

To the teacher.

All care (but no responsibility) has been taken to attempt to make this examination as close as possible to the 'real experience' of sitting a NSW HSC General Mathematics examination both in type of questions and level of difficulty.

Before using this examination please consider, for yourself, if you think the type of question, level of difficulty and mark allocation are suitable for your needs.

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The writing of this examination was done to support teachers who are a part of the TIGM project. TIGM is a joint initiative of Casio Australia and the Noel Baker Centre for School Mathematics.

To download a copy of this examination visit www.casioed.net.au

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A product of the Noel Baker Centre for School Mathematics
WIP (Work in progress)
TIGM - 2006 is the initiative of the
Noel Baker Centre for School Mathematics and CASIO AUSTRALIA.



Section I

22 marks

Attempt Questions 1 – 22

Allow about 30 minutes for this section



- 1 If two dice are rolled, what is the probability of getting a double 6?
- (A) $\frac{12}{36}$
(B) 0.3
(C) $\frac{1}{6}$
(D) $\frac{1}{36}$
- 2 If $M = \frac{\sqrt{t-n}}{P}$, $P = 12$, $t = 4$ and $n = 2$, find the value of M, correct to 3 decimal places.
- (A) 0.118
(B) 0.408
(C) 0.117
(D) 0.407
- 3 The manager of a famous footballer works on a commission basis. He negotiates a one year contract for the player worth \$450 000. The manager earns \$54 000 from the deal.

What percentage does the manger charge?

- (A) 88%
(B) 12%
(C) 10%
(D) 54%
- 4 The two circles in the diagram below have radius 4 cm and 5 cm respectively.

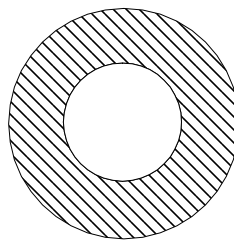


DIAGRAM NOT TO SCALE.

What is the area of the shaded annulus?

- (A) π square centimetres
(B) 4π square centimetres
(C) 9π square centimetres
(D) 16π square centimetres

- 5 Julie purchases a block of land for \$220 000 at the beginning of 2003. At the end of 2003 the land has appreciated by 4%. In 2004 it appreciates by 3% of its value at the end of 2003.

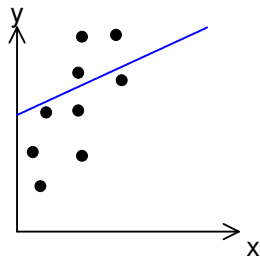
What is the value of the land at the end of 2004?

- (A) \$235 664
 (B) \$235 400
 (C) \$204 864
 (D) \$204 600
- 6 Expand the following $3x(4y - 2)$

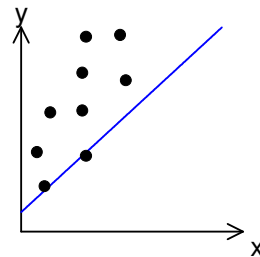
- (A) $7xy - 2$
 (B) $12xy - 2$
 (C) $12xy - 6x$
 (D) $7xy - 5x$

- 7 Which of the graphs below includes the straight line which best fits the data points?

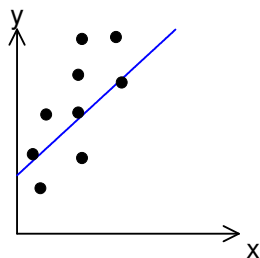
(A)



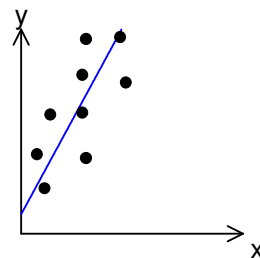
(B)



(C)



(D)

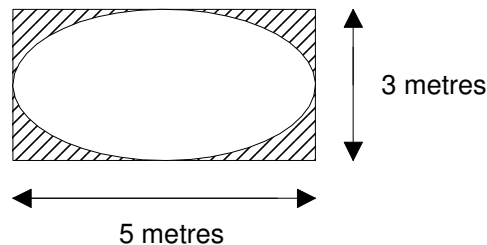


- 8 Sam invests \$30 000 into an account for a period of 5 years. The account pays 3.5% p.a. compounded quarterly. Which of the following correctly calculates the value of the investment at the end of the 5 years.

