



Student Name: \_\_\_\_\_

Teacher's Name: \_\_\_\_\_

# KNOX GRAMMAR SCHOOL

## 2015

Trial Higher School Certificate Examination

# Mathematics General 2

### General Instructions

- Reading time – 5 minutes
- Working time – 2.5 hours
- Write using blue or black pen only
- Board approved calculators only
- Draw diagrams in pencil
- A formulae sheet and multiple choice answer sheet are provided

### Subject teachers

Ms Tran  
 Mr L Harvey \*  
 Ms E Ruff  
 Mr A Willcocks  
 Ms Yamaner  
 Mrs C Ward  
 Mr V Naidoo

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

**Total Marks - 100**

**Section I** Pages 3 – 12

**25 marks**

- Attempt questions 1 – 25
- Allow 35 minutes for this section

**Section II** Pages 13 – 35

**75 marks**

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

Number of Students in Course: 144

MC	Q26	Q27	Q28	Q29	Q30	TOTAL
/25	/15	/15	/15	/15	/15	/100

### Section I

**Total marks (25)**

**Attempt Questions 1 – 25**

**Allow about 35 minutes for this section**

Use the multiple choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

**Sample**  $2 + 4 = ?$

(A) 2 (B) 6 (C) 8 (D) 10

A  B  C  D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A  B  C  D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:

A  B  C  D   
 correct ↖

## 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

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1. How many kilobytes are there in 2 gigabytes?

- (A)  $2^{20}$
- (B)  $2^{21}$
- (C)  $2^{30}$
- (D)  $2^{31}$

2. Simplify  $3(x+4) - 5(2x-3)$ .

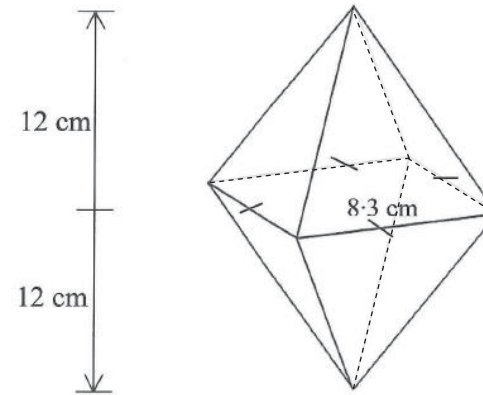
- (A)  $-7x-7$
- (B)  $-7x+27$
- (C)  $13x-3$
- (D)  $13x+27$

3. Patrick earns a fortnightly wage of \$1475.80.

What is Patrick's wage for one month to the nearest dollar?

- (A) \$2952
- (B) \$3162
- (C) \$3198
- (D) \$3276

4. A square bi-pyramid consists of two identical square pyramids. The square base has an edge length of 8.3 centimetres and the perpendicular height of each pyramid is 12 centimetres.



**NOT TO SCALE**

Determine the volume of the square bi-pyramid in cubic centimetres, correct to 3 significant figures.

- (A) 275
- (B) 276
- (C) 551
- (D) 552

5. Riley has a mobile phone plan which includes a data allowance of 1.5 gigabytes (GB) each month. The mobile company charges excess usage fees of \$0.0195 per megabyte of usage over the allowance. Last month Riley used 1.87 GB of data.

Calculate, to the nearest cent, the amount he will need to pay for the excess usage.

- (A) \$7.22
- (B) \$7.39
- (C) \$37.34
- (D) \$73.88

6. The average NSW annual water consumption from the residential sector is equal to 90 340 litres per person per year. The Building Sustainability Index (BASIX) uses this as the benchmark to set a target for reducing water consumption by up to 40%.

A new building, planned to house 50 people, has been designed to meet a 25% reduction on this water consumption benchmark.

How much water per year, to the nearest kilolitre, is this building designed to save when fully occupied?

- (A) 1129  
 (B) 1807  
 (C) 2710  
 (D) 3388
7. The weights of 10 000 newborn babies in NSW are normally distributed. These weights have a mean of 3.1 kg and a standard deviation of 0.35 kg.

How many of these newborn babies have a weight between 2.75 kg and 4.15 kg?

- (A) 4985  
 (B) 6570  
 (C) 8370  
 (D) 8385
8. Jordan has bought his first car for \$4000. Jordan does not think it is worth insuring the car but wants protection against damage to other people and property for which he may be responsible.

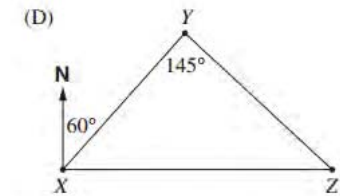
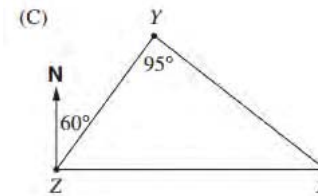
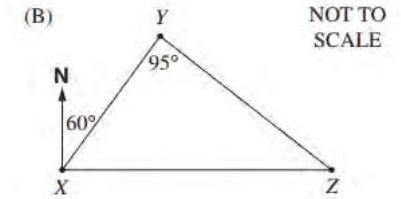
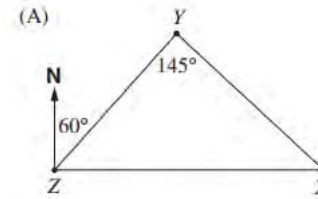
Jordan will need to take out:

- (A) compulsory third party insurance  
 (B) third party property insurance  
 (C) comprehensive insurance  
 (D) both A and B

9. The following information is given about the location of three towns  $X, Y$  and  $Z$ :

- $X$  is due east of  $Z$
- $X$  is on a bearing of  $145^\circ$  from  $Y$
- $Y$  is on a bearing of  $060^\circ$  from  $Z$

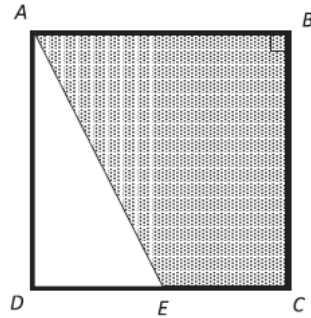
Which diagram best represents this information?



