

Year 12

Name _____

Mathematics General 2

Trial HSC Examination

2014

General Instructions

- Reading time – 5 minutes
- Working time – 2.5 hours
- Write using black or blue pen
- Calculators may be used
- A formulae sheet is provided at the back of this paper
- Write your name on the front cover of each booklet to be handed in
- If you do not attempt a question, submit a blank booklet marked with the question number, your name and "N/A"

Note: Any time you have remaining should be spent revising your answers

Total marks – 100

Section I

25 marks

- Attempt Questions 1-25
- Allow about 35 minutes for this section

Section II

75 marks

- Attempt Questions 26-30
- Allow about 1 hour and 55 minutes for this section

Section I

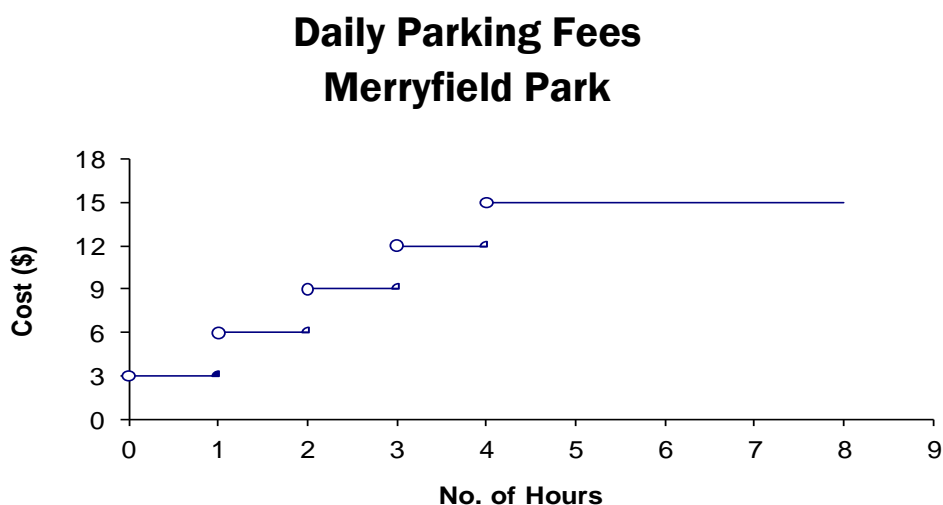
25 marks

Attempt Questions 1 – 25

Allow about 35 minutes for this section

Use the multiple-choice answer sheet for Questions 1 – 25.

- 1 Hong scored 44% in her statistics test. The class average was 76% and the standard deviation was 16%. What was her z -score?
- (A) 2%
(B) -2%
(C) -32%
(D) 32%
- 2 During the holidays, a family went to Merryfield Park on three separate days. On Monday, they parked for 4 hours, on Wednesday, they parked for $3\frac{1}{2}$ hours and on Friday, they parked for $4\frac{1}{2}$ hours.



Use the step graph to calculate the total amount the family paid for parking.

- (A) \$15
(B) \$45
(C) \$37.50
(D) \$39

3 Annie is paid \$946.80 per fortnight. She gets four weeks annual leave each year on full pay with 17½% annual leave loading.
Calculate the total amount of pay Annie receives for her annual holidays.

- (A) \$2224.98
- (B) \$4449.96
- (C) \$662.76
- (D) \$331.38

4 In how many different ways can four students from a group of ten students be arranged in a line?

- (A) 210
- (B) 5040
- (C) 40
- (D) 280

5 An employer wants to survey a sample of her employees. Salespeople make up 10% of her staff, so 10% of those surveyed will be salespeople. Administration staff account for 15% of her employees so 15% of those surveyed will be administrative staff. She will do this for all of the different sections of her company.

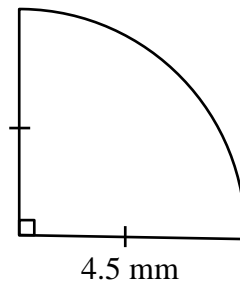
What type of sample is the employer using?

- (A) Systematic sample
- (B) Stratified sample
- (C) Census
- (D) Categorical

6 A factory tests 50 light globes and finds that 2 are faulty. If the factory makes 2000 light globes one day, how many are expected to be NOT faulty?

- A. 96
- B. 48
- C. 1960
- D. 1920

- 7 The diagram shows a quadrant of a circle with radius 4.5 mm.



Find the perimeter of the quadrant, correct to 1 decimal place.

- (A) 7.1 mm
(B) 28.3 mm
(C) 16.1 mm
(D) 11.6 mm
- 8 The people who attended a movie were grouped according to their gender and their age. The results are shown in the table below.

	<i>Female</i>	<i>Male</i>	<i>Total</i>
<i>Adult</i>	24	36	60
<i>Child</i>	76	44	120
	100	80	180

A person is selected at random from the survey group.
What is the probability that the person selected is not female and is not a male adult as a percentage to the nearest whole number?

- (A) 76%
(B) 37%
(C) 55%
(D) 24%

9 A mobile phone plan includes a charge of 98 cents per minute (or part thereof) plus 40 cents flagfall (connection charge) for each standard voice call. How much would be charged for 8 calls that were all between 4 minutes and 5 minutes long?

- (A) \$42.40
- (B) \$34.56
- (C) \$31.76
- (D) \$38.48

10 Young's rule can be used to calculate a child's medicine dose. Young's rule is:

$$\text{Dosage for children} = \frac{\text{age (of child in years)} \times \text{adult dosage}}{\text{age (of child in years)} + 12}$$

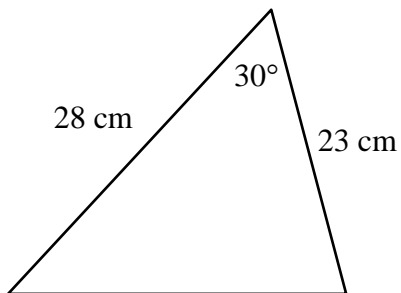
For a particular medicine, the child dose for a 3 year old is 12 mL. Calculate the adult dose.

- (A) 50 mL
- (B) 60 mL
- (C) 70 mL
- (D) 80 mL

- 11 Using the table given below, find the future value of \$1200 invested each year for four years at 2% pa.

Table of future value interest factors					
	Interest rate per period				
Period	1%	2%	3%	4%	5%
1	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500
3	3.0301	3.0604	3.0909	3.1216	3.1525
4	4.0604	4.1216	4.1836	4.2465	4.3101

- (A) \$5172
(B) \$2448
(C) \$4946
(D) \$1491
- 12 Find the area of this triangle.

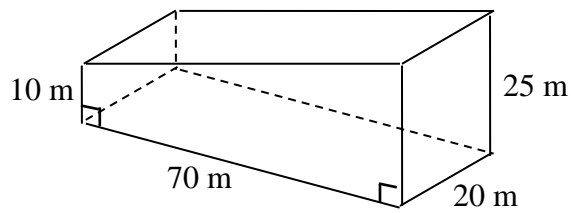


- (A) 161 cm^2
(B) 322 cm^2
(C) 12.75 cm^2
(D) 25.5 cm^2

13 How many files of average size 1.5 MB can be stored on a 16 GB USB drive?

- (A) 11
- (B) 24
- (C) 10 923
- (D) 24 576

14 Find the volume of this solid.



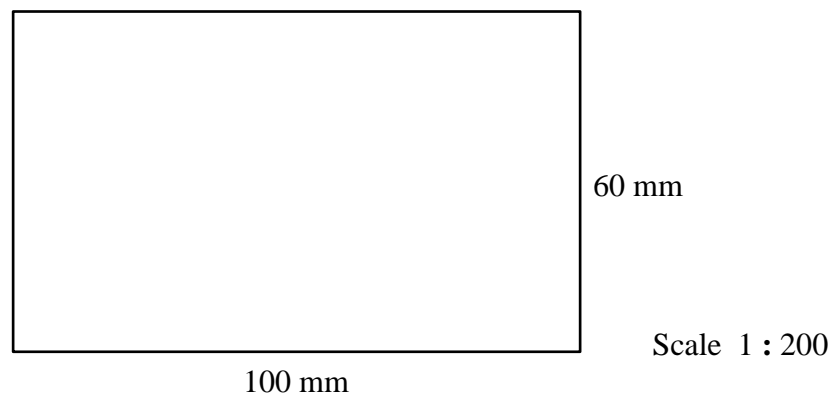
- (A) 49 000 m³
- (B) 24 500 m³
- (C) 26 250 m³
- (D) 52 500 m³

- 15 Part of the bill a household received for their water usage is shown below.