Then that and this

- (A) $30000 \times (1.035)^5$
 (B) $30000 \times (1.00875)^{20}$
 (C) $30000 \times \left(\frac{1.035^5 - 1}{0.0035} \right)$
 (D) $30000 \times \left(\frac{1.00875^{20} - 1}{0.00875} \right)$
- 9 An ellipse fits exactly inside a rectangle with dimensions 5 metres by 3 metres.

DIAGRAM NOT TO SCALE.



What is the area of the shaded region, to the nearest metre?

- (A) 3
 (B) 27
 (C) 15
 (D) 4
- Use the following information for questions 10 and 11.

A shop sells packets of Cornies and Oaties. Both types of cereal are sold in packets marked as 600 grams. All packets on the shelf that are for sale are weighed. The weights are summarised in the table below.

Weight (g)	Cornies	Oaties
Greater than 620	40	25
Between 570 and 620	105	54
Less than 570	32	10

- 10 How many packets of cereal are on the shelf for sale?
- (A) 266
 (B) 177
 (C) 88
 (D) 89

11 If one packet of Cornies is chosen at random, what is the probability that it weighs less than 570 grams?

- (A) 0.12
- (B) 0.11
- (C) 0.18
- (D) 0.04

12

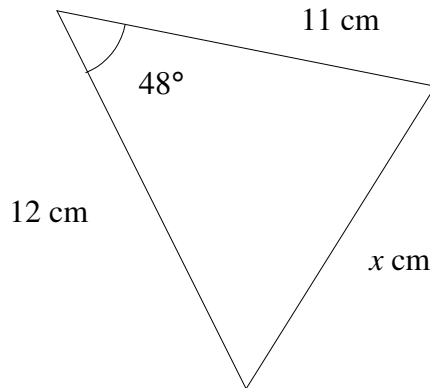


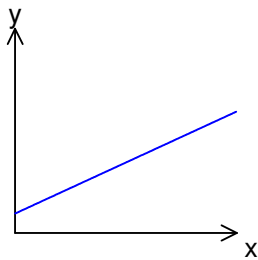
DIAGRAM NOT TO SCALE.

Find the value of x in this triangle correct to 1 d.p.

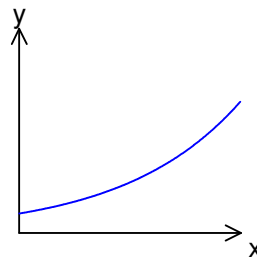
- (A) 9.4
- (B) 16.2
- (C) 10.3
- (D) 88.3

13 Which of the graphs is most likely to be the graph of $y = 1.2^x$?

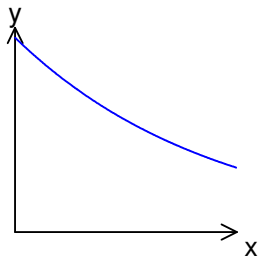
(A)



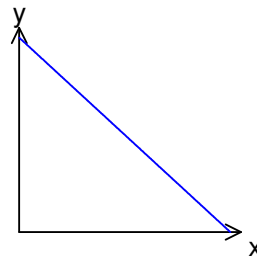
(B)



(C)



(D)



The table below is used to calculate monthly loan repayments. Use this table to assist in answering questions 14 and 15.

Monthly loan repayments (in dollars) per \$1000 borrowed.

<i>Interest Rate per annum</i>	<i>15 years</i>	<i>20 years</i>	<i>25 years</i>	<i>30 years</i>
5.75	8.31	7.02	6.29	5.84
6.00	8.44	7.16	6.44	6.00
6.25	8.57	7.31	6.60	6.16
6.5	8.71	7.46	6.75	6.32
6.75	8.85	7.60	6.91	6.49

- 14 On the day that Lisa borrows \$345 000, the interest rate rises from 6% per annum to 6.25% per annum compounded monthly. Her loan was for 20 years.

What is the increase in her monthly repayment?

- (A) \$2 521.95
 (B) \$2 470.20
 (C) \$48.30
 (D) \$51.75
- 15 Hunji borrowed \$7000 at 6.5% per annum compounded monthly for 15 years.