10. Which of the following data sets demonstrates a range of 23 and an interquartile range of 15?

- (A) 4, 10, 15, 18, 27  
 (B) 4, 10, 10, 18, 25, 31  
 (C) 4, 6, 10, 12, 14, 19  
 (D) 4, 10, 10, 18, 25, 27

11. The square  $ABCD$  has a perimeter of 36 cm.



The point  $E$  is the midpoint of the edge  $DC$  of the square. What is the perimeter, in centimetres, of the shaded trapezium?

- (A) 21.7 cm  
 (B) 22.5 cm  
 (C) 31.5 cm  
 (D) 32.6 cm
12. Consider the data displayed in the stem-and-leaf plot below which shows the number of gold medals won by a country at each Olympic Games.

Stem	Leaf	Key $1 5 = 15$
0	0 1 3 5 5 8	
1	0 0 2 3 7 7 8	
2	0 1	

At the next Olympic Games the country wins 12 gold medals. When this is added to the data set:

- (A) The median will decrease and the interquartile range will decrease.  
 (B) The median will decrease and the interquartile range will increase.  
 (C) The median will increase and the interquartile range will remain the same.  
 (D) The median will increase and the interquartile range will increase.

13. The surface area of a spherical ball is  $2828 \text{ cm}^2$ . What is the radius of the basketball, to the nearest cm?

- (A) 15 cm  
 (B) 27 cm  
 (C) 47 cm  
 (D) 225 cm

14. The table below shows Micah's results in four subjects. The mean and standard deviation for each subject are also shown.

Subject	Micah's Mark	Mean	Standard Deviation
English	70	60	7.5
Maths	72	60	10
Chemistry	71	63	4
Biology	68	58	8

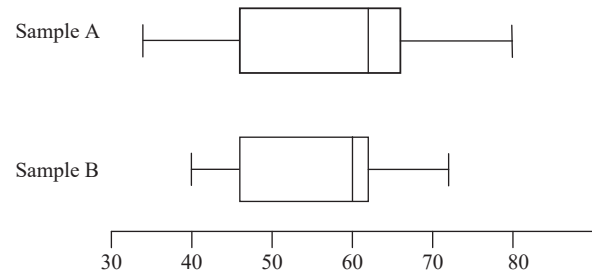
In which subject did Micah achieve his best standardised result?

- (A) English  
 (B) Maths  
 (C) Chemistry  
 (D) Biology

15. How many square millimetres are in  $0.000\ 075$  square metres?

- (A) 0.075  
 (B) 705  
 (C) 75  
 (D) 7500

16.



Which of the following can't be found from the above box and whisker plot?

- (A) Mean
  - (B) Range
  - (C) Median
  - (D) Interquartile range
17. A bag contains red, black and yellow marbles. There are more red marbles than black marbles, and more black marbles than yellow marbles. There are 3 yellow marbles and 10 red marbles.

Josh draws a marble at random.

Which of the following statements could be true?

- (A) The probability of drawing a yellow marble is  $\frac{4}{17}$ .
- (B) The probability of drawing a black marble is  $\frac{7}{21}$ .
- (C) The probability of drawing a red marble is  $\frac{10}{22}$ .
- (D) The probability of drawing a red marble is  $\frac{10}{23}$ .

18. A machine produces 6000 items in a week. A systematic sample of 200 items is required. The 20<sup>th</sup> item is selected first.

Which of the following sequences should be used to select the rest of the items?

- (A) 50<sup>th</sup>, 80<sup>th</sup>, 110<sup>th</sup>, 140<sup>th</sup>, .....
- (B) 200<sup>th</sup>, 400<sup>th</sup>, 600<sup>th</sup>, 800<sup>th</sup>, .....
- (C) 110<sup>th</sup>, 170<sup>th</sup>, 230<sup>th</sup>, 290<sup>th</sup>, .....
- (D) 250<sup>th</sup>, 450<sup>th</sup>, 650<sup>th</sup>, 850<sup>th</sup>, .....

19. Aaron measures the length and breadth of a rectangle to the nearest centimetre. His answers are 12 cm and 16 cm.

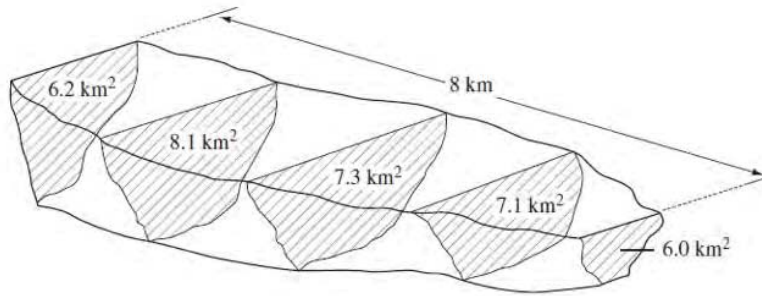
Between what lower and upper values must the actual area of the rectangle lie?

