) $A = \frac{15}{2} \times 3 \times \pi$
   $= 7\cdot5 \times 3 \times \pi$ (C)

9) shoe size (B)

10) $V - b = 5b(2+V)$
    $\therefore V - b = 10b + 5bV$
    $\therefore V = 11b + 5bV$
    $\therefore V - 5bV = 11b$
    $\therefore V(1-5b) = 11b$
    $\therefore V = \frac{11b}{1-5b}$ (B)

11) $\frac{10 \times 9 \times 8}{3 \times 2 \times 1}$
    $= \frac{720}{6}$
    $= 120$ teams (A)

12) $3x^3 - 4x^3 + 16x$
    $= -x^3 + 16x$
    $= 16x - x^3$ (A)

13) $\frac{3}{100} \times (500 \times 5\cdot80)$
    $= \$87$ brokerage fee
    $\therefore$ Tim gets $(500\times5\cdot8) - 87$
    $= \$2813$ (C)

14) $h = 0$
    $\therefore 0 = -0\cdot4d^2 + 10$
    $\therefore 0\cdot4d^2 = 10$
    $\therefore d^2 = 25$
    $\therefore d = 5m$ (A)

15) $9\cdot8975 \times 3000$
    $= 29692\cdot5$
    $\doteqdot \$29693$ (B)

16) $2y = -x + 6$
    $\therefore y = -\frac{x}{2} + 3$ (A)

17) $\frac{1}{6} \times 400$
    $\doteqdot 67$ (B)

18) $y = 2x^3 + 2$ (B)

19) $\frac{x}{10} = \frac{7\cdot5}{8}$
    $\therefore x = \frac{75}{8}$
    $= 9\cdot375cm$ (C)

20) $P(\text{at least 1 prize})$
    $= 1 - P(\text{no prizes})$
    $= 1 - \frac{97}{100} \times \frac{96}{99}$ (B)

21) $15 \times 5 - 14 \times 4$
    $= 19$ (D)

22) $150000 = 10000\left(\frac{1\cdot095^n - 1}{0\cdot095}\right)$
    $\therefore 15 \times 0\cdot095 + 1 = 1\cdot095^n$
    $\therefore 1\cdot095^n = 2\cdot425$
    $1\cdot095^{10} = 2\cdot478...$
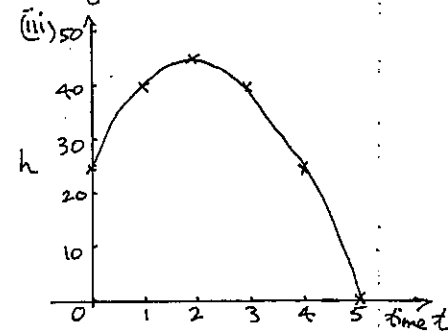 $\therefore 10$ years (C)

Section II

Question 23

(a) $\frac{3\cdot2 + (-16\cdot2)^2}{3\cdot2 + (-16\cdot2)}$
    $= \frac{3\cdot2 + 262\cdot44}{3\cdot2 - 16\cdot2}$
    $= \frac{265\cdot64}{-13}$
    $= -20\cdot4338...$
    $\doteqdot -20\cdot434$

(b) $3h \times \frac{14}{3h} + \frac{8}{3} \times 3h = 5 \times 3h$
    $\therefore 14 + 8h = 15h$
    $\therefore 14 = 7h$
    $\therefore h = 2$

(c)(i) $t=2 \Rightarrow h = -5\times4 + 20\cdot2 + 25$
    $= 45$
    $t=4 \Rightarrow h = -5\times16 + 20\times4 + 25$
    $= 25$

(ii) Because you can't have negative time

(iii)

(iv) Maximum height $\doteqdot 45m$

(v) Height of tower $= 25m$

(vi) 5 seconds

(d) $156 = k\sqrt{12}$
    $\therefore k = 13$
    $\therefore 247 = 13t$
    $\therefore t = 19$ minutes

Question 24

(a) $V = Ah$

$V = \frac{1}{2} \times 11 \times (10+16) \times 27$

$= 3861 \text{ cm}^3$

(b) $A_1 \approx \frac{5}{3}(15 + 4 \times 17.5 + 18)$

$\approx 171\frac{2}{3}$

$A_2 \approx \frac{5}{3}(18 + 4 \times 17.8 + 12)$

$\approx 168\frac{2}{3}$

Total area $\approx 171\frac{2}{3} + 168\frac{2}{3}$

$\approx 340\frac{1}{3} \text{ m}^2$

(c)(i) 11.5 m/s

$= 11.5 \times 60 \times 60 \text{ m/hr}$

$= \frac{11.5 \times 60 \times 60}{1000} \text{ km/hr}$

$= 41.4 \text{ km/h}$

(ii) Time $= \frac{123}{41.4} \approx 2.97 \text{ hr}$

$\approx 2 \text{ hr } 58 \text{ min}$

(d) $m = -2$

y-intercept $= 2$

$y = mx + b$ gives

$y = -2x + 2$

(e)(i) $\$30\,000$

(ii) Profit $= 60\,000 - 30\,000$

$= \$30\,000$

(iii) 20 sets since this is the point of intersection of the income and expenses lines

Question 25

(a) 4.5% p.a. $= 1.125\%$ per quarter

$A = 4500 \times (1.01125)^{20}$

$= \$5628.38$

Interest $= \$1128.38$

(b) Increase of $10\% = 110\%$ of $\$300$

$= 1.1 \times 300$

$= \$330$

Decrease of $5\% = 95\%$ of $\$330$

$= 0.95 \times 330$

$= \$313.50$

Increase of $\$13.50$

$\%$ increase $= \frac{13.50}{300} \times 100$

$= 4.5\%$

(c)(i) $S = 4155 - 3 \times 425$

$= \$2880$

(ii) $0 = 4155 - 425n$

$\therefore 425n = 4155$

$\therefore n = 9.7764...$

$\therefore 10$ full years

(d)

$700\,000 = M\left(\frac{1.095^{25} - 1}{0.095}\right)$

$\therefore 700\,000 = M \times 91.2459...$

$\therefore M \approx \$7671.57$

(e) 4.2% p.a. $= 0.35\%$ per month

20 years $= 240$ months

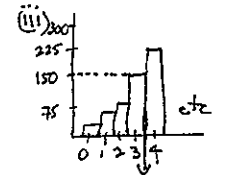$N = 400\left(\frac{1.0035^{240} - 1}{0.0035 \times 1.0035^{240}}\right)$

$= \$64\,874.96$

Question 26

(a) $\frac{500}{P} = \frac{105}{800}$ (tagged) (total)

$\therefore 400\,000 = 105P$

$\therefore P = 3809.52...$

≈ 3810 yabbies

(b)(i) 300 students

(ii) $150 - 60 = 90$ students

(iii)

Median $= 3.5$

(iv) Lower quartile $= 3$

Upper quartile $= 5$

$IQR = 5 - 3$

$= 2$

(c)(i) Store 1 mode $= 16$

Store 2 mode $= 25$

(ii) Store 1 range $= 51 - 12$

$= 39$

Store 2 range $= 42 - 12$

$= 30$

Store 1 has largest range.

(iii)

Store 1	Store 2
Mean $= 30$	Mean $= 25.35$
Sample S.D. ≈ 12.39	Sample S.D. ≈ 8.05

(iv) Store 2 since it has a smaller range and a lower sample standard deviation

(d) Year 2000

Question 27

(a) $\text{Prob}(GRG) = \frac{11}{19} \times \frac{8}{18} \times \frac{10}{17}$

$= \frac{440}{2907}$

(b)(i) $A = 486 - 248$

$= 238$

(ii) 486

(iii) $\frac{238}{500} = \frac{119}{250} = 0.476$

$= 47.6\%$

(c)(i) Financial Expectation

$= 0.3 \times 90000 - 0.7 \times 30000$

$= \$6000$

(ii) Yes she should open the business because she has a "predicted profit" of $\$6000$ over the first year.

(d) No. of possible combinations $= \frac{45 \times 44 \times 43 \times 42 \times 41 \times 40}{6 \times 5 \times 4 \times 3 \times 2 \times 1}$

$= 8\,145\,060$

$\text{Prob(win)} = \frac{1}{8\,145\,060}$

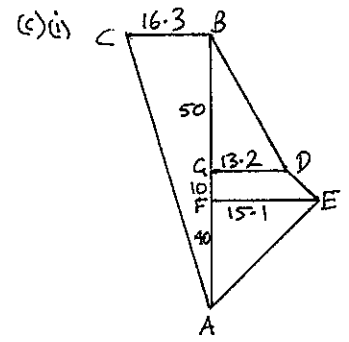(e)(i) $6 \times 10 \times 4$

$= 240$ different meals

(ii) $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$
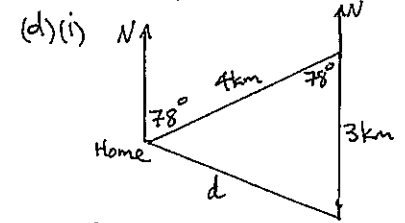
Question 28

(a)

$1 \text{ m}^3 = 100 \times 100 \times 100 \text{ cm}^3$

$= 1\,000\,000 \text{ cm}^3$

$\therefore 3.5 \text{ m}^3 = 3\,500\,000 \text{ cm}^3$

$= 3\,500\,000 \text{ mL}$

$= 3500 \text{ Litres}$

(b)(i) 0.5 m

(ii) Between 97.5 m and 98.5 m

(iii) Upper Area Limit $= 98.5 \times 51.5$

$= 5072.75 \text{ m}^2$

(iv) Max cost $= 5072.75 \times 5.5 + 6 \times 20$

$= \$28\,020.13$

(c)(i)

(ii) Total Area ABDE $=$ Area of $\triangle BDG$ $+$ Area of trapezium DEFG $+$ Area of $\triangle AEF$

$= \frac{1}{2} \times 50 \times 13.2 + \frac{1}{2} \times 10 \times (13.2 + 15.1) + \frac{1}{2} \times 40 \times 15.1$

$= 330 + 141.5 + 302$

$= 773.5 \text{ m}^2$

(d)(i)

(ii) $d^2 = 3^2 + 4^2 - 2 \times 3 \times 4 \times \cos 78°$

$= 25 - 24\cos 78°$

$= 20.0101...$

$\therefore d = 4.4732...$

≈ 4.47 (3 s.f.)