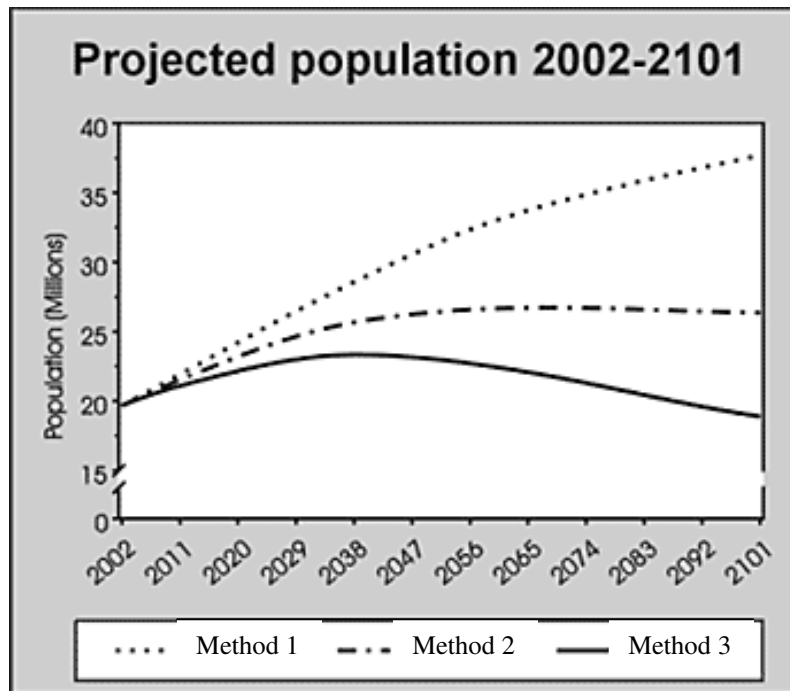
If he made monthly repayments, how much interest did he pay over the 15 years?

- (A) \$3 974.60
 (B) \$2 399.60
 (C) \$9 399.60
 (D) \$10 974.60
- 16 For the first twelve months after being planted in the ground the height (h centimetres) of a certain type of trees, can be estimated by $h = 12m + 20$ where m is the number of months after planting.

What is the estimated increase in height of one of these trees 6 months after planting?

- (A) 0.38 metres
 (B) 18 centimetres
 (C) 72 centimetres
 (D) 0.92 metres

- 17 The graph below shows the results of three different methods of predicting the population of Australia in the future.

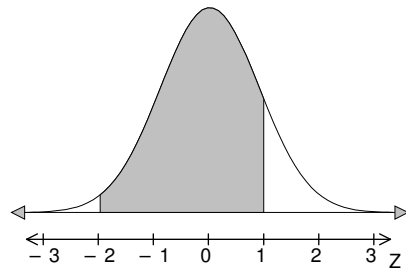


- Which of the values below is closest to the difference between the predicted population values of Method 1 and Method 3 for 2074?
- (A) 5 million people
 (B) 10 million people
 (C) 15 million people
 (D) 20 million people
- 18 Luis is an electrical contractor and completes a job for a customer. He tells the customer that the cost of the job is \$719 inclusive of 10% GST.
- What is the amount of GST included in the total?
- (A) \$71.90
 (B) \$65.36
 (C) 790.90
 (D) \$647.10
- 19 P varies inversely to V . If the value of V changes from 12 to 36, which of the following statements is true?
- (A) P will change from 3 to 6
 (B) P will change from 6 to 3
 (C) P will change from 9 to 27
 (D) P will change from 27 to 9

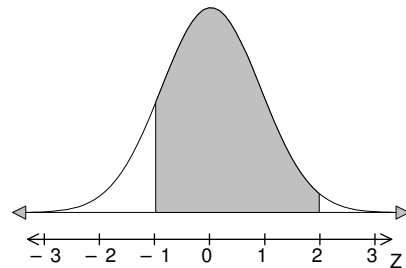
- 20 The variation in the length of a certain type of bolt can be described by a normal distribution. The mean of the population of bolts is 54 mm and the standard deviation is 3 mm.

Which of the following graphs represents the percentages of bolts that fall between 51 mm and 60 mm?