- (A)  $(11.5 \times 15.5) \text{ cm}^2$  and  $(12 \times 16) \text{ cm}^2$
- (B)  $(11.5 \times 15.5) \text{ cm}^2$  and  $(12.5 \times 16.5) \text{ cm}^2$
- (C)  $(12 \times 16) \text{ cm}^2$  and  $(12.5 \times 16.5) \text{ cm}^2$
- (D)  $(11.5 \times 15.5) \text{ cm}^2$  and  $(13 \times 17) \text{ cm}^2$

20. What is  $\frac{6x^2y}{3} \div \frac{2y}{5}$  expressed in its simplest form?

- (A)  $5x^2$
- (B)  $30x^2y$
- (C)  $\frac{1}{5x^2}$
- (D)  $\frac{5}{4x^2y^2}$

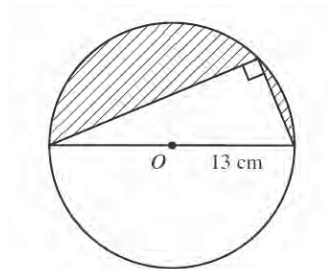
21. The equally spaced cross-sectional areas of a water reservoir are shown.



Using Simpson's rule twice, what is the approximate volume of the reservoir?

- (A)  $31 \text{ km}^3$   
 (B)  $58 \text{ km}^3$   
 (C)  $117 \text{ km}^3$   
 (D)  $234 \text{ km}^3$

- 22.



The centre of a circle is  $O$  and the radius is  $13 \text{ cm}$ . One side of the triangle is  $10 \text{ cm}$  long. Calculate the size of the shaded area correct to 1 decimal place.

- (A)  $145.5 \text{ cm}^2$   
 (B)  $223.9 \text{ cm}^2$   
 (C)  $410.9 \text{ cm}^2$   
 (D)  $941.9 \text{ cm}^2$

23. A car is travelling at  $80 \text{ km/h}$ . It takes the driver two seconds to react to a dangerous situation before applying the brakes.

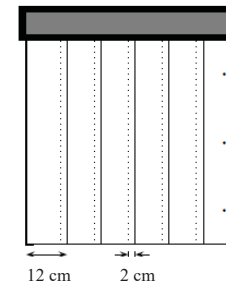
Approximately how far will the car travel in this time?

- (A)  $44 \text{ m}$   
 (B)  $160 \text{ m}$   
 (C)  $288 \text{ m}$   
 (D)  $576 \text{ m}$

24. Aleck borrows  $\$20\,000$  to purchase a motorcycle. His payments are set out at  $\$195$  per fortnight. The total interest charged over the period of the loan will be  $\$10\,420$ . Over how many years will Aleck repay his loan?

- (A) 2  
 (B) 4  
 (C) 5.5  
 (D) 6

25. Vertical blinds  $12 \text{ cm}$  wide overlap by  $2 \text{ cm}$  when they are closed.



Which of the following expressions represents the width, in centimetres, covered by  $n$  blinds when they are closed?

- (A)  $10n + 2$   
 (B)  $10n - 2$   
 (C)  $12n$   
 (D)  $12n - 2$

**Section II**

**75 marks**

**Attempt Questions 26 – 30**

**Allow about 1 hour and 55 minutes for this section**

Answer all questions in the spaces provided.

Your responses should include relevant mathematical reasoning and/or calculations.

Extra writing space is provided on page 36. If you use this space, clearly indicate which question you are answering.

**QUESTION 26 (15 marks)**

- (a) Isaac needs to give his nephew some medicine. He uses Clark’s rule:

$$D = \frac{kA}{70}$$

(where  $D$  is the dosage,  $k$  is the weight of the child in kilograms and  $A$  is the adult dosage.) 2

Isaac’s nephew is six years old and weighs 21 kg. The adult dosage is 10 mL every morning and 10 mL every night.

How many days will a 300 mL bottle of medicine last for Isaac’s nephew?

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- (b) Lachlan buys a new car for \$18 560. Using the declining balance method of depreciation, calculate the value of Lachlan’s car after three years if it depreciates at a rate of 15% p.a. 2

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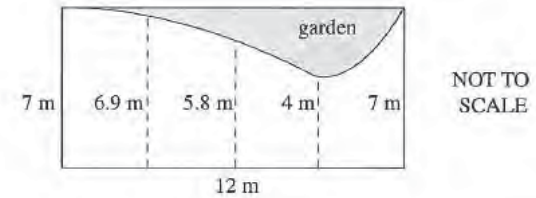


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Question 26 continues on page 14

**Question 26 continued**

- (c) Three straight fences and a garden border a piece of land. 2



Find the area of the land by applying Simpson’s rule twice. Answer correct to the nearest square metre.

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- (d) A design of numberplates has a two-digit number, two letters and then another two-digit number. Examples include 02 AC 15 and 52 XJ 13.

- (i) How many different such numberplates are possible? 1

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- (ii) James’ birthday is 5<sup>th</sup> March, 1998. He would like the numberplate 05 JK 03 or the numberplate 19 JK 98. 2

James can order a numberplate with ‘JK’ in the middle but will have to randomly selected numbers on either side.

What is the probability that James will be issued with one of the number plates he would like?

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Question 26 continues on page 15

**Question 26 continued**

- (e) The table shows the fortnightly ABSTUDY allowances available to independent indigenous students.

Category of eligibility	Maximum fortnightly payment
<b>Single, no dependents</b>	
less than 16 years old	\$414.40
16-21 years old	\$414.40
Less than 16 years old, at home	\$226.80
16-17 years old, at home	\$226.80
18-21 years old, at home	\$272.80
22 to less than 60 years old	\$501.00
aged 60 years old or more	\$542.10
<b>Partnered, no dependents</b>	
Less than 16 years old	\$414.40
16-21 years old	\$414.40
22 years old or more	\$452.30
<b>Single, with dependent children</b>	
Less than 16 years old	\$542.90
16-21 years old	\$542.90
22 years old or more	\$542.10
<b>Partnered, with dependent children</b>	
Less than 16 years old	\$455.00
16-21 years old	\$455.00
22 years old or more	\$452.30

Source : Australian Government Department of Human Services

Peter and Samantha are indigenous students who recently married. Peter is 23 years old and Samantha is 20. They have no dependent children.

2

Calculate their combined maximum fortnightly allowance.

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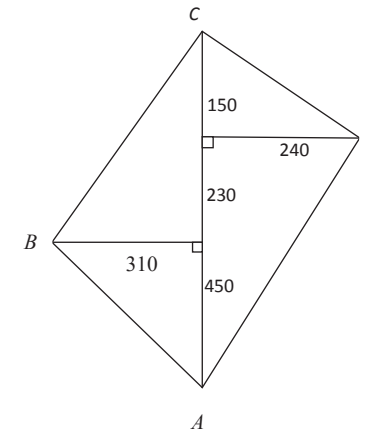


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Question 26 continues on page 16

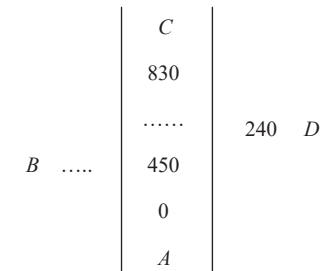
**Question 26 continued**

- (f) Ben surveys a fenced paddock on his farm. Ben completes a traverse survey as shown in the diagram below. All dimensions are in metres.



- (i) Complete the missing values in the field diagram below

1



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

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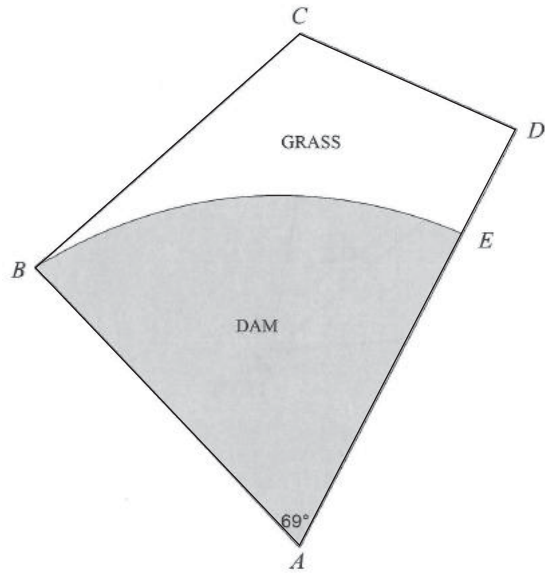
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Question 26 continues on page 17



**Question 26 continued**

- (iii) Ben wishes to construct a new dam in this paddock. He uses his traverse survey measurements as a guide. The dam is in the shape of a sector as shown in the shaded part of this diagram.



If  $AB = AE$  and  $\angle BAE = 69^\circ$ , find the area of the dam, correct to 2 significant figures.

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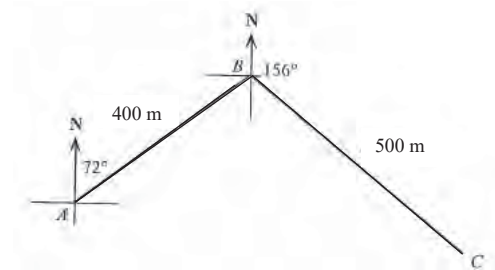
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**End of Question 26**

**QUESTION 27 (15 marks)**

- (a) A class is on a treasure hunt as part of their Sports, Lifestyle & Recreation course. They are given the following directions from base camp  $A$ . They are to walk on a bearing of  $072^\circ$  for 400 metres to point  $B$ . They are then to continue on a bearing of  $156^\circ$  for 500 metres to Point  $C$ . They then return to base camp  $A$ .



- (i) Show that  $\angle ABC = 96^\circ$ .

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- (ii) Calculate,  $AC$ , the distance that the class needs to travel on their final leg of their journey. Give your answer correct to the nearest metre.

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**Question 27 continues on page 19**

**Question 27 continued**

- (iii) Find the bearing that the class needs to take from Point *C* to return to base camp *A*. 2

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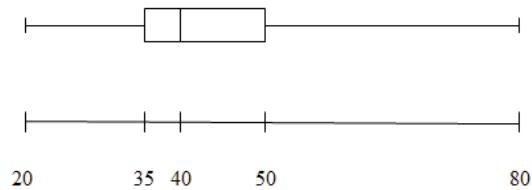
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- (b) Drew created this box and whisker plot from data that he had collected.



He said that the highest score was an outlier.

- Is Drew correct? Justify your answer with appropriate calculations. 2

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Question 27 continues on page 20

**Question 27 continued**

- (c) Penny works as a part-time waiter in a club bistro.

Use her Payment Summary and other information to answer the questions below.

PAYG Payment Summary – Individual Non Business			
Payee	PENNY LANE		Tax File Number
			149 370 011
Address	13 ABBEY ROAD STRAWBERRY FIELDS NSW 2527		Gross Payments
			\$28 480
Payer	PEPPERS HEARTS CLUB PTY LTD		
Authorised Person	Payer Number 555-301-24		
ERIGBY			
Deductions	Amount		
UNION FEES	\$241.00		
Total Tax Withheld-whole dollars only in words			Total Tax Withheld
Thousands	Tens	Hundreds	Units
FIVE	ONE	EIGHT	NINE

Other details:	
Penny's age this year	18
Other Income this year:	
Youth Allowance	\$9183.68
Interest: Bank Account	\$75.90
Other tax deductions this year:	
Work related expenses	\$95.14
Donations to charities	\$54.00

- (i) Calculate Penny's total income to the nearest dollar. 1

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- (ii) Calculate her total tax deductions to the nearest dollar. 1

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Question 27 continues on page 21

**Question 27 continued**

- (iii) Use the tax table below to calculate the tax payable on Penny's taxable income.  
(Answer to the nearest dollar)

<b>Taxable Income</b>	<b>Tax on this Income</b>
0 - \$18 200	Nil
\$18 201 - \$37 000	19c for each \$1 over \$18 200
\$37 001 - \$80 000	\$3572 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

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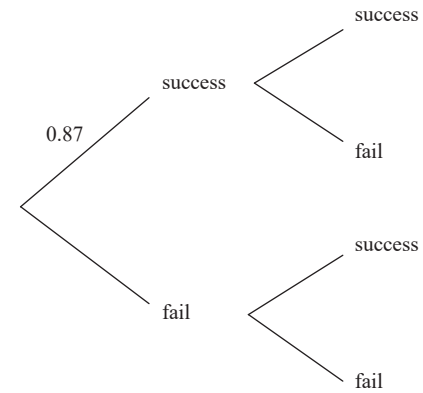
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Question 27 continues on page 22

**Question 27 continued**

- (d) A new drug has a probability of 0.87 of being successful in preventing the spread of a virus.  
Two people are selected at random to test the drug.

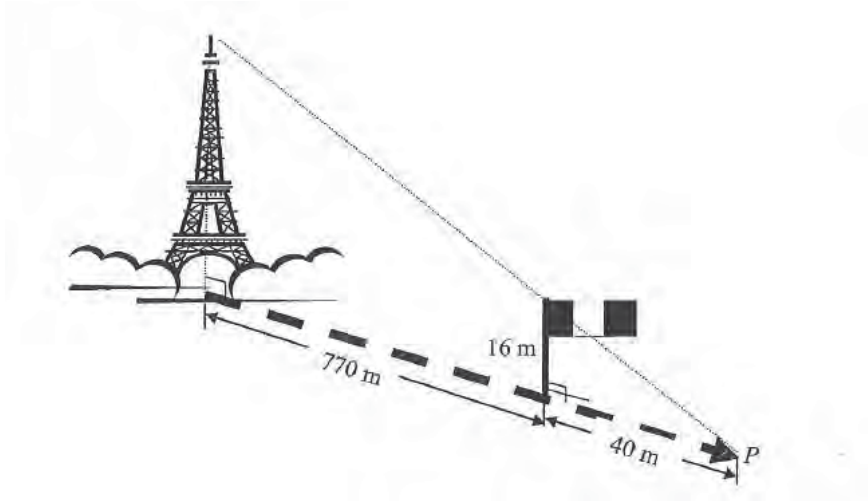


- (i) What is the probability of the drug failing? 1
- 
- 
- (ii) What is the probability of the drug being successful on both people? 1
- 
- 
- 
- (iii) What is the probability of the drug being successful on only one person? 2
- 
- 
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**End of Question 27**

**Question 28 (15 Marks)**

- (a) The French flag is on a 16 metre pole perpendicular to the ground at a position 770 metres from the foot of the Eiffel Tower in Paris. The ground is level.



At night, a beam of light shines from the top of the tower and reaches appoint  $P$  along the ground, 40 metres from the flag pole.

- (i) Show that the height of the Eiffel Tower is 324 metres tall. 3

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- (ii) What is the angle of depression (to the nearest degree) from the top of the Eiffel Tower to the bottom of the flagpole? 2

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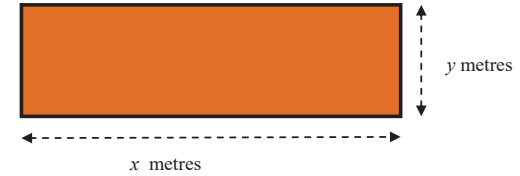


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Question 28 continues on page 24

**Question 28 continued**

- (b) Farmer Giddy wants to enclose some of his animals using 160 linear metres of fencing. Farmer Giddy initially draws a plan of a rectangular enclosure, as shown, and marks the length  $x$  metres and width  $y$  metres.



- (i) Write down one possible value of each of  $x$  and  $y$  that Farmer Giddy could write on the plan. 1

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- (ii) Show that  $y = 80 - x$ . 1

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Question 28 continued on page 25

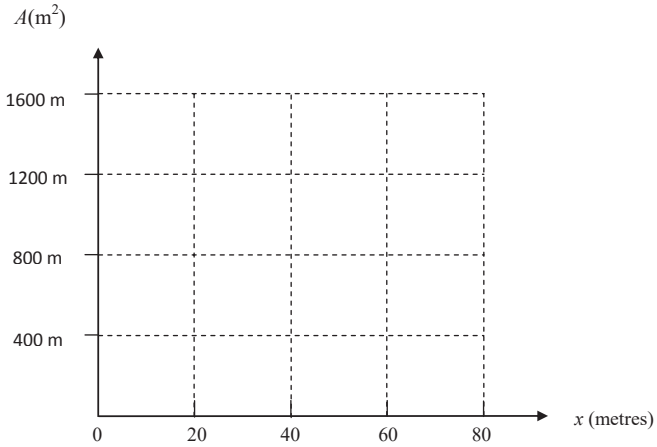
**Question 28 continued**

(iii) Farmer Giddy writes an equation for the area ( $A$ ) of the enclosure as:

$$A = 80x - x^2$$

$$= x(80 - x)$$

On the axes below, draw a sketch of the graph represented by this equation using the values of  $x$  given. Show the corresponding  $A$  values on the vertical axis.



(iv) Using the graph, determine the dimensions of the enclosure that will give the maximum area.

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(v) What conclusion can be drawn from the graph?

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Question 28 continued on page 26

**QUESTION 28 continued**

(c) The maximum speed (km/h) of a ski lift going up an incline to a plateau, is inversely proportional to the square of the total weight (kg) of the skiers in the lift.

A ski lift with a total weight of 348 kg has a maximum speed of 35 km/h.

What would be the total weight (to the nearest kilogram) on the lift if it has a maximum speed of 25 km/h?

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End of Question 28

**Question 29 (15 Marks)**

- (a) Kayleb has a personal loan of \$15 000 and has to repay this loan in equal monthly payments over 4 years. The interest rate on Kayleb's loan is 7.8% p.a.

The following table shows the present value interest factors for reducing balance loans at various *monthly* interest rates ( $r$ ) over different time periods ( $N$ ).

**Table of present value interest factors**

$r$	0.0060	0.0065	0.0070	0.0075	0.0080	0.0085
$N$						
45	39.33406	38.90738	38.48712	38.07318	37.66545	37.26383
46	40.09350	39.64965	39.21263	38.78231	38.35859	37.94133
47	40.84841	40.38714	39.93310	39.48617	39.04622	38.61311
48	41.59882	41.11986	40.64856	40.18478	39.72839	39.27924
49	42.34475	41.84785	41.35905	40.87820	40.40515	39.93975
50	43.08623	42.57113	42.06459	41.56645	41.07653	40.59470

- (i) Write down the present value interest factor from the table associated with Kayleb's loan.

1

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- (ii) Calculate the interest that Kayleb will pay over the term of the loan.

3

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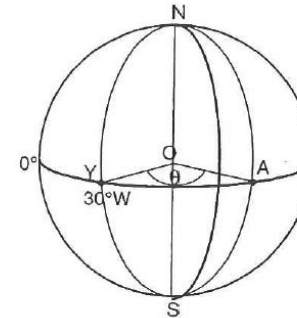


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Question 29 continued on page 28

**Question 29 continued**

- (b) Two cities  $A$  and  $Y$  are located on the equator, as shown in the diagram of the Earth's surface.



- (i) Write down the co-ordinates of city  $Y$ .

1

- (ii) The distance between city  $Y$  and city  $A$  is approximately 5000km. Show that  $\theta$  (angle  $AOY$ ) is approximately  $45^\circ$ .

3

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Question 29 continued on page 29

**Question 29 continued**

(iii) Write down the co-ordinates of city *A*.

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(iv) A plane takes off in city *Y* at 10.30 am local time with city *A* as its destination.

If the plane travels at an average speed of 625 km/h, at what local time will it touch down in city *A* (assuming its flight path is along the equator)?

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Question 29 continued on page 30

**Question 29 continued**

(c) The spreadsheet shows monthly loan repayments with interest rate changes from February to October 2012.

1

**Monthly home loan repayments**

	A	B	C	D	E
1					
2	<i>Dates</i>	Feb 2012	Apr 2012	Jun 2012	Oct 2012
3	<i>Increase/Decrease</i>	-1.0%	-0.1%	0.05%	0.25%
4	<i>Rate (pa)</i>	5.85%	5.75%	5.80%	6.05%
5	\$1000	\$6.35	\$6.29	\$6.32	\$6.47
6	\$50 000	\$318	\$315	\$316	\$324
7	\$100 000	\$635	\$629	\$632	\$647
8	\$150 000	\$953	\$944	\$948	\$971
9	\$200 000	\$1270	\$1258	\$1264	\$1295
10	\$250 000	\$1588	\$1573	\$1580	\$1618
11	\$300 000	\$1905	\$1887	\$1896	\$1942
12	\$350 000	\$2223	\$2202	\$2212	\$2266
13	\$400 000	\$2541	\$2516	\$2529	\$2589
14					

Campbell's bank approves loans for customers if their loan repayments are no more than 30% of their monthly gross salary.

Campbell wanted to borrow money to buy a house. His monthly gross salary was \$7500. He applied for the loan in June 2012.

What was the maximum amount that his bank would approve for him to borrow?

3

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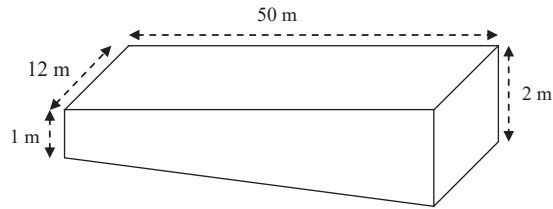
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**Question 30 (15 Marks)**

- (a) A swimming pool is in the shape of a trapezoidal prism as shown in the diagram below. The pool is 50 m long and 12 m wide, and 1 m in depth at the shallow end and 2 metres in depth at the deep end.



NOT TO SCALE

- (i) Find the area of the trapezoidal cross section.

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- (ii) Find the capacity of the pool in litres.

1

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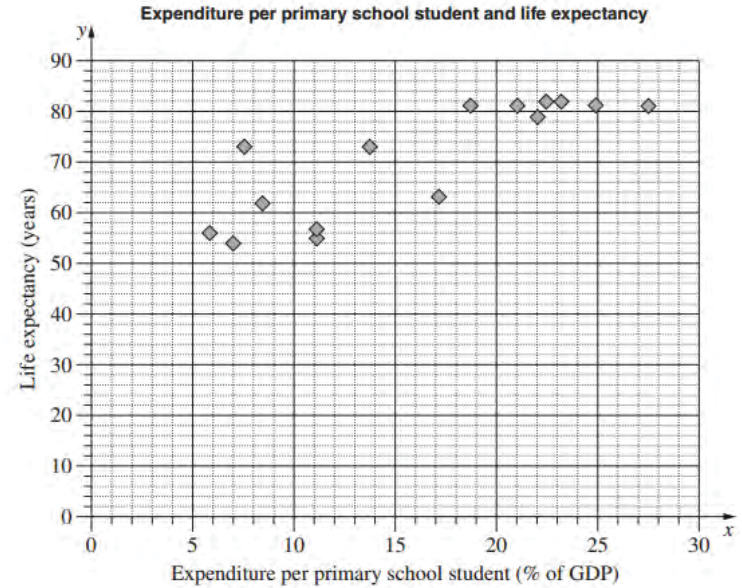


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Question 30 continued on page 32

**QUESTION 30**

- (b) The scatterplot shows the relationship between expenditure per primary school student, as a percentage of a country's Gross domestic Product (GDP), and the life expectancy in years for 15 countries.



- (i) For the given data, the correlation coefficient,  $r$ , is 0.83. What does this indicate about the relationship between expenditure per primary school student and life expectancy for the 15 countries?

1

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Question 30 continued on page 33



**Question 30 continued**

- (ii) The expenditures per primary school student for the 15 countries in the scatter plot are:  
5.9, 7, 7.6, 8.4, 11.2, 11.2, 13.7, 17.1, 18.7, 21.2, 22, 22.5, 23.2, 24.9, 27.6

Complete the table below by calculating the mean,  $\bar{x}$ , and the standard deviation,  $\sigma_x$ , of these data. Calculate both values to two decimal places. 2

	<i>Mean</i>	<i>Standard deviation</i>
Expenditure per primary school student	$\bar{x} =$	$\sigma_x =$
Life expectancy	$\bar{y} = 70.73$	$\sigma_y = 10.94$

- (iii) Using the values from the table in part (ii), show that the equation of the least-squares line of best fit is:

$$y = 1.29x + 49.9$$

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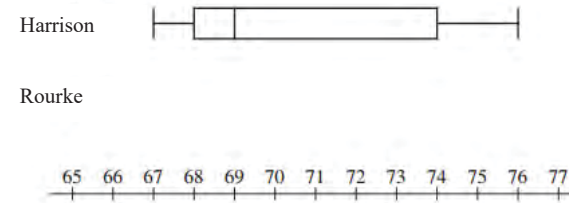
Question 30 continued on page 34

**Question 30 continued**

- (c) Harrison and Rourke each sat twenty class tests. Harrison's results on the tests are displayed in the box-and-whisker plot shown in part (i).

- (i) Rourke's 5-number summary for the tests is 67, 69, 71, 73, 75

Draw a box-and-whisker plot to display Rourke's results below that of Harrison's results. 1



- (ii) What percentage of Harrison's results were below 69? 1

- (iii) Harrison claims that his results were better than Rourke's. Is he correct? Justify your answer by referring to the summary statistics and the skewness of the distributions. 3

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Question 30 continued on page 35

**Question 30 continued**

- (d) Toby owns a credit card that has no annual fee and charges 19.6% interest per annum, simple interest on all purchases. The interest is charged, and includes, the day of purchase and the day of payment.

On the 28 July, Toby bought a new mobile phone for \$980 using his credit card.  
He paid his credit card account on 26 August.

What was the total amount Toby paid for his mobile phone? Answer correct to the nearest cent.

**3**

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**End of paper**



Student Name: SOLUTIONS

Teacher's Name: \_\_\_\_\_

# KNOX GRAMMAR SCHOOL

## 2015

Trial Higher School Certificate Examination

# Mathematics General 2

### General Instructions

- Reading time – 5 minutes
- Working time – 2.5 hours
- Write using blue or black pen only
- Board approved calculators only
- Draw diagrams in pencil
- A formulae sheet and multiple choice answer sheet are provided

### Subject teachers

Ms Tran  
 Mr L Harvey \*  
 Ms E Ruff  
 Mr A Willcocks  
 Ms Yamaner  
 Mrs C Ward  
 Mr V Naidoo

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

**Total Marks - 100**

**Section I** Pages 3 - 12

**25 marks**

- Attempt questions 1 - 25
- Allow 35 minutes for this section

**Section II** Pages 13 - 35

**75 marks**

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

**Number of Students in Course: 144**

MC	Q26	Q27	Q28	Q29	Q30	TOTAL
/25	/15	/15	/15	/15	/15	/100

### 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. How many kilobytes are there in 2 gigabytes?
- (A)  $2^{20}$        $2 \times 1024 \times 1024 = 2097152$
- (B)  $2^{21}$        $2 \times 2^{10} \times 2^{10} = 2^{21}$
- (C)  $2^{30}$
- (D)  $2^{31}$

2. Simplify  $3(x+4) - 5(2x-3)$  =  $3x + 12 - 10x + 15$
- (A)  $-7x - 7$       =  $-7x + 27$
- (B)  $-7x + 27$
- (C)  $13x - 3$
- (D)  $13x + 27$

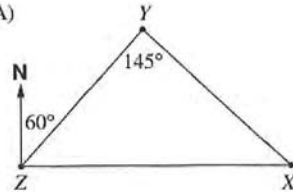
3. Patrick earns a fortnightly wage of \$1475.80
- What is Patrick's wage for one month to the nearest dollar?
- (A) \$2952
- (B) \$3162
- (C) \$3198       $\$1475.8 \times 26 \div 12 = \$3198$
- (D) \$3276

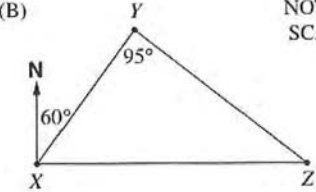


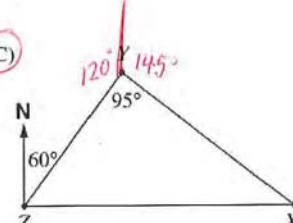
9. The following information is given about the location of three towns  $X, Y$  and  $Z$ :

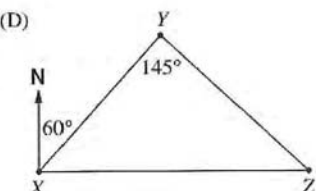
- $X$  is due east of  $Z$
- $X$  is on a bearing of  $145^\circ$  from  $Y$
- $Y$  is on a bearing of  $060^\circ$  from  $Z$

Which diagram best represents this information?

(A) 

(B)  NOT TO SCALE

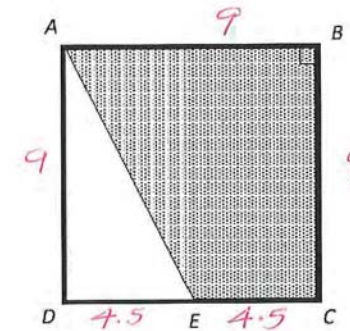
(C) 

(D) 

10. Which of the following data sets demonstrates a range of 23 and an interquartile range of 15?

- (A) 4, 10, 15, 18, 27
- (B) 4, 10, 10, 18, 25, 31
- (C) 4, 6, 10, 12, 14, 19
- (D) 4, 10, 10, 18, 25, 27
- Q1 = 10, Q3 = 18, IQR = 8, R = 23*

11. The square  $ABCD$  has a perimeter of 36 cm.



The point  $E$  is the midpoint of the edge  $DC$  of the square. What is the perimeter, in centimetres, of the shaded trapezium?

- (A) 21.7 cm
- (B) 22.5 cm
- (C) 31.5 cm
- (D) 32.6 cm

*AE = \sqrt{9^2 + 4.5^2}*  
*= 10.0623...*  
*P = 10.06 + 9 + 9 + 4.5*  
*= 32.56 cm*

12. Consider the data displayed in the stem-and-leaf plot below which shows the number of gold medals won by a country at each Olympic Games.

Stem	Leaf	Key
0	0 1 3 5 5 8	$1 5 = 15$
1	0 2 2 3 7 7 8	
2	0 1	

*Median increases*  
*10R15 = 12*  
*10R16 = 12 Same*

At the next Olympic Games the country wins 12 gold medals. When this is added to the data set:

- (A) The median will decrease and the interquartile range will decrease.
- (B) The median will decrease and the interquartile range will increase.
- (C) The median will increase and the interquartile range will remain the same.
- (D) The median will increase and the interquartile range will increase.



13. The surface area of a spherical ball is  $2828 \text{ cm}^2$ . What is the radius of the basketball, to the nearest cm?

- (A) 15 cm
- (B) 27 cm
- (C) 47 cm
- (D) 225 cm

$$4\pi R^2 = 2828$$

$$R^2 = \frac{2828}{4\pi}$$

$$R = 15.00150 \dots$$

14. The table below shows Micah's results in four subjects. The mean and standard deviