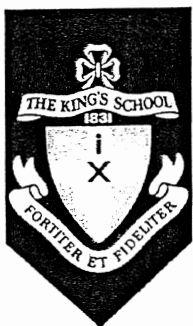


Class _____

Student
Number _____



THE KING'S SCHOOL

2006
Higher School Certificate
Trial Examination

General Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2.5 hours
- Write using black or blue pen
- Board approved calculators may be used
- Draw diagrams using pencil
- Write your student number at the top of every page
- A formulae sheet is provided separately

Total marks – 100

Section I - Pages 2 – 13

Total marks (22)

Attempt Questions 1 – 22

Allow about 30 minutes for this section

Section II - Pages 14 – 24

Total marks (78)

Attempt Questions 23 - 28

Allow about 2 hours for this section

This paper **MUST NOT** be removed from the examination room

STUDENT NUMBER/1

STUDENT NUMBER/NAME.....

1. How many significant figures are there in the decimal 0.0604?

- (A) 2
- (B) 3
- (C) 4
- (D) 5

2. Evaluate $4a - 2a^2$ if $a = -3$

- (A) -30
- (B) -48
- (C) 6
- (D) 24

3. The two similar dollar signs have heights in the ratio 2 : 5.

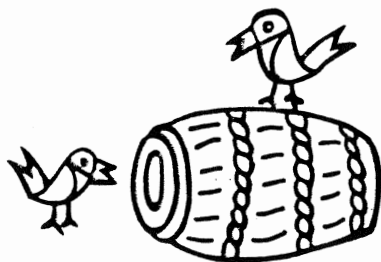


If the large sign has a height of 20 cm, what is the height of the small sign?

- (A) 8 cm
- (B) 11 cm
- (C) 14 cm
- (D) 17 cm

STUDENT NUMBER/NAME.....

4. 8 yellow tipped birds and 4 blue tipped birds live in an aviary and feed from a barrel.



When two birds feed from the barrel, what is the probability that both birds are blue tipped?

- (A) $\frac{4}{12} \times \frac{3}{11}$
- (B) $\frac{4}{12} \times \frac{4}{11}$
- (C) $\frac{4}{8} \times \frac{3}{11}$
- (D) $\frac{4}{8} \times \frac{3}{7}$

5. A tank is being emptied of liquid at the rate of 5 litres per minute.

At this rate, how long will it take for a kilolitre of water to empty from the tank?



- (A) 3 minutes 20 seconds
- (B) 20 minutes
- (C) 33 minutes 30 seconds.
- (D) 3 hours 20 minutes.

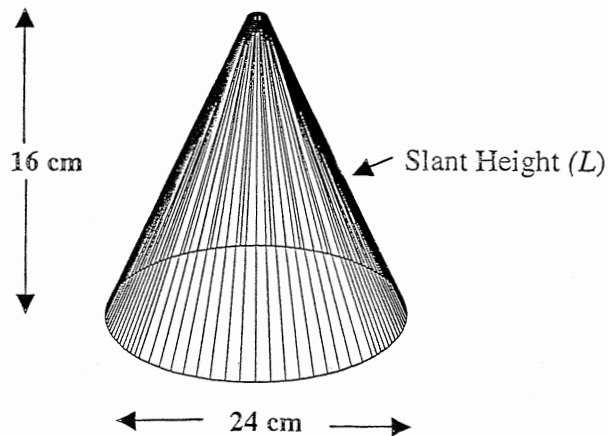
STUDENT NUMBER/NAME.....

6. Which of these data sets is negatively skewed?

- (A) 10, 20, 40, 45, 50
- (B) 15, 20, 30, 45, 50
- (C) 10, 15, 20, 25, 30
- (D) 10, 10, 20, 30, 30

7. A child's party hat is made in the shape of a cone with a height of 16 cm and diameter of 24 cm.

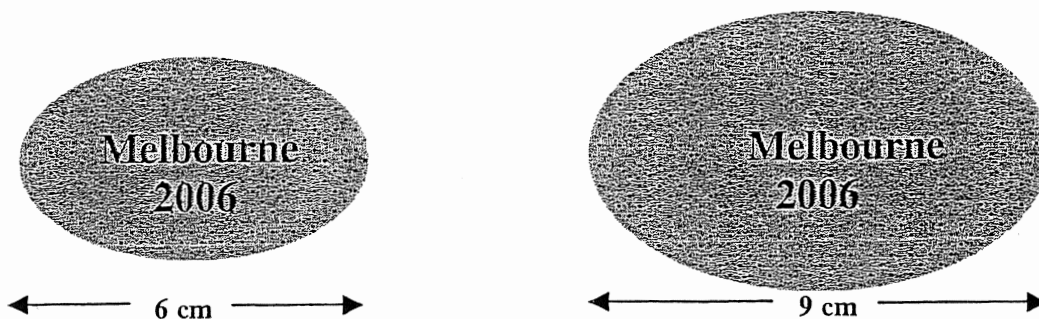
The slant height (L) of the cone is the length from the top, to any point on the circumference of the base.



Using the formula: Surface area (S) = πrL where r is the radius, what is the approximate surface area (in cm^2) of the party hat?

- (A) 603
- (B) 754
- (C) 1508
- (D) 9048

8. Stickers for the 2006 Commonwealth games were made in the shape of ellipses.

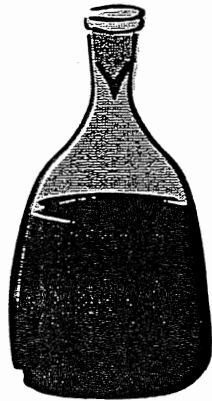


The length of the major axis in two similar stickers is shown.

What is the ratio of the area of the two stickers?

- (A) 1 : 3
 - (B) 4 : 9
 - (C) 2 : 3
 - (D) 3 : 4
9. After the City to Surf, a jogger finds he has lost 5% of his weight. If he weighs 76kg after the race, his original weight is closest to:
- (A) 72.2kg
 - (B) 76.4kg
 - (C) 79.8kg
 - (D) 80kg

10. 350 mL of the contents of a bottle have been used.

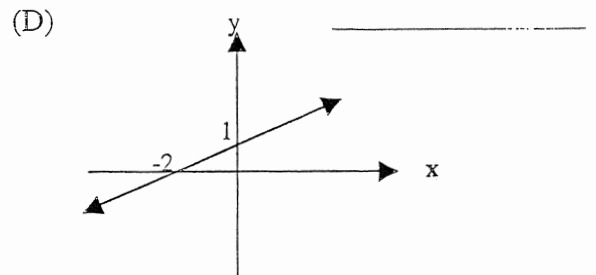
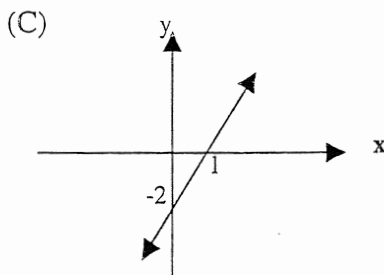
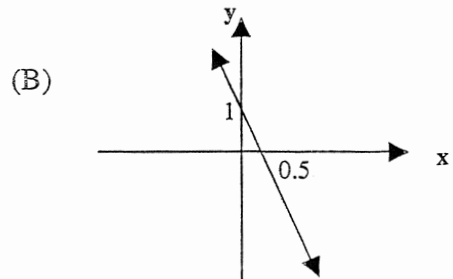
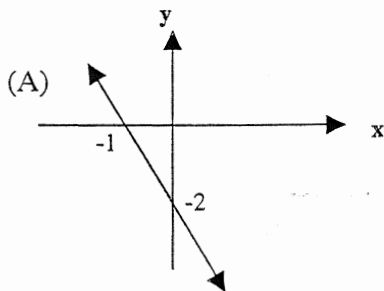


← 1.25 L remaining

If 1.25 L of the bottle's full capacity remains, what percentage has been used?

- (A) 21.88%
- (B) 28%
- (C) 72%
- (D) 90%

11. Which of the diagrams shows the graph of $y = 1 - 2x$?



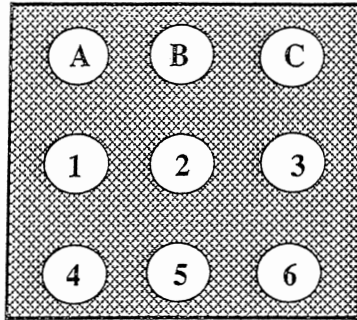
12. The careers advisor of a high school determined the number of last year's HSC students who either continued with further study, or joined the work force.

	Further Study	Workforce
Boys	62	28
Girls	70	35

From the information in the table, what is the probability that if a girl was selected at random from last years HSC students, she would have joined the workforce?

- (A) $\frac{35}{195}$
- (B) $\frac{35}{135}$
- (C) $\frac{35}{70}$
- (D) $\frac{35}{63}$
13. Simplify: $5 - 3(2x - 1)$
- (A) $4x + 3$
- (B) $4x - 3$
- (C) $8 - 6x$
- (D) $2 - 6x$

14.

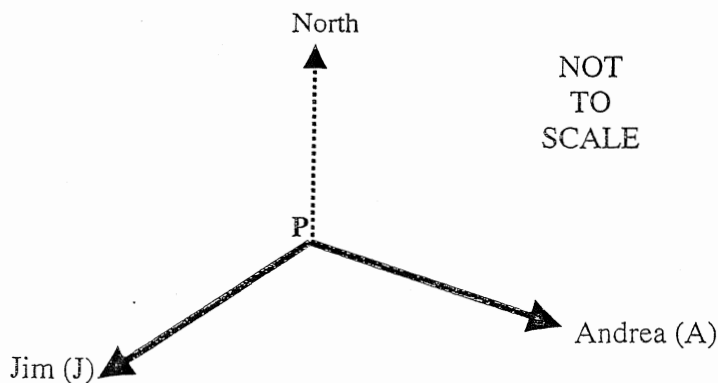


A code of 2 letters and 3 numbers is to be pressed on the security panel. Any letter and any number can be repeated.

How many codes are possible?

- (A) 6
- (B) 60
- (C) 1944
- (D) 531441

15.



Jim leaves point P and walks on a bearing of $S 50^\circ W$.
 Andrea leaves point P and walks on a bearing of $110^\circ T$.

What is the angle JPA?

- (A) 60°
- (B) 110°
- (C) 120°
- (D) 160°

STUDENT NUMBER/NAME.....

16. A person's Body Mass Index (*BMI*) can be found using the formula:

$$BMI = \frac{m}{h^2} \quad (\text{where } m \text{ is the person's mass in kg and } h \text{ is the person's height in metres.})$$

Peta has a mass of 67.5 kg and a BMI of 22.5.

Which of the following calculations gives Peta's height?

- (A) $\sqrt{\frac{67.5}{22.5}}$
- (B) $\frac{22.5^2}{67.5}$
- (C) $\sqrt{67.5} \times 22.5$
- (D) $\sqrt{22.5} \times 67.5$

17. A one cubic metre tank can hold 1000 litres.

What is the capacity of one cubic centimetre of the tank?

- (A) 1 millilitre
- (B) 10 millilitres
- (C) 1 litre
- (D) 10 litres

STUDENT NUMBER/NAME.....

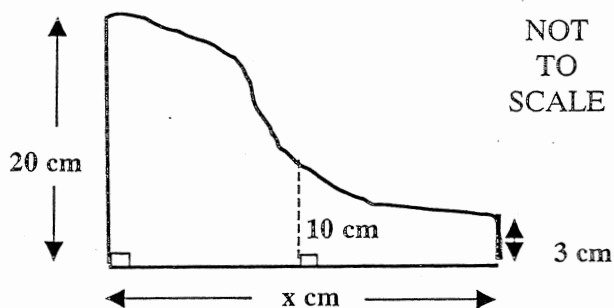
18. An interest rate of 5% p.a. compounded annually is paid on an account for the first 2 years of an investment.

The interest rate increases to 6% p.a. compounded annually for the next 2 years.

Which of the following calculations would give the value (A) of the investment (P) after 4 years?

- (A) $A = P(1.11)^4$
(B) $A = P(1.05)^4 + P(1.06)^4$
(C) $A = P(1.05)^2 (1.06)^2$
(D) $A = P(1.05)^2 + P(1.06)^2$

- 19.



Three perpendicular lengths across a piece of a jig-saw puzzle are shown, with the distance from the centre of the base to the curved edge as 10 cm.

The area of this piece of the puzzle is 189 cm^2 .

Using Simpson's rule, calculate the length (x) of the base.

- (A) 9 cm
(B) 15 cm
(C) 18 cm
(D) 30 cm

20. Simplify: $\sqrt{p^{16}q^{36}}$

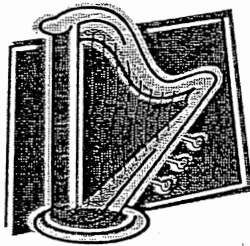
(A) pq^{10}

(B) $(pq)^{10}$

(C) $(pq)^{26}$

(D) p^8q^{18}

21. The frequency (number of vibrations per second) measured in Hertz (Hz) of a string on the harp is inversely proportional to the square root of the length of the string.



The frequency of a string of length 25 cm is 10 Hz.

What length of string (in cm) produces a frequency of 20 Hz?

(A) 3.5

(B) 6.25

(C) 15

(D) 64

STUDENT NUMBER/NAME.....

22. Without reading any of the questions, Barry fills in an answer sheet for a 22 question multiple choice test. Each of the questions has 4 possible answers. What is the probability that he gets all 22 questions correct?

(A) $\frac{1}{4}$

(B) $\frac{2}{11}$

(C) $\frac{4}{7315}$

(D) $\frac{1}{4^{22}}$

End of Section I

Section II**Total marks (78)****Attempt Questions 23 – 28****Allow about 2 hours for this section**

Answer the questions on your own paper, or writing booklet, if provided. Start each question on a new page. All necessary working must be shown.

Question 23 (13 marks)**Marks**

- (a) Electricity charges for households are based on the average daily usage of kilowatts per hour (kwh) over a period of 90 days.

A different rate for 'domestic' usage and 'off-peak' usage is applied:

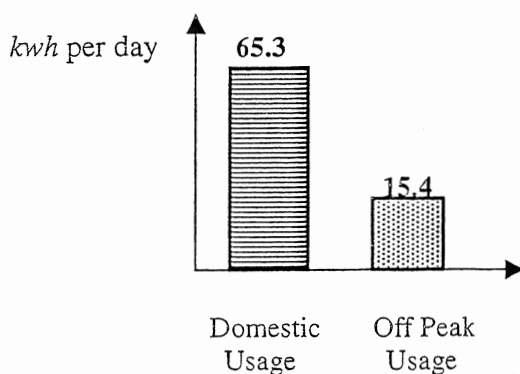
Domestic Usage: \$0.119397 per kwh for the first 1880 kwh

\$0.124267 per kwh for usage over 1880 kwh

Off Peak Usage: \$0.044988 per kwh

A 10% Goods and Services Tax (GST) is added to the total.

The graphs show a household's average daily usage of electricity for the last 90 days.



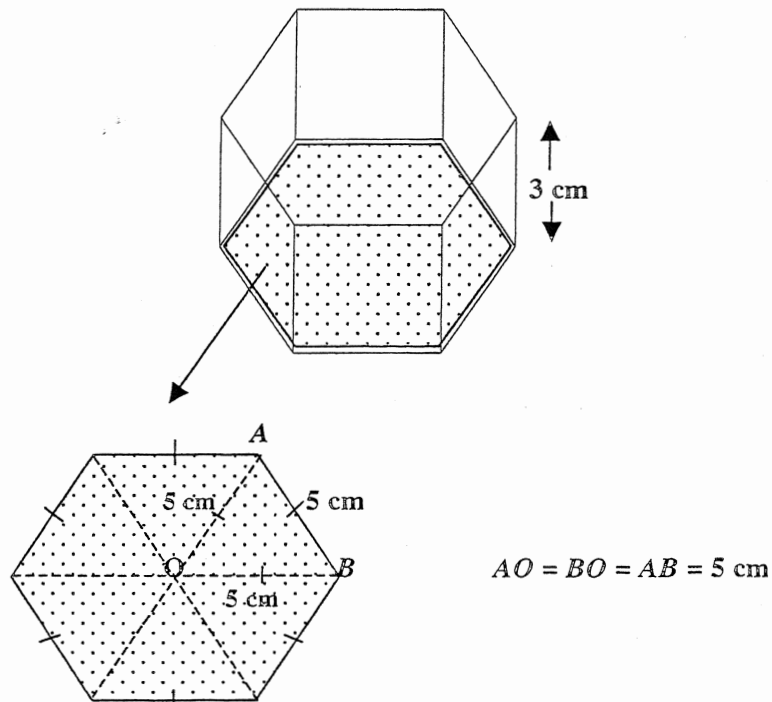
- (i) Calculate the charge for the 'domestic' usage of electricity for this household for the 90 days. 2
- (ii) Calculate the charge for the 'off peak' usage. 1
- (iii) What is the total charge for electricity usage for this household for the last 90 days? 2

Question 23 (continued)

Marks

- (b) A hexagonal prism made completely from thin glass is open at the top.

The prism has a height of 3 cm and a regular hexagonal base with edges 5 cm (shown below)



- | | | |
|-------|---|---|
| (i) | Explain why angle AOB is 60° . | 1 |
| (ii) | Use the formula $\text{Area} = \frac{1}{2}ab\sin C$ to determine the area of triangle ABO to the nearest square centimetre. | 2 |
| (iii) | Find the area of the hexagonal base of the prism. | 1 |
| (iv) | Determine the volume of the prism. | 2 |
| (v) | Determine the area (in cm^2) of glass used in the construction of the prism. | 2 |

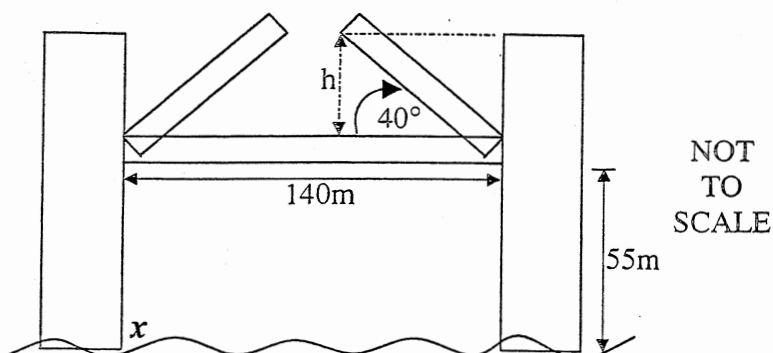
End of Question 23

Question 24 (13 marks)

Marks

- (a) The 140 metre walkway between the pylons of the bridge opens up to allow ships to pass underneath.

The two sections of walkway are elevated to an angle of 40° and open to a height, h metres above their original horizontal position, so that they are exactly in line with the top of the pylons.



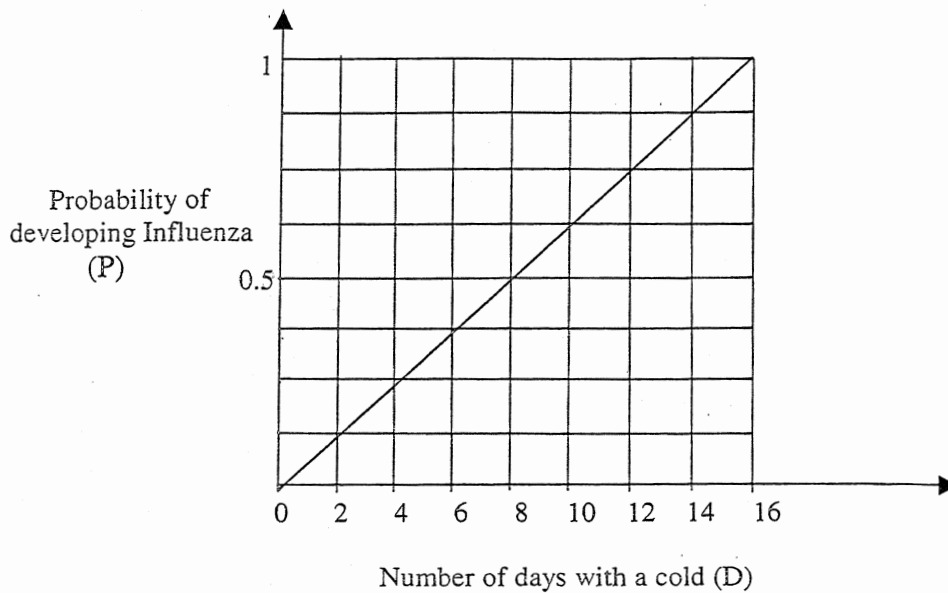
- (i) Calculate the height (h) that the sections of walkway reach above their original horizontal position. (Give your answer to the nearest metre.) **2**
- (ii) The walkway is 55 metres above the water line. **1**
- Determine the height of the pylon from the water line.
- (iii) Determine the angle of elevation of the walkway from the water line at point x . **3**
(Give your answer to the nearest degree).

Question 24 continues on next page

Question 24 (continued)

Marks

- (b) The probability that a person will develop influenza if they have had a cold continuously for a number of days, is shown on the graph below:



- (i) What probability corresponds to one division on the vertical scale? 1
- (ii) After how many days with a cold will a person be certain of developing influenza? 1
- (iii) What is the probability that a person will develop influenza after 10 continuous days with a cold? 1
- (c) Chicago has co-ordinates (42°N, 88°W) and Rome has co-ordinates (42°N, 12°E)
- (i) Show the position of these cities on a neatly drawn diagram of the Earth's surface. (Show the equator on your diagram.) 2
- (ii) Maria makes a phone call at 2:15 pm local time from Rome to her sister Isabela, who is on a tour in Chicago. 2
- What local time in Chicago will Isabela receive the call?

End of Question 24

Question 25 (13 marks)

Marks

- (a) The probability of choosing a bad tomato from a very large box of tomatoes is $\frac{1}{10}$. Two tomatoes are chosen at random.
- (i) draw a probability tree containing all of the above information. 1
- What is the probability that:
- (ii) both tomatoes are bad? 1
- (iii) only one tomato is bad? 1
- (iv) at least one tomato is bad? 2
- (b) (i) A committee of 5 people is to be chosen from a class of 12 students. How many possible committees can be chosen? 1
- (ii) If the class contains exactly 3 girls, how many committees of 5 containing all 3 girls are possible? 1
- (c) Solve $\frac{x}{5} - \frac{2x+3}{2} = 9$ 2

Question 25 continues on next page

Question 25 (continued)

Marks

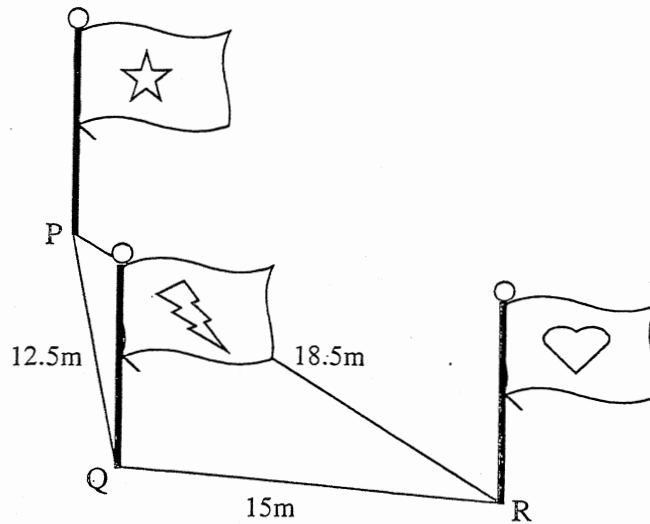
- (d) Troy borrows \$30 000 as a personal loan to buy a car. The interest charged is at a flat rate of 16.5% p.a and in addition he pays a loan protection of 25cents per \$100 borrowed. He agrees to repay the loan plus other charges by equal monthly instalments over 3 years.
- (i) Find the total interest paid for 3 years. 1
- (ii) Find the total charges paid for the loan. 1
- (iii) Calculate the monthly instalments, to the nearest cent. 1
- (iv) Find the effective annual interest rate $a\%$ correct to 2 decimal places, using the formula
- $$a = \frac{2nR}{n+1}$$
- where $R\%$ is the flat rate of interest
 n is the number of instalments 1

End of Question 25

Question 26 (13 Marks)

Marks

- (a) Three flags on the roof of a building are shown in the diagram below.



- | | | |
|-------|--|---|
| (i) | Explain why $\angle PQR$ is the largest angle in the triangle formed by the flags on the roof. | 1 |
| (ii) | Show by calculation that the size of the largest angle is 84° . | 3 |
| (iii) | Determine the size of $\angle PRQ$ to the nearest degree. | 2 |
| (iv) | If the flag pole at R is due East of the flag pole at Q, determine the bearing of the flag pole at P from R. | 1 |

Question 26 continues on next page

STUDENT NUMBER/NAME.....

- (b) A computer network system has been installed in an office block at a cost of \$35 000.

The office manager calculates the depreciation of the computer equipment using the *Declining Balance method* at a rate of 22.5% per year for the first 2 years, then uses the *Straight Line method* to calculate the depreciation of the equipment for a further 3 years at 25% per year.

- (i) Calculate the value of the computer equipment after 2 years.
(Give your answer to the nearest dollar.) 2
- (ii) Calculate the value of the computer equipment at the end of 5 years
of use. 2
- (iii) Determine as a percentage how much the computer equipment depreciates over
5 years of use. (Give your answer to the nearest whole number.) 2

End of Question 26

Question 27 (13 Marks)**Marks**

- (a) Two species of pine, the Radiata pine and the Norfolk pine, are growing in a state forest.
A forest ranger needs to compare the growth of the two species of trees before they are felled and completes a back to back stem-and-leaf plot for the heights in metres of a sample of 20 of each species.

The tree heights are recorded with 1 decimal place (eg: $9 \mid 4 = 9.4$ metres)

Radiata Pine		Norfolk Pine
9 9 4 3 3	8	2 4 4 6
7 6 6 6 5 4 2	9	2 8 9 9
9 8 8 6 5 5 5 5	10	2 2 4 5 7
	11	1 1 3 3 3 7
	12	1

- (i) Identify which species of tree has the greatest range in height:
What is the range? 1
- (ii) Identify which species of tree has the mode height in the forest:
What is the mode? 1
- (iii) The ranger recorded the following data for the heights (in metres) of the Radiata pine trees: 4
- Median 9.6
 - Mean 9.7
 - Inter-Quartile Range 1.45
 - Sample Standard Deviation 0.852

Calculate the same data for the heights of the Norfolk Pine trees.

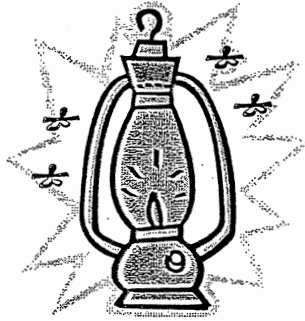
- (iv) Using the data from both species of tree, suggest which species has the more consistent height. 1

Question 27 continues on next page

Question 27 (continued)

Marks

- b) The number of insects (N) attracted to a light is related to the Intensity (I) of the light measured in Watts.



The following table gives values of N for some values of I .

I	10	20	30	40
N	7	13	23	37

The values in the table are related by the formula: $N = 5 + kI^2$

- (i) Use the table of values to show that $k = 0.02$. 2
- (ii) Calculate the number of insects attracted to a light with an intensity of 60 watts. 1
- (iii) Calculate the intensity of a light (to the nearest 10 watts) which would attract 200 insects. 2
- (iv) Give the name of the graph which could best show the relationship between N and I . 1

End of Question 27

Question 28 (13 Marks) Begin a NEW page.

Marks

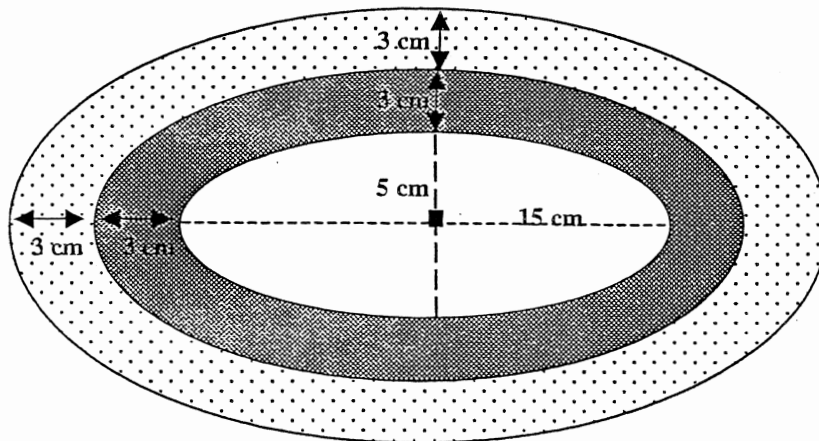
- (a) \$225 000 is borrowed from a financial institution at an interest rate of 6.9% p.a charged monthly on the amount owing.

(i) Use the formula $N = M \left\{ \frac{(1+r)^n - 1}{r(1+r)^n} \right\}$ to determine the monthly repayment on the loan if it is to be repaid over 30 years. 3

(ii) Calculate the interest charged on the loan over the 30 year period. 2

- (b) A Christmas decoration comes flat in its packaging and consists of several layers of cellophane in the shape of ellipses overlapping each other.

The top ellipse has semi major and semi minor axes lengths as shown and 3 cm of each layer underneath can be seen surrounding the layer above.



The shaded sections represent the area of the 'elliptical ring' seen between the layers.

(i) Show that the area of the first ring (between the top and second layer) is given by 69π 3

(ii) Write an expression for the area (A) of the 4th ring using the table below:

Number of rings (n)	1	2	3	4
Area of rings (A)	69π	87π	105π	

Record your answer in your work book. 1

(iii) Write down a formula which would give the area (A) of the 'n'th ring. 2

(iv) The area of the last ring is 195π .
How many layers of cellophane are in the decoration? 2

End of paper

Solutions 2006 General TRIAL HSC

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

Question 23

a. i. For 90 days $65.3 \times 90 = 5877 \text{ kwh}$ ✓

$$1880 \times 0.119397 + (5877 - 1880) \times 0.124267 = \$721.16$$
 ✓

2 marks for correct answer.
Ignore rounding errors
1 mark for correct calculation of total kwh or CNE for total charge.

ii. $15.4 \times 90 \times 0.044988 = \62.35 ✓
1 mark for correct answer.

iii. $721.16 + 62.35 = 813.51$
 $GST \frac{10}{100} \times 813.51 = 81.35$ ✓
 $81.35 + 813.51 = 894.86$ ✓

2 marks for correct answer or CFPA .
Ignore rounding errors
1 mark for correct calculation of total kwh or CNE for total charge.

TKS 2006 General Mathematics Trial HSC

b. i. $360 \div 6 = 60^\circ$ ✓

1 mark for CNE calculation MUST be shown.

ii. $AREA = \frac{1}{2} \times 5 \times 5 \sin 60$ ✓
 $= 10.8 \text{ cm}^2$ ✓
 $= 11 \text{ cm}^2$

2 marks for correct answer correctly rounded. OR correct answer CFPA with working shown only and correct rounding.

1 mark for correct calculation with incorrect rounding.

iii. $6 \times 11 = 66 \text{ cm}^2$ ✓

1 mark for correct calculation (CFPA) or CNE.

iv. $66 \times 3 = 198 \text{ cm}^3$ ✓ ✓

2 marks for correct answer.
OR correct answer CFPA with working shown only and correct rounding.

1 mark for correct CNE no final answer.

v. $66 + (3 \times 5 \times 6) = 156 \text{ cm}^2$ ✓ ✓

2 marks for correct answer.
OR correct answer CFPA with working shown only and correct rounding.

1 mark for progress to solution (missing one set of faces).

Question 24

a i) $\sin 40 = \frac{x}{70}$ ✓
 $70 \times \sin 40 = x$
 $44.995 = x$ ✓
 $45 \text{metres} = x$

2 marks for correct answer.
 Ignore rounding errors
 1 mark CNE but no or incorrect calculation

ii) $45 + 55 = 100$ ✓

1 mark for correct answer CFPA.

iii) $\tan \theta = \frac{55}{140}$ ✓ ✓
 $\theta = 21^\circ$ ✓

3 marks for correct answer with correct rounding.
 2 marks for incorrect rounding error
 1 mark CNE but no calculation or incorrect calc.

b i) $1 \div 8 = 0.125$ ✓

1 mark for correct answer or any equivalent expression

ii) 16 days ✓

1 mark for correct answer.

iii) $0.5 + 0.125 = 0.625$ ✓

1 mark for correct answer.

c i) Chicago 88° West 0° Rome 12° East



OR equivalent spherical diagram.

2 marks for correct indication of longitude and latitude of both cities (equator and prime meridian must be shown).

1 mark for evidence of latitude or longitude or only one city shown or no equator and prime meridian.



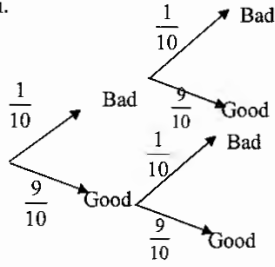
$88 + 12 = 100^\circ$
 $100 \div 15 = 6 \text{hrs } 40 \text{m behind}$ ✓
 $7:35 \text{ am}$ ✓

2 marks for correct answer including AM.

1 mark for correct calculation of longitude difference but incorrect time calculation or evidence of valid time calculation from incorrect longitude difference.

Question 25

a. i.



1 mark correct tree diagram with all info shown.

$$\begin{aligned} \text{ii. } P(B,B) &= \frac{1}{10} \times \frac{1}{10} \\ &= \frac{1}{100} \checkmark \end{aligned}$$

1 mark for correct answer (any equivalent form) or CNE.

$$\begin{aligned} \text{iii) } P(BG) + P(GB) &= \left(\frac{1}{10} \times \frac{9}{10}\right) \times 2 \\ &= \frac{9}{50} \checkmark \end{aligned}$$

1 mark for correct answer (any equivalent form) or CNE.

$$\begin{aligned} \text{iv) } 1 - P(GG) &= 1 - \frac{9}{10} \times \frac{9}{10} \checkmark \\ &= \frac{19}{100} \checkmark \end{aligned}$$

2 marks for correct answer.
1 mark progress toward correct calculation ie sum of branches method omitting one branch.
0 marks for omission of more than one required branch or incorrect method.

$$\text{b i) } {}^{12}C_3 = 792 \checkmark$$

1 mark for correct answer or CNE not calculated.

$$\text{ii) } {}^9C_2 = 36 \checkmark$$

1 mark for correct answer or CNE not calculated.

$$\text{c) } \frac{x}{5} - \frac{2x+3}{2} = 9$$

$$\begin{aligned} 2x - 10x - 15 &= 90 \checkmark \\ -8x - 15 &= 90 \\ -8x &= 105 \end{aligned}$$

$$x = -13\frac{1}{8} \text{ or } 13.125 \checkmark$$

2 marks for correct answer or any equivalent expression.
1 mark for progress to the correct solution (1 error evident).
0 marks for more than two errors evident.

$$\text{d) i) } \frac{16.5}{100} \times 30,000 \times 3 = \$14,850 \checkmark$$

1 mark CNE with or without correct answer.

$$\begin{aligned} \text{ii) } 30,000 \div 100 &= 300 \times 0.25 \\ &= \$75 \end{aligned}$$

$$14,850 + 75 = \$14,925 \checkmark$$

1 mark evidence of division by 100 or multiplication by 0.25 of any calculated loan protection value then added to interest CFPA.
0 marks for two or more errors.

$$\begin{aligned} \text{iii) } 30,000 + 14,925 &= 44,925 \div 12 \div 3 \\ &= \$1247.92 \checkmark \end{aligned}$$

1 mark evidence of division of any amount by 36.
0 marks for two or more errors.

$$\text{iv) } a = \frac{2 \times 36 \times 16.5}{37}$$

$$a = 32.1\% \checkmark$$

1 mark evidence of correct substitution with or without final answer. (Don't penalize student who incorrectly divide the final a by 100 ie answer of 0.321)
0 marks for any error in substitution.

Question 26

a i) Opposite the largest side. ✓

1 mark for correct answer.

$$\text{ii) } \cos \theta = \frac{12.5^2 + 15^2 - 18.5^2}{2 \times 12.5 \times 15} \checkmark$$

$$\cos \theta = \frac{39}{375} \checkmark$$

$$\theta = 84^\circ \checkmark$$

3 marks for correct answer with correct rounding.

2 marks CNE for Cos incorrectly calculated or incorrect rounding.

1 mark use of cosine rule with incorrect substitution.

$$\text{ii) } \frac{\sin \theta}{12.5} = \frac{\sin 84}{18.5} \checkmark$$

$$\sin \theta = 42^\circ \checkmark$$

2 marks for correct answer IGNORE ROUNDING.

1 mark for correct rule with incorrect or no calculation.

$$\text{iii) } 270 + 42 = 312^\circ \checkmark$$

1 mark for correct answer.

$$\text{b i) } S = 35000(1 - 0.225)^2 \checkmark$$

$$S = \$21,022 \checkmark$$

2 marks for correct answer IGNORE ROUNDING.

1 mark for correct rule with incorrect or no calculation.

$$\text{ii) } S = V_0 - Dn$$

$$D = 21\,022 \times \frac{25}{100} \checkmark$$

$$D = \$5255.50$$

$$S = 21\,022 - 5255.5 \times 3 \checkmark$$

$$S = \$5255.50$$

2 marks for correct answer IGNORE ROUNDING.

1 mark for correct or incorrect attempt to calculate D.

May have used \$21 021 or \$35 000 (NOTE \$35 000 gives D of \$8 750 -> S -\$5228)

0 marks for evidence of two or more errors.

$$\text{iii) } 35\,000 - 5256 = \$29\,744 \checkmark$$

$$\frac{29744}{35000} \times 100 = 85\% \checkmark$$

2 marks for correct answer IGNORE ROUNDING.

1 mark for incorrect denominator used in final percentage calculation.

Question 27

a i) Norfolk pine 12.1-8.2=3.9m ✓

1 mark correct range, identification of species not necessary.

*** Note evidence of incorrect interpretation of data eg 98 instead of 9.8 must be carried forward into other parts of the question, with or without working.

ii) Radiata pine 10.5m ✓

1 mark for mode must identify species.

iii) Median = 10.3 ✓

Mean = 10.215 ✓

Inter quart range = 11.2-9.5=1.7 ✓

Sample st dev = 1.167 (3dp's) ✓

4 marks for all correct answers IGNORE ROUNDING.

Subtract one mark for each error.

iv) Example response: Radiata pine as range and standard dev and interquartile range lower indicating less spread

ie more consistent. ✓

$$\text{b i) } 7 = 5 + k \times 10^2 \checkmark$$

$$7 = 5 + 100k$$

$$2 = 100k$$

$$0.02 = k \checkmark$$

2 marks for correctly solved equation from a shown correct substitution.

1 mark for 1 evidenced error in solving.

0 marks for evidence of two or more errors in solving.

$$\text{ii) } N = 5 + 0.02 \times 60^2 \checkmark$$

$$N = 77$$

1 mark for correct answer or CNE no calculation required if substitution shown.

$$\text{iii) } 200 = 5 + 0.02 \times I^2 \checkmark$$

$$195 = 0.02 \times I^2$$

$$98.7 = I^2$$

$$100 = I \checkmark$$

2 marks for correctly solved equation from a shown correct substitution. IGNORE ROUNDING

1 mark for 1 evidenced error in solving.

0 marks for evidence of two or more errors in solving.

iv) parabola ✓

Question 28

a) i)

$$225\,000 = M \left\{ \frac{(1.00575)^{360} - 1}{0.00575(1.00575)^{360}} \right\} \checkmark$$

$$225\,000 = M(151.8372)$$

$$M = \frac{225\,000}{151.8372} \checkmark$$

$$M = \$1481.85 \checkmark$$

3 marks for correct answer allow rounding errors to be carried..
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2 marks evidence of correct n and r and correct substitution but any error in solving.
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1 mark evidence of correct n and r and no or incorrect substitution shown. Or incorrect n and r but correct substitution and solving.

0 marks for more

ii) $\text{payments} = \$1481.82 \times 12 \times 30$

$$\text{payments} = \$533\,455.20 \checkmark$$

$$\text{Interest} = \$533\,455.20 - \$225\,000 \checkmark$$

$$\text{Interest} = \$308\,455.20 \checkmark$$

2 marks for correctly answer. IGNORE ROUNDING

1 mark calculation of TOTAL PAYMENTS but no interest calculation.

0 marks for evidence of two or more errors in solving.
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b) i) $A = \pi \times 18 \times 8 - \pi \times 15 \times 5 \checkmark \checkmark$

$$A = 144\pi - 75\pi$$

$$A = 69\pi \checkmark$$

3 marks for correct answer .

2 marks correct answer in rounded decimal form. Or correct expression of subtraction incorrectly calculated.
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1 mark evidence of correct (single) ellipse formula used with correct substitution for any of the ellipses.
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0 marks no indication of understanding of the correct use of ellipse area formula.
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ii) $105\pi + 18\pi = 123\pi \checkmark$

1 mark for correct answer or any equivalent numerical expression.

iii) $y = mx + b$

$$A = 18\pi n - b$$

when $n=1$, $A = 69\pi$

$$69\pi = 18\pi \times 1 + b$$

$$69\pi - 18\pi = b$$

$$51\pi = b \checkmark$$

$$A = 18\pi n + 51\pi \checkmark$$

2 marks for correct equation in any form.

1 mark for 1 evidenced understanding of straight line relationship with no substitution or errors made in substitution etc.

iv) $195\pi = 18\pi n + 51\pi \checkmark$

$$195\pi - 51\pi = 18\pi n$$

$$\frac{144\pi}{18\pi} = n$$

$$8 = n \checkmark$$

2 marks for correct solution or correct CFPA.

1 mark for progression towards the correct solution with only one error.
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0 marks for two or more errors.