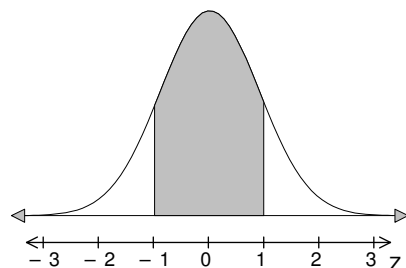
(A)



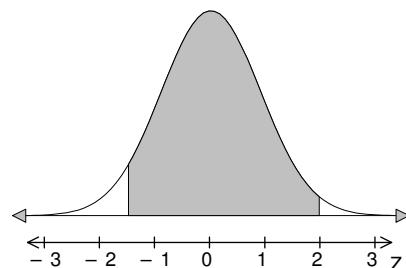
(B)



(C)



(D)



- 21 Edmund works a 40 hour week plus over-time as required. His rate of pay is \$15.20 and over-time is paid as time-and-a-half. Last week, his pay, before tax, was \$858.80.

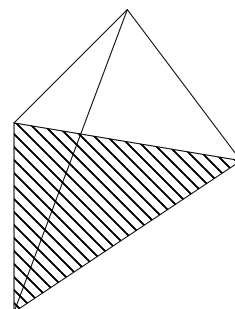
How many hours over-time did he work?

- (A) 4
- (B) 7
- (C) 10
- (D) 11

- 22 The base of the pyramid opposite (shaded) is an equilateral triangle with side length 5 centimetres. The volume of the pyramid is 32.48 cubic centimetres (correct to 2 decimal places).

What is the perpendicular height of the pyramid correct to the nearest centimetre?

- (A) 6
- (B) 8
- (C) 9
- (D) 162



Section II

78 marks

Attempt Questions 23 – 28

Allow about 2 hours for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

All necessary working should be shown in every question.

Marks

Question 23 (13 marks) Use a SEPARATE writing booklet.

- (a) Hillside High School takes up basketball as a sport. The coach asks any boys who are interested to be in of the team to meet with him. 25 boys attended the meeting. The heights of each boy (in cm) are as follows:

124,125,126,127,132,133,134,135,136,140,141,142,143,144,145,155,156,157,
158,169,169,171,173,182,190

- (i) Draw a stem and leaf plot of the heights. 2
- (ii) Describe the shape of the distribution. 1
- (iii) Determine the 5-number summary of the heights. 2

Valley High School has been playing basketball for many years and the height distribution of their 25 man squad can be summarised by the following table.

shortest	Q1	median	Q3	tallest
133	143	163.5	190	195

- (iv) Draw two box and whisker plots on the same scale that help to compare the two height distributions. 2
- (v) Which school has a height advantage? Justify your answer 2

Marks

- (b) An airplane flies at a constant speed of 600 kilometres per hour for 10 minutes.
- (i) How many kilometres will it travel? **1**
- (ii) If the plane is 2000 metres above the ground when it reaches the constant speed and then travels at an angle of elevation of 5 degrees above the horizontal, how high above the ground will it be at the end of the 20 minutes? **3**

End of Question 23

Question 24 (13 marks) Use a SEPARATE writing booklet.

- (a) The company called Trendies is approached to cater for the school formal. They quote \$80 per head.

Let A be the total amount paid to the company for n students.

- (i) Write down an expression for A **1**
- (ii) How much would be paid to Trendies if 180 students attended? **1**

A second company called Fashion Statement is also approached and they quote \$4000 plus \$30 per head.

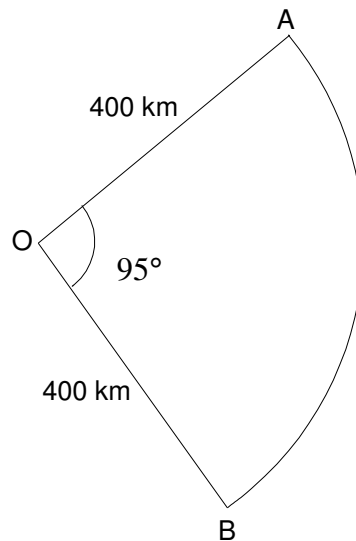
- (iii) Draw a graph with A on the vertical axis and n on the horizontal axis to show the values of A for between 0 and 200 students. **3**
- (iv) Write down an equation involving n and solve it to find the number of students for which both companies costs are the same **2**
- (v) If 180 students were to attend, which company is the cheapest? Show the necessary mathematical working to justify your answer. **2**
- (b) Lulu purchases a new photocopier for her business at the start of 2006/7 financial year. The photocopier is worth \$2350. She depreciates it using the declining balance method of depreciation. The rate of depreciation is 35% per annum.
- (i) What will be the value of the tax deduction for the 2006/7 financial year? **1**
- (ii) How many years will pass before the photocopiers value falls to below \$400? **3**

End of Question 24

Question 25 (13 marks) Use a SEPARATE writing booklet.

- (a) A boat is lost at sea and the search area is defined to be a sector OAB. OA=OB=400 kilometres and angle AOB is 95° .

DIAGRAM NOT TO SCALE



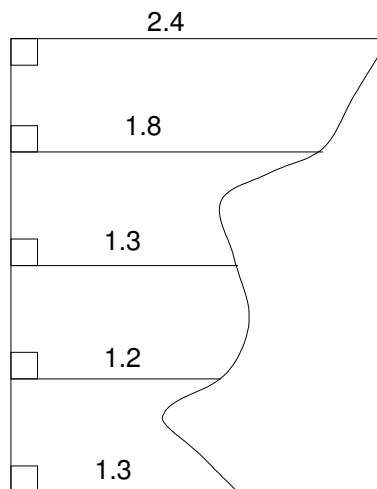
- (i) What is the area of the region to be searched? **1**
- (ii) What is the length of the arc length AB. **2**
- (ii) An airplane has 600 litres of fuel and has fuel consumption of 40 litres per 100 km, can the plane around the perimeter of the sector without running out of fuel? Show the mathematical working that justifies your answer. **3**
- (b) In a game of chance, a bag contains 10 balls, 4 red balls, 3 rainbow coloured balls and 3 white balls. Linda is allowed to choose 1 ball. If she chooses a red ball, she wins \$2 and if she chooses a rainbow coloured ball she wins \$3 and if she chooses a white ball she wins nothing. What is Linda's financial expectation? **2**
- (c) A side-show game allows players to try to throw a soft ball into a steel bucket. The player takes three shots. Peter has practiced a great deal and claims the probability of getting a single ball into the bucket is 0.8.
- (i) Draw a tree diagram to represent this situation. **3**
- (ii) Determine the probability that he gets exactly one ball in the bucket. **2**

End of Question 25

Question 26 (13 marks) Use a SEPARATE writing booklet.

- (a) Peter starts saving to form a deposit on a home. He invests \$200 each month into an investment account that pays 3.5% interest per annum compounded monthly.
- (i) How much will his investment be worth after 8 years? **3**
- (ii) Suppose it is necessary for Peter to have 5% of the purchase price of a home as a deposit, determine the maximum value of the home he could afford after 8 years? **2**
- (b) Peter borrows \$400 000 to purchase his home. He must make monthly repayments. The interest rate is 6.25% per annum compounded monthly.
- If the loan is taken over 30 years, determine the size of the monthly repayments **3**
- (c) Peter has a plot of land on the side of his house to cover with concrete. It is the following shape. He takes 5 perpendicular measurements 1 metre apart. All measurements shown on the diagram are in metres.

DIAGRAM NOT TO SCALE.



- (i) Use Simpsons rule to determine an estimate for the area of the plot correct to 1 d.p. **3**
- (ii) If the concrete is to be laid 100 millimetres thick, determine the volume of concrete required. **2**

End of Question 26

Question 27 (13 marks) Use a SEPARATE writing booklet.

- (a) When under water, scuba divers breathe compressed air from the tanks they carry on their back. This air has a high percentage of Nitrogen in it. This Nitrogen is dissolved in the blood of the divers. When the diver comes to the surface, the Nitrogen is slowly released from the diver's blood.

Let N the percentage of Nitrogen dissolved in the blood be t minutes after the diver comes to the surface.

It is known that $N = 100(0.92)^t$

- (i) What is the percentage of Nitrogen lost from the blood each minute after the diver surfaces? 1
- (ii) What is the percentage of Nitrogen remaining in the blood after 15 minutes? 2
- (ii) After how many minutes will the percentage of Nitrogen fall below 10%? 3
- (b) The table below shows the how the size of Australian households (measured by the number of people living in the household has changed over time from 1911 to 1981.

HOUSEHOLD SIZE
private households ('000)

Persons per household	Year		
	1911	1947	1981
One	96	146	831
Two	109	384	1,373
Three and four	257	789	1,671
Five and over	388	555	794

- (i) How many household were there in 1911 1
- (ii) If a household was chosen at random in 1911, what was the chance it was a two person household 1
- (iii) If a household was chosen at random in 1981, what was the chance it was a two person household 2
- (iv) What has happened to the size of households over this period? Show suitable calculations to justify your answer. 3

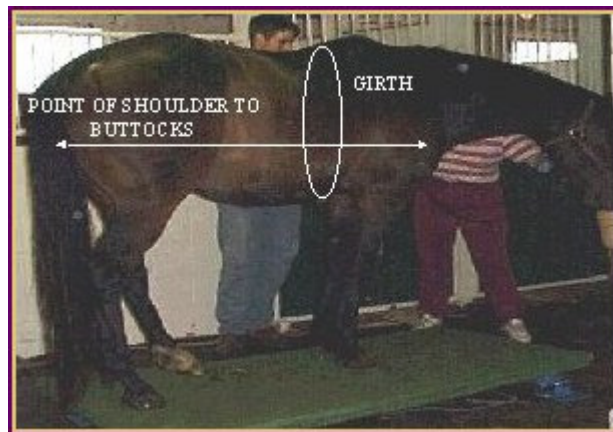
End of Question 27

Question 28 (13 marks) Use a SEPARATE writing booklet.

- (a) The following equation gives an approximation for the weight (W kg) of a horse.

$$W = \frac{LG^2}{3011}$$

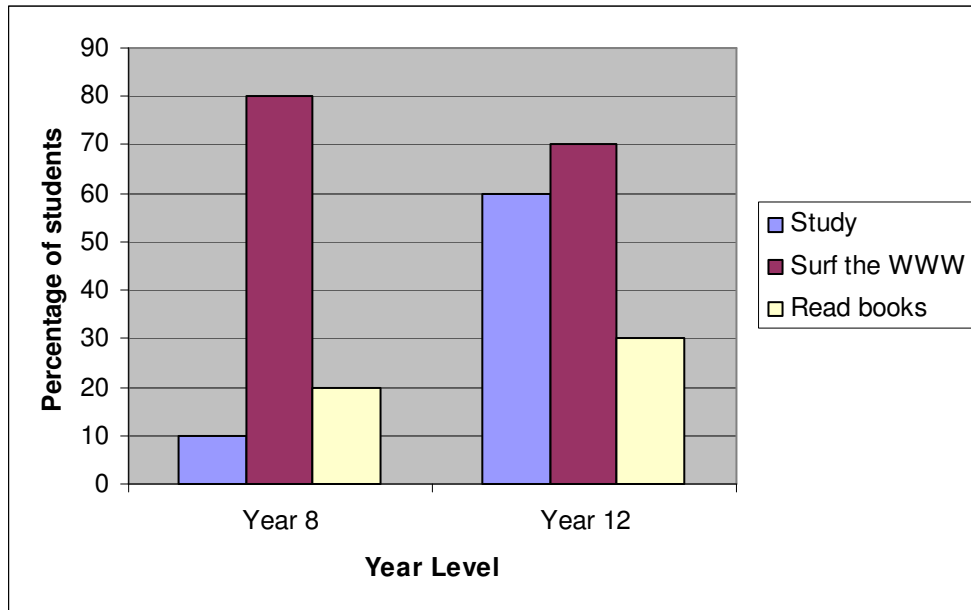
where L is the length of the horse from its shoulder to its buttocks in centimetres and G is the girth of the horse in centimetres.



- (i) What is the approximate weight of a horse that is 185 cm long and has a girth of 145 cm? Give your answer correct to the nearest kilogram. 2
- (ii) Make G the subject of the formula. 3

Question 28 is continued on the next page.

- (b) The students in Year 8 and Year 12 at Midlands High School are surveyed about how they use the school library. The following graph summarises the results.



- (i) What percentage of Year 12 students used the library to study? **1**
- (ii) If there are 120 Year 8 students in the school, how many do not use the library to read books? **2**
- (iii) Explain why a Pie Chart would not be suitable to represent how the Year 8 students use the library. **2**
- (c) Many people own a Smooth Roll garage door. They all have the same remote control. So that everyone can not open everyone else's door, each remote has 4 switches inside of it. Each switch has 3 positions, A, B and C.
- (i) How many different switch settings are there if the first switch is set on A? **2**
- (ii) What is the probability of guessing the correct switch setting used by someone with a single guess? **1**

End of exam.