Fixed charges – GST free	1 Jan – 31 Mar 14	\$
Water service		45.78
Wastewater (sewerage) service		157.06
<hr/>		
Usage charges – GST free	23 Oct 14 – 18 Dec 14	
Water 23/10 – 18/12	38 kL at \$2.4500 a kL	?
<hr/>		
Other charges and credits		0
Total amount due		\$295.96

What is the amount owing for usage charges?

- (A) \$202.86
(B) \$295.96
(C) \$2.45
(D) \$93.10
- 16 The scale drawing for a rectangular block of land is shown below. A house will be built on the land, occupying 75% of the block.



What will be the area of the floor space of the house when it is built?

- (A) 180 m²
(B) 4500 m²
(C) 240 m²
(D) 320 m²

17 Most cars use fuel that is a blend of 90% petrol and 10% ethanol. What is the ratio of petrol to ethanol in this blend?

- (A) 1 : 9
- (B) 9 : 1
- (C) 10 : 1
- (D) 1 : 10

18 \$3000 is deposited into an account. The rate of interest is 12% p.a., compounded monthly. How much will be in the account in 4 years?

- (A) \$3380.48
- (B) \$11687.93
- (C) \$4836.68
- (D) \$691 172.33

19 The breaking distance of a car is found using the formula

$$d = \frac{u^2}{20}.$$

d is the distance the car travels before stopping, measured in metres.

u is the speed of the car when the brakes are first applied, measured in metres per second.

One car's speed is 16.7 m/s and another car's speed is 13.9 m/s.

Find the difference in their breaking distances.

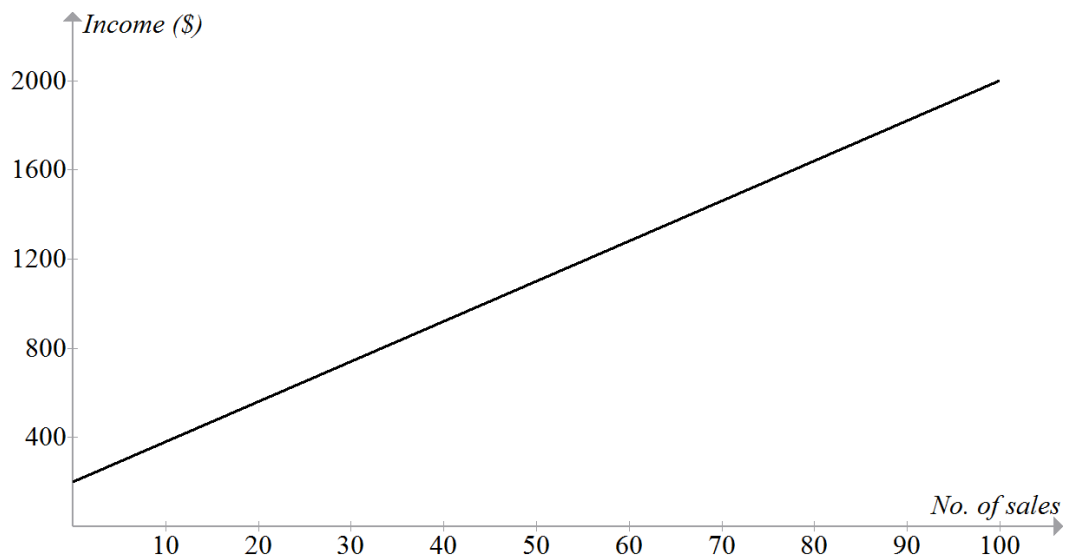
- (A) 4.284 m
- (B) 0.392 m
- (C) 23.605 m
- (D) 1.7136 m

- 20 When it is 10 p.m. on Monday in Singapore (1°N , 104°E) what is the day and the time in Los Angeles (34°N , 118°W)?
- (A) Tuesday, 7.12 am
 (B) Tuesday, 4.14 am
 (C) Sunday, 4.14 am
 (D) Monday, 7.12 am

- 21 Which of the following makes t the subject of the formula $v = u + at$?

- (A) $t = v - au$
 (B) $t = v - u - a$
 (C) $t = \frac{v - u}{a}$
 (D) $t = \frac{v + u}{a}$

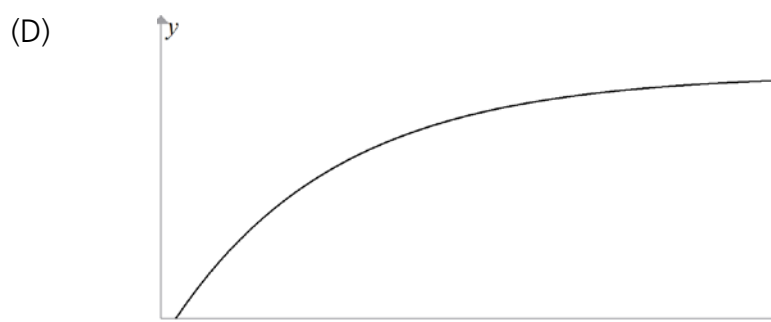
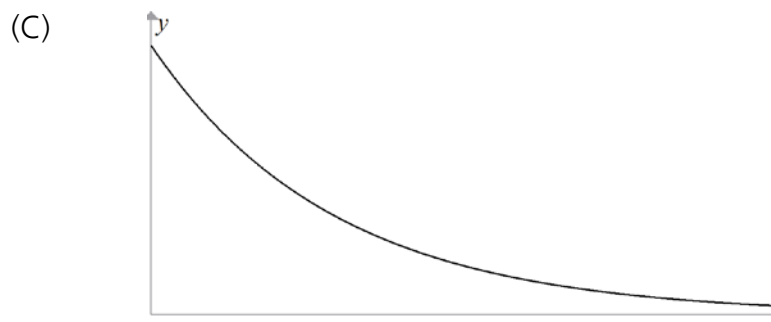
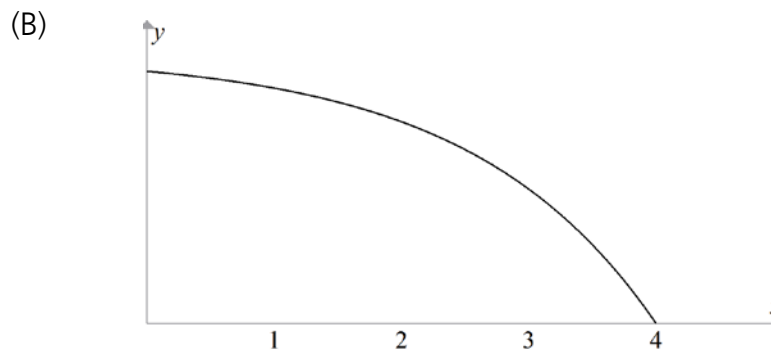
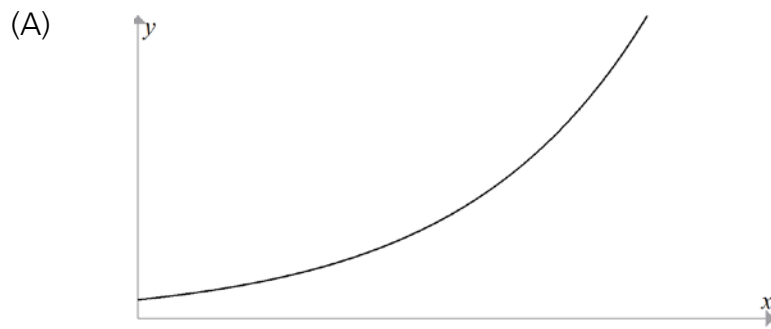
- 22 The straight line graph below shows the relationship between how many items a salesperson sells each week and how much he earns.



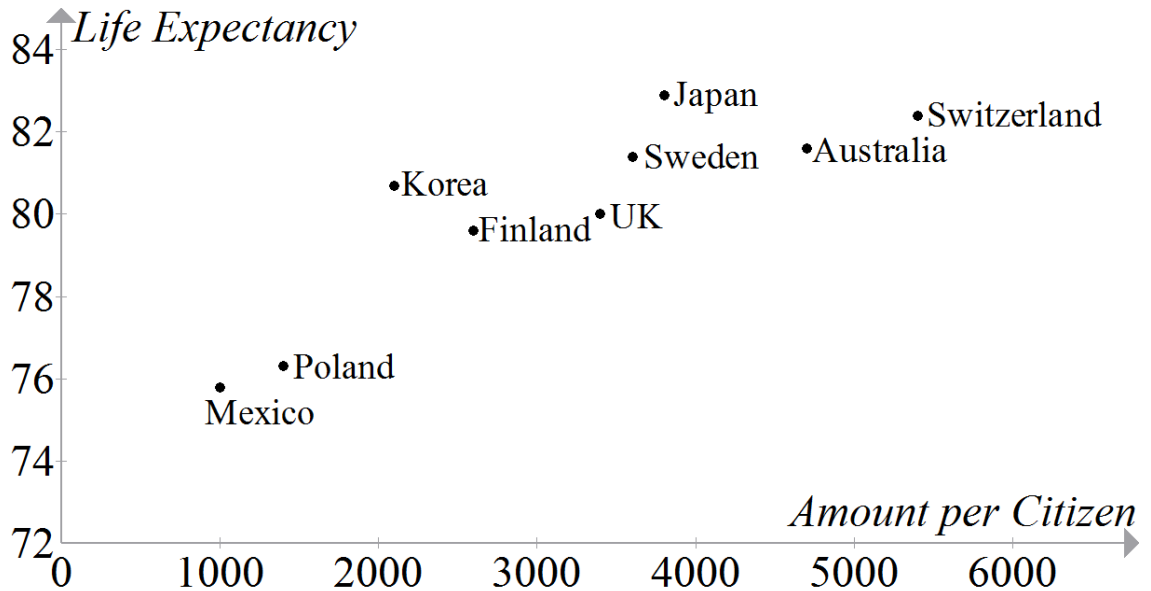
How much does the salesperson earn if he sells no items during the week?

- (A) \$0
 (B) \$100
 (C) \$200
 (D) \$300

23 Which graph below best represents the equation $y = 2^x$.



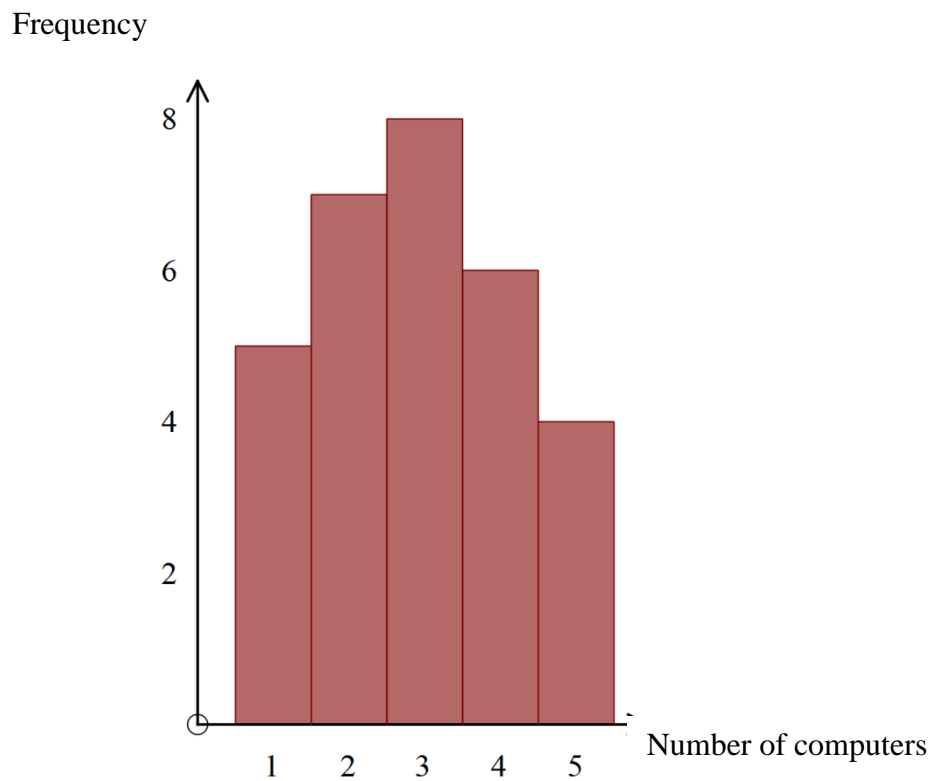
- 24 The scatterplot below compares the average amount of money a country spends on the health of each citizen each year to the life expectancy of people in that country.



Why might the scatterplot be considered misleading?

- (A) The dots do not lie on a straight line.
- (B) The *Life Expectancy* axis does not start at 0.
- (C) Mexico and Poland are in different parts of the world.
- (D) The ages given for life expectancy are too high.

- 25 The histogram below shows the number of computers per household for thirty households surveyed.



Choose the correct statement regarding this data.

- (A) Mean = 6, Mode = 3
- (B) Mean = 6, Median = 3
- (C) Mean = 2.9, Median = 3
- (D) Mean = 2.9, Mode = 8

Section II

75 marks

Attempt Questions 26 – 30

Allow about 1 hour and 55 minutes for this section

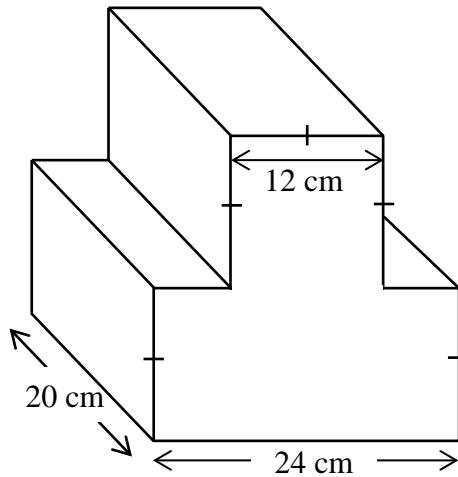
Answer the questions in the spaces provided. Your responses should include relevant mathematical reasoning and/or calculations.

Extra writing space is provided on page 41. If you use this space, clearly indicate which question you are answering.

Please turn over

Question 26 (15 marks)

- (a) The diagram shows a prism whose front face consists of a square and a rectangle. The sides of the square have length 12 cm. The length of the rectangle is 24 cm and its width is 12 cm. The height of the prism is 20 cm.



- (i) Find the perimeter of the front face. **1**

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- (ii) Find the area of the front face. **1**

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- (iii) Find the volume of the prism. **1**

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Question 26 (continued)

(b) The principal at a primary school wants to survey a sample of parents to see if they think traffic lights should be installed at the pedestrian crossing outside the school.

(i) Write a survey question that will have discrete quantitative responses. **1**

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(ii) One of the survey questions is:

<p><i>“Do you feel safe when you use the school crossing?”</i></p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p>

What type of data will be collected from this question? **1**

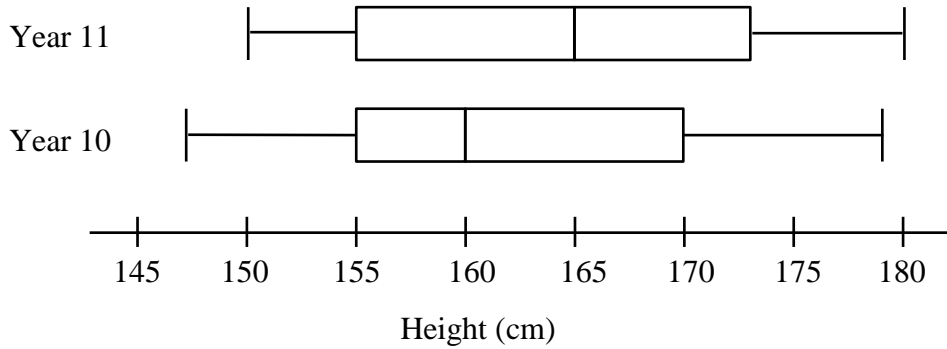
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(iii) The principal decides to select a sample by handing surveys to all the parents who drop their children off between 8:00 and 8:05 on Monday morning. Discuss why this would not be effective in selecting a representative sample. **1**

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Question 26 (continued)

- (c) The box-and-whisker plots show the distribution of the heights of all the students in Year 10 and a sample of 20 students in Year 11 at a particular high school in 2014.



- (i) What was the interquartile range of the students' heights in Year 10? **1**

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- (ii) How many students were 155cm or taller in Year 11? **1**

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- (iii) The number of students in Year 10 who were between 155cm and 160 cm tall was equal to the number of Year 11 students 155cm or taller. How many students were in the year 10 group? **1**

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Question 26 continues on page 18

- (d) Jacinta was involved in a car accident where she was at fault.
What would be covered by her Compulsory Third Party Insurance policy?

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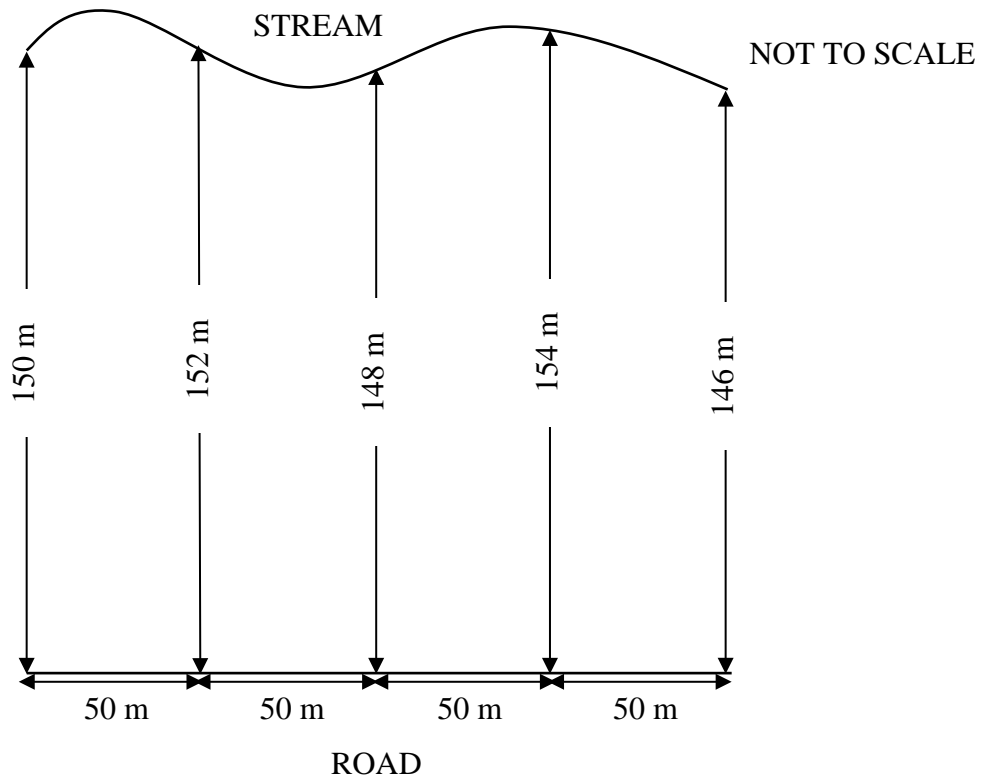
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Question 26 continues on page 19

Question 26 (continued)

- (e) One side of a farm lies on a straight road and is 200 metres long. The opposite side of the farm borders a stream. A plan of the farm below shows the lengths of five vertical lines drawn from the road to the stream. These vertical lines are 50 metres apart.



Use two applications of Simpson's Rule to find an estimate of the area of the farm.

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Question 26 (continued)

(f) Expand and simplify $2x^3(x-5)+5x^3(3x+4)$.

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End of Question 26

Question 27 (15 marks)

- (a) The water usage, measured in kilolitres (kL) per household in Green Street was measured. The results for the months of January and July are shown in this double stem-and-leaf plot.

January		July
3	0	3 5 7 7 9
9 7 6 4	1	1 1 4 6
9 6 5 1 0	2	0

- (i) How many households were in Green Street? **1**

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- (ii) Find the median for January. **1**

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- (iii) Find the interquartile range for January. **2**

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- (iv) Is the score of 3 an outlier for the data for January?
Justify your answer using suitable calculations. **1**

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Question 27 continues on page 22

- (v) Did water usage change from January to July?
Justify your answer by commenting on one result from the data. 1

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- (b) The table below shows the tax rates for employees.

Personal Tax Rates

Taxable income	Tax payable
0 – \$18 200	Nil
\$18 201 – \$37 000	19c for each \$1 over \$18 200
\$37 001 – \$80 000	\$3 572 plus 32.5c for each \$1 over \$37 000
\$80 001 – \$180 000	\$17 547 plus 37c for each \$1 over \$80 000
\$180 001 and over	\$54 547 plus 45c for each \$1 over \$180 000

Kathie’s annual wage is \$45 156. Her employer deducted 30% of her pay for tax.

- (i) How much tax was deducted from Kathie’s pay for the whole year? 1

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Question 27 continues on page 23

- (ii) Using the table of tax rates, determine how much tax Kathie should have paid.

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- (iii) Does Kathie have to pay extra tax or is she due to receive a refund? Explain your answer.

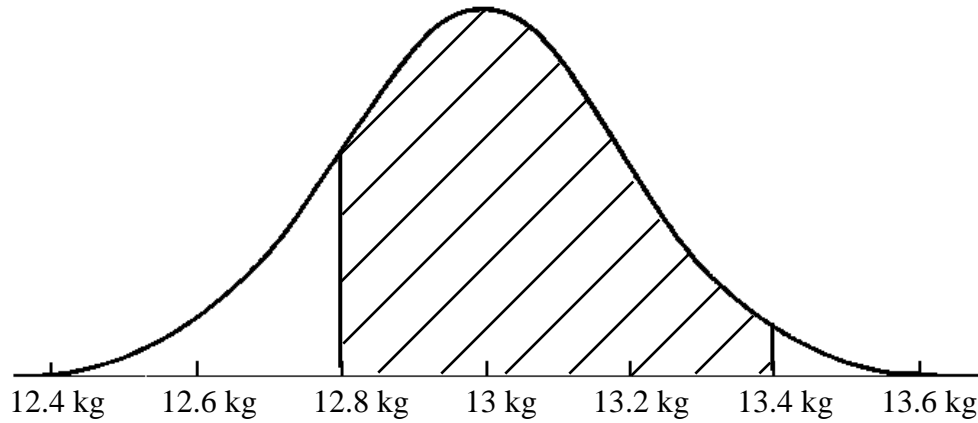
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Question 27 continues on page 24

Question 27 (continued)

- (c) Bags of soil have an average mass of 13 kg with a standard deviation of 0.2 kg.



What percentage of bags would have a mass between 12.8 kg and 13.4 kg?

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- (d) A patient is to receive 1.2 litres of fluid over 6 hours.
What is the required flow rate in mL/h?

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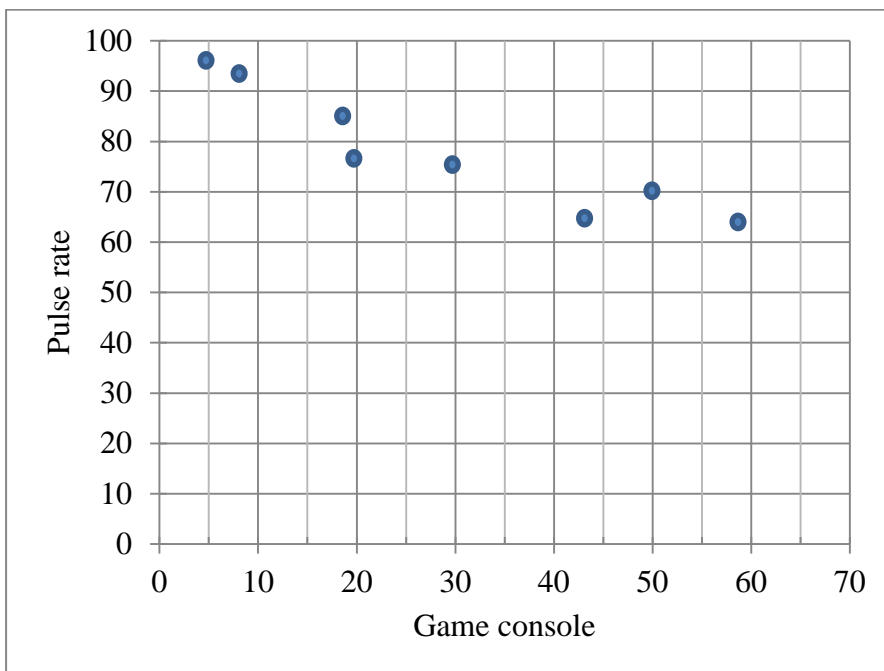
Question 27 continues on page 25

- (e) The table shows a student's score on a game console and their pulse rate.

Game console (x)	5	7	18	20	30	43	50	58	60	65
Pulse rate (y)	97	93	85	77	75	64	70	64	60	55

Complete this scatterplot by plotting the final two pairs of points and draw a line of best fit.

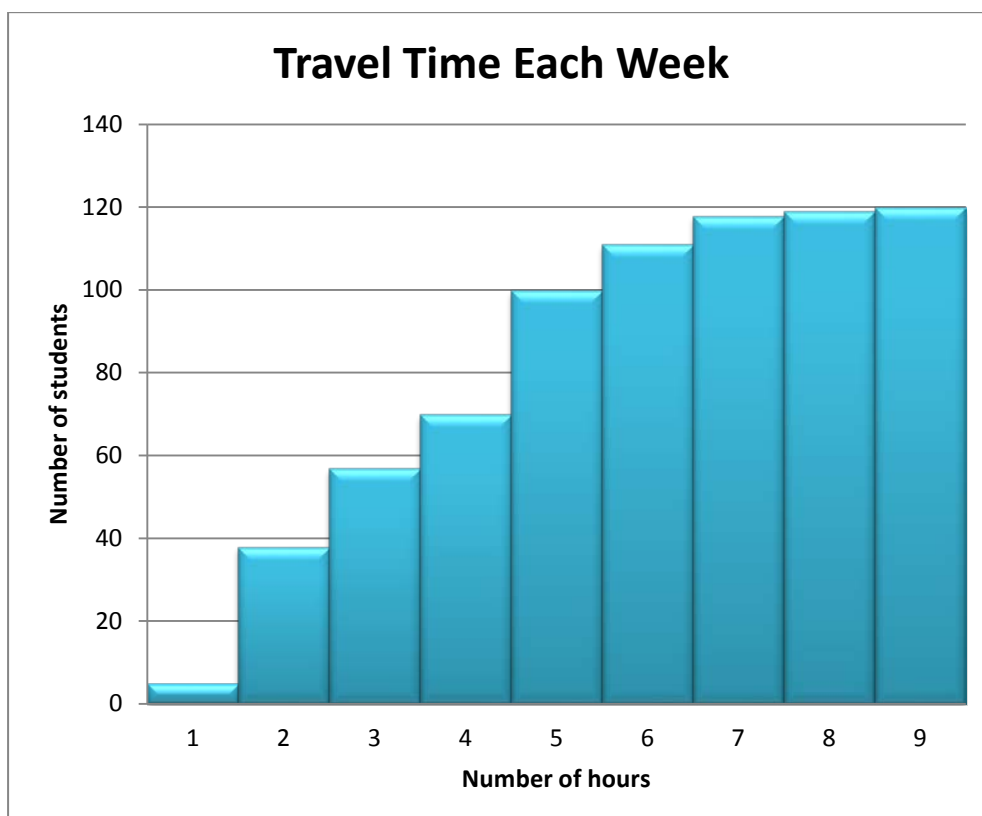
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End of Question 27

Question 28 (15 marks)

- (a) High school students were asked to estimate how many hours they spent travelling to and from school each week. The results of the survey are shown in the cumulative frequency histogram given below.



- (i) Draw a cumulative frequency polygon on this histogram. **1**
- (ii) How many students spent five hours or less hours travelling to and from school each week? **1**

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Question 28 continues on page 27

(iii) What was the interquartile range for this data set

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(b) The table below shows the number of traffic accidents at a particular intersection each week and the probability for each number of accidents.

Number of Accidents	Probability
0	0.24
1	0.45
2	0.05
3	0.15
4	0.07
5	0.03
6	

(i) The probability of 6 accidents occurring in one week has been left blank.

What is the probability of 6 accidents?

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(ii) Calculate the expected number of weeks over five years when 1 accident occurs.

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Question 28 continues on page 28

Question 28 (continued)

(c) A construction company bought an excavator for \$85 000. Each year the excavator depreciates \$12 500. **1**

(i) Use the straight-line method of depreciation to find how much the excavator will be worth in four years time.

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(ii) The excavator will be sold for scrap when its value is \$10 000. In how many years will it be sold? **2**

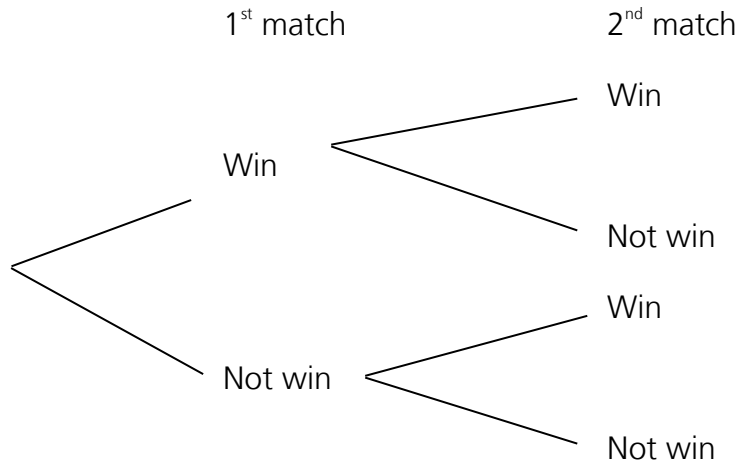
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Question 28 continues on page 29

Question 28 (continued)

(d) Lexie is going to play two matches of tennis. The probability that she wins the first match is 0.6. If she wins the first match, the probability that she wins the second match is 0.7. But if she loses her first match, the probability that she wins the second match is only 0.4.

(i) Complete the probabilities on the tree diagram below. **2**



(ii) What is the probability that Lexie wins both matches? **1**

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(iii) What is the probability that she wins at least one match? **2**

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End of Question 28

Question 29 (15 marks)

(a) Solve the following pair of simultaneous equations.

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$$4x - y = 6$$
$$3x + 2y = -1$$

(b) A ranger captured and tagged 86 emus in a national park. Three months later, she captured 25 emus and she found that 4 of them were tagged.

Estimate the number of emus in the park, to the nearest fifty.

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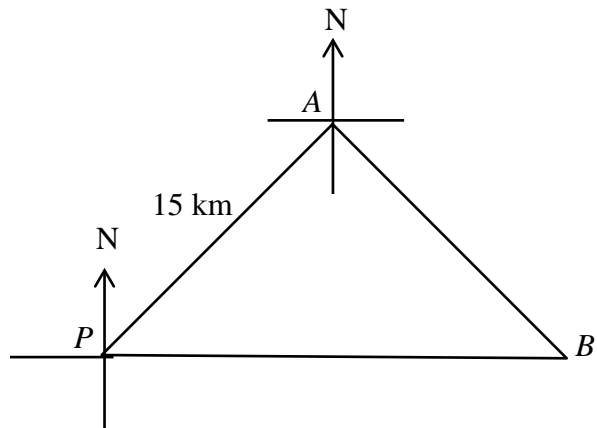
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Question 29 continues on page 31

Question 29 (continued)

- (c) A yacht left port P and travelled on a bearing of 045° for 15 km to point A . It then changed its bearing to 150° and continued to point B which was due East of the port. It then returned to the port.



Find the total distance the yacht travelled, to the nearest kilometre.

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Question 29 continues on page 32

Question 29 (continued)

- (d) Jenny has a monthly limit of \$2500 on her credit card. If she spends more than this during a month, she is charged interest, shown at the bottom of her statement.

Here are the details on her statement for August, 2013. Note that Jenny automatically pays the amount owing on the credit card by withdrawing that amount from her savings account and transferring it to her credit card account at the end of the month.

Date of Transaction	Description			Debits	Credits (-)
06 Aug 13	SUZIE'S HAIR BOUTIQUE	BALMAIN	AU	125	
10 Aug 13	WOOLIES	BALMAIN	AU	132.75	
12 Aug 13	AMAZON.COM \$140.50 USD	USA	US	153.78	
15 Aug 13	FOREIGN TRANSACTION FEE			0.96	
17 Aug 13	OFFICE SUPPLIERS	NORTH RYDE	AU	1240.00	
21 Aug 13	WWW.TXTGLOBAL.COM.GZ	GZ	AU	679.00	
22 Aug 13	WWW.TXTGLOBAL.COM.GZ	GZ	AU	358.00	
26 Aug 13	WOOLIES	BALMAIN	AU	68.35	
29 Aug 13	BALMAIN HEALTH CENTRE	BALMAIN	AU	235.70	
31 Aug 13	AUTOMATIC PAYMENT				2993.54
31 Aug 13	INTEREST CHARGES			0.35	

- (i) By how much did Jenny exceed her monthly limit? 1

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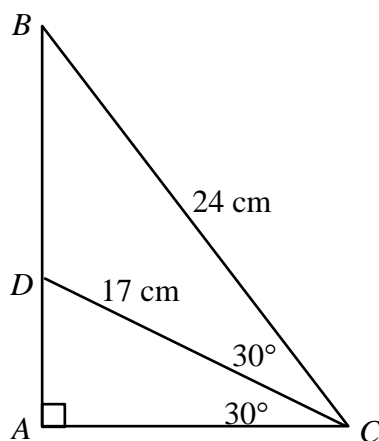
- (ii) The transactions involving WWW.TXTGLOBAL.COM.GZ were illegal withdrawals by internet hackers.
How much money would have to be refunded by the bank to Jenny? 1

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Question 29 (continued)

- (e) The diagram shows the right-angled triangle ABC . The line DC is drawn so that $\angle ACD = \angle BCD = 30^\circ$. $BC = 24$ cm and $CD = 17$ cm.



- (i) Use the cosine rule to find the length of BD , correct to one decimal place

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- (ii) Find the length of AB , correct to one decimal place.

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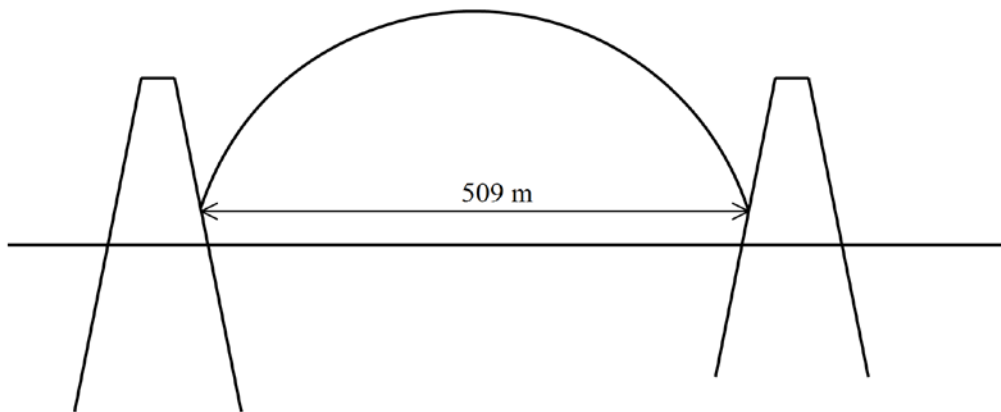
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Question 29 continues on page 34

Question 29 (continued)

- (f) The length of the road on the Sydney Harbour Bridge between the two pylons is 509 metres, correct to the nearest metre.



Calculate the percentage error of this measurement, correct to 2 significant figures.

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End of Question 29

Question 30 (15 marks)

- (a) The results of research between the average height of parents and the height of their children in a particular community, when they have achieved their maximum height as adults, is recorded in the table below.

	Correlation coefficient (r) = 0.7590	
	Mean	Standard deviation
Height of child (c)	169.55	5.384
Height of parent (p)	173.20	5.740

- (i) Calculate, correct to 4 decimal places, the gradient of the line of best fit using the formula;

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$$\text{gradient} = \text{correlation coefficient} \times \frac{\text{standard deviation of p-scores}}{\text{standard deviation of c-scores}}$$

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- (ii) Find the **p**-intercept, correct to 4 decimal places, using the formula:

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$$\text{p-intercept} = \text{mean of p-values} - [\text{gradient} \times \text{mean of c-values}]$$

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Question 30 continues on page 36

- (iii) Hence write down the equation of the straight line in the form $p = mc + q$, where m is the gradient from (i) and q is the intercept from (ii).

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Question 30 continues on page 37

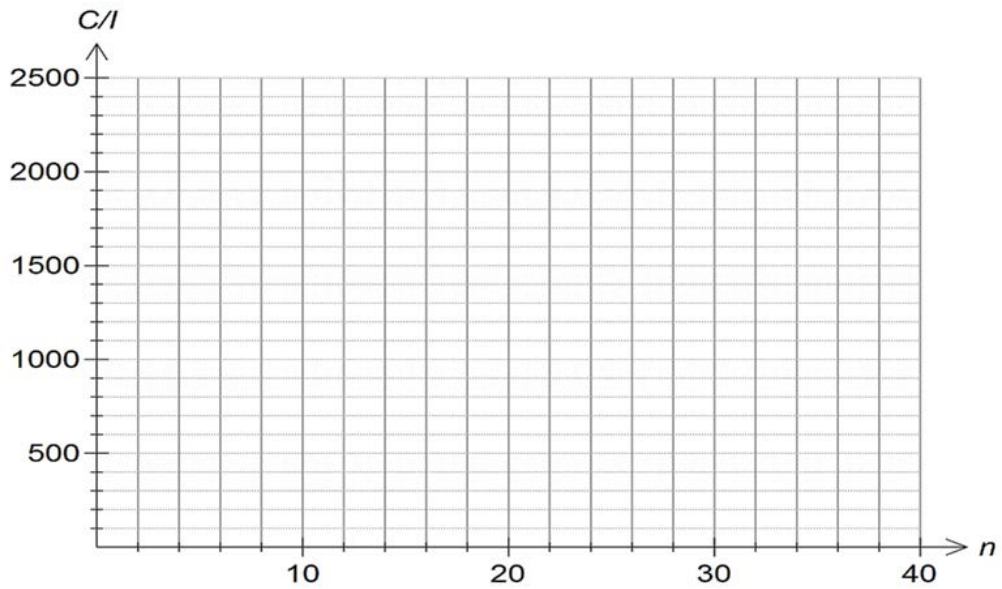
Question 30 (continued)

- (b) Following her success on a TV cooking show, Hannah decides to open her own exclusive cake shop.

Following research, she calculates that the cost of producing cakes on any day can be calculated using the formula $C = 45n + 360$, where n is the number of cakes produced.

- (i) On the axes provided, draw the graph of $C = 45n + 360$.

1



- (ii) The gradient of the line is 45. What does this number represent in terms of money?

1

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- (iii) On the axes graph the line $I = 63n$, where I represents the income Hannah earns selling her cakes.

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Question 30 continues on page 38

- (iv) Find the number of cakes Hannah needs to make and sell to break even in her business.

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(c)

Period	Interest rate per period							
	1%	2%	3%	4%	5%	6%	7%	8%
1	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	2.0700	2.0800
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2149	3.2464
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.4399	4.5061
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.7507	5.8666
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.1533	7.3359
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.6540	8.9228
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975	10.2598	10.6366
9	9.3685	9.7546	10.1591	10.5828	11.0266	11.4913	11.9780	12.4876
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808	13.8164	14.4866

- (i) Michel decides to invest \$600 every 6 months into an investment plan at 8% p.a. interest compounded for 5 years.

Using the values in the table above, show how his investment will have grown to \$7203.66 after 5 years.

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Question 30 continues on page 39

- (ii) Michel's aim is to have his investment reach a value of \$12000.
How much more must Michel invest into his saving account every
six months to achieve a balance of \$12000 at the end of the 5 years?

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Question 30 continues on page 40

(iii)

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Michel changes his mind and decides to invest the balance from his investment in (i) at 10% p.a. compounded annually. He makes the following calculation to determine the time it will take for him to achieve his goal of \$12000.

$$12000 = 7203.66 \times (1.1)^n,$$

Where n is the number of years the money is invested for.

Substituting $n = 10$, Michel's calculation is $7203.66 \times (1.1)^{10} = 18684.44$, which is too high.

By substituting different values for n , find the number of years it will take for Michel achieve to his investment goal of \$12000.

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End of Examination



International
Grammar School

2014

HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION

Mathematics General 2

WORKED SOLUTIONS

SECTION 1

1. $z = \frac{x - \bar{x}}{\sigma}$ **B**
 $= \frac{44 - 76}{16}$
 $= -2$
2. Total = Mon fee + Wed fee + Fri fee **D**
 $= \$12 + \$12 + \$15$
 $= \$39$
3. Four weeks pay = $\$946.80 \times 2$ (four weeks = 2 fortnights) **A**
 $= \$1893.60$
- Loading = $17\frac{1}{2}\%$ of $\$1893.60$
 $= 0.175 \times 1893.60$
 $= \$331.38$
- Total holiday pay = $\$1893.60 + \331.38
 $= \$2224.98$
4. No. of arrangements = $10 \times 9 \times 8 \times 7$ **B**
 $= 5040$
5. When the sample is chosen so that the proportion of the groups in the population matches their proportion in the sample, this is known as stratified sampling. **B**
6. 1920 **D**
7. P = side + side + quarter of circumference **C**
 $= 4.5 + 4.5 + \frac{1}{4} \times 2 \times \pi \times 4.5$
 $= 16.06858347$
 $= 16.1 \text{ mm (1dp)}$

8. No. of females = 100 **D**
 No. of male adults = 36
 No. not female and not male adult = $180 - (100 + 36) = 44$
 $P(\text{not female and not male adult}) = \frac{44}{180} \times 100\% = 24\%$
9. Cost = cost of flagfalls + cost of calls **A**
 $= 8 \times 0.40 + 8 \times 5 \times 0.98$
 $= \$42.40$
10. 60ml **B**
11. $1200 \times 4.1216 = 4945.92$ (4946) **C**
12. Area = $\frac{1}{2} \times 23 \times 28 \times \sin 30^\circ$ **A**
 $= 161 \text{ cm}^2$
13. 24576 **D**
14. Area of trapezium = $\frac{1}{2} \times 70 \times (10 + 25)$ **B**
 $= 1225 \text{ m}^2$
 Volume = 1225×20
 $= 24\,500 \text{ m}^3$

15. Usage charges = $\$295.96 - (\$45.78 + \$157.08)$ **D**
 $= \$93.10$

OR

Usage charges = 38×2.4500
 $= \$93.10$

16. Area of land = $(0.1 \times 200) \times (0.06 \times 200) \text{ m}^2$ **A**
 $= 240 \text{ m}^2$

Area of house = $0.75 \times 240 \text{ m}^2$
 $= 180 \text{ m}^2$

17. petrol : ethanol = 90% : 10% **B**
 $= 9 : 1$

18. $r = 12\% \div 12 = 0.01$ **C**
 $n = 4 \times 12 = 48$
 $FV = 3000(1.01)^{48}$
 $= \$4836.68$

19. Difference = $\frac{16.7^2}{20} - \frac{13.9^2}{20}$ **A**
 $= 4.284 \text{ m}$

20. Difference in longitude = $104^\circ + 118^\circ$ **D**
 $= 222^\circ$

Time difference = 222×4
 $= 888 \text{ minutes}$
 $= 14 \text{ h } 48 \text{ min}$

Singapore time = 10pm = 22:00
Time in LA = 22:00 – 14:48
 $= 07:12$
 $= 7.12 \text{ am on Monday}$

21. $v = u + at$
 $v - u = at$
 $t = \frac{v - u}{a}$ **C**
22. Line cuts Income (y) intercept at 200.
Salesperson earns \$200 if he sells nothing. **C**
23. An exponential graph starts close to the x -axis and then increases more and more quickly. **A**
24. The graph is misleading because the *Life Expectancy* axis does not start at 0.
This makes a line of best fit appear to be steeper than it really is. **B**
25. Mean = 2.9 (87/30) and Median is 3. **C**

Question 26 (15 marks)

- (a) (i) $P = \text{perimeter of square} + \text{perimeter of rectangle} - \text{shared length}$ **1**
 $= 4 \times 12 + 2 \times (24 + 12) - 12$
 $= 108 \text{ cm}$
- (ii) $\text{area} = \text{area of square} + \text{area of rectangle}$ **1**
 $= 12 \times 12 + 12 \times 24$
 $= 432 \text{ cm}^2$
- (iii) $\text{volume} = Ah$ **1**
 $= 432 \times 20$
 $= 8640 \text{ cm}^3$
- (b) (i) Any question that is relevant to the survey and whose response is a whole number. **1**
- (ii) Categorical. **1**
- (iii) Targets too narrow a selection of parents who drop their children off. **1**
- (c) (i) $\text{IQR} = Q_3 - Q_1$ **1**
 $= 170 - 155$
 $= 15$
- (ii) $Q_1 = 155 \text{ cm}$ **1**
 $\text{no. of students above } 155 \text{ cm} = 75\% \times 20$
 $= 15$
- (iii) $4 \times 15 = 60$
- (d) Injury or death of another person **1**

Question 26 (continued)

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

$$A \approx \frac{50}{3}(150 + 4 \times 152 + 148) + \frac{50}{3}(148 + 4 \times 154 + 146)$$
$$\approx 30\,267 \text{ m}^2$$

(f) $2x^3(x-5) + 5x^3(3x+4) = 2x^4 - 10x^3 + 15x^4 + 20x^3$ **2**

$$= 17x^4 + 10x^3$$

Question 27 (15 marks)

- (a) (i) 10 **1**
(ii) 19.5 **1**
(iii) $25 - 16 = 9$ **1**
(iv) $19.5 + 1.5 \times 9 > 29$. No it is not. **2**
(iv) Yes, less water was used in July. Eg. Skewness **1**
- (b) (i) Tax deducted = 30% of \$45 156 **1**
 $= 0.3 \times \$45\,156$
 $= \$13\,546.80$
- (ii) Tax payable = $\$3572 + 0.325 \times (\$45\,156 - \$37\,000)$ **2**
 $= \$6222.7$
- (iii) The tax deducted is greater than the tax payable. Kathie has to receive a refund. **1**

Question 27 (continued)

- (c) One s.d. down plus 2 s.d up.

$$\frac{68+95}{2} = 81.5$$

95% will weigh between 12.8 kg and 13.4 kg (± 2 standard deviations). **2**

\therefore 47.5% will weigh between 13.0 and 13.4 kg.

68% of the bags will weigh between 12.8 kg and 13.2 kg (± 1 standard deviations).

\therefore 34% will weigh between 12.8 and 13.0 kg.

$$\begin{aligned}\therefore \text{percentage of bags between 12.8 kg and 13.4 kg} &= 47.5\% + 34\% \\ &= 81.5\%\end{aligned}$$

- (d) Flow rate = $\frac{1.2 \times 1000}{6}$ **1**

$$= 200 \text{ mL/h}$$

- (e) Scatter plot & line of best fit **2**

Question 28 (15 marks)

- (a) (i) Cumulative frequency histogram **1**
- (ii) 100 students **1**
- (iv) $5 - 2 = 3$ **2**

- (b) (i) $0.24 + 0.45 + 0.05 + 0.15 + 0.07 + 0.03 = 0.99$ **1**
 $P(6 \text{ accidents}) = 1 - 0.99 = 0.01$
- (ii) Expected number of accidents **2**
 $= 0.45 \times 52 \times 5$
 $= 1.17$

- (c) (i) $S = V_0 - Dn$ **1**
 $= 85\,000 - 12\,500 \times 4$
 $= \$35\,000$

- (ii) $S = V_0 - Dn$ **2**
 $10000 = 85000 - 12500n$
 $12500n = 85000 - 10000$
 $12500n = 75000$
 $n = 75000 \div 12500$
 $= 6$

The excavator will be scrapped after 6 years.

Question 28 (continued)

- (d) (i) Tree diagram 2
(ii) $0.6 \times 0.7 = 0.64$ 1
(iii) $1 - 0.6 \times 0.4 = 1 - 0.24$ 2
 $\quad \quad \quad = 0.76$

Question 29 (15 marks)

(a)

2

$$4x - y = 6$$

$$y = 4x - 6$$

$$3x + 2(4x - 6) = -1$$

$$11x - 12 = -1$$

$$x = 1$$

$$y = -2$$

$$\frac{\text{No. tagged from population}}{\text{Population } (P)} = \frac{\text{No. tagged from sample}}{\text{Sample}}$$

$$\frac{86}{P} = \frac{4}{25}$$

$$4P = 86 \times 25$$

$$P = \frac{2150}{4}$$
$$= 537.5$$

There were about 550 emus in the park.

(c) $\angle A = 90^\circ$

$$\angle P = \angle B = 45^\circ$$

$$\therefore AB = 15 \text{ km (isosceles)}$$

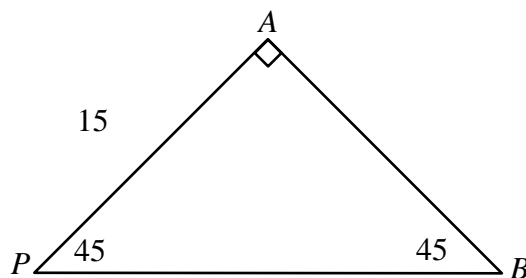
$$PB^2 = 15^2 + 15^2 \text{ (Pythagoras)}$$

$$PB = \sqrt{450}$$

$$= 21.21320344$$

$$\therefore \text{Distance} = 15 + 15 + 21$$

$$= 51 \text{ km (nearest km)}$$



3

Question 29 (continued)

(d) (i) Excess = \$2993.54 – \$2500
= \$493.54 1

(ii) Returned = \$679 + \$358 + \$0.35
= \$1037.35 1

(e) $BD^2 = 17^2 + 24^2 - 2 \times 17 \times 24 \times \cos 30^\circ$ 2
 $= 158.3232705$

$$BD = \sqrt{158.3232705}$$
$$= 12.58265753$$
$$= 12.6 \text{ cm (1dp)}$$

(ii) In $\triangle ACD$, $\sin 30^\circ = \frac{AD}{17}$ 2

$$AD = 17 \sin 30^\circ$$
$$= 8.5 \text{ cm}$$

$$BA = BD + AD$$
$$= 12.6 + 8.5$$
$$= 21.1 \text{ cm (1dp)}$$

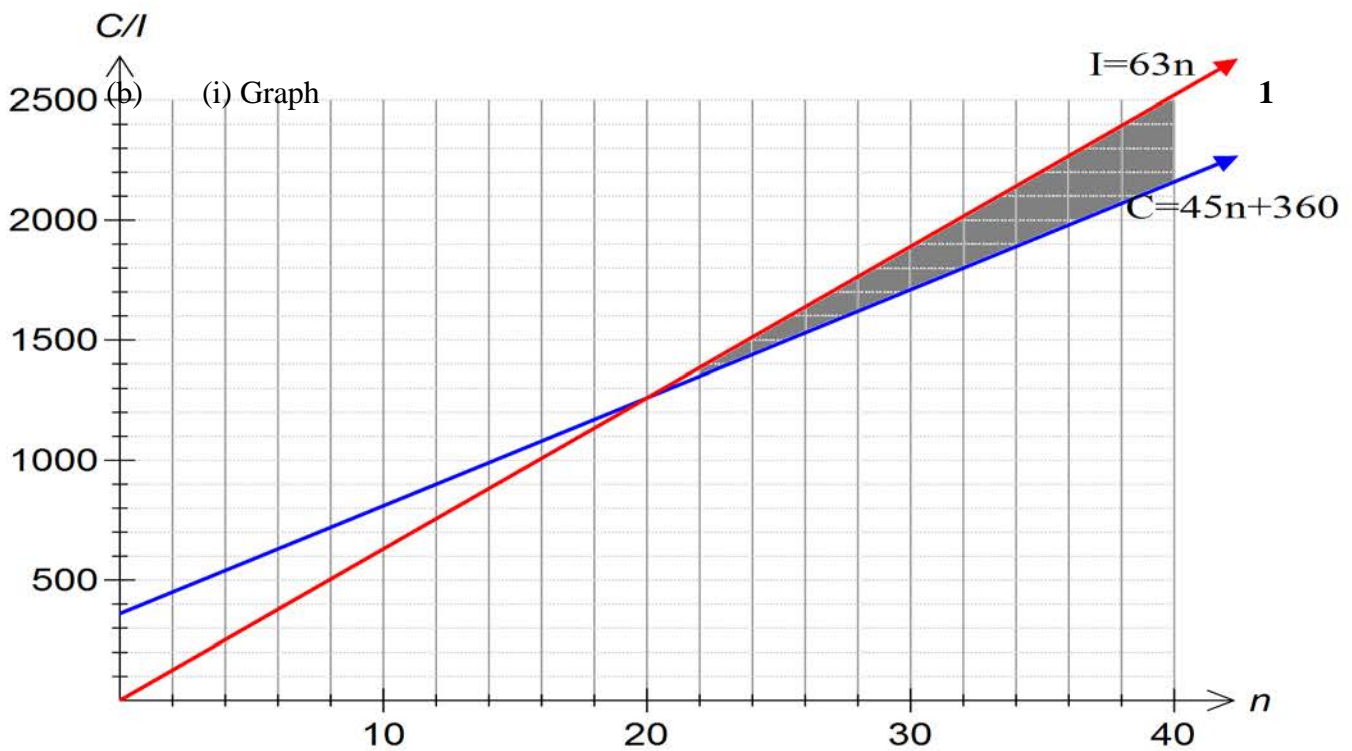
(f) $\frac{0.5}{509} \times 100 = 0.09823$ 2
9.8% (2 s.f.)

Question 30 (15 marks)

(a) (i) $\text{gradient} = 0.7590 \times \frac{5.740}{5.384}$ 2
 $= 0.8092$

(ii) $\text{p-intercept} = 173.20 - 0.8029 \times 169.55$ 2
 $= 37.068305$

(iii) $p = 8.092c + 37.068$



(ii) The cost of making each cake. 1

(iii) Graph 1

(iv) Approximately 19. 1

(c) (i) Value from the table is 12.0061. 2
 $600 \times 12.0061 = \$7203.66$

(ii) Amount required to achieve \$12000 = $12000 \div 12.0061 = \$999.49$ **3**

He will have to invest an extra $(\$999.49 - \$600) = \$399.49$

(iii) $7203.66(1.1)^n = 12000$ **2**
 $(1.1)^n = \frac{12000}{7203.66} = 1.665819875$

When $n = 5$; $(1.1)^5 = 1.61051.....$

When $n = 6$; $(1.1)^6 = 1.771561.....$

Therefore he will achieve his investment amount in the 6th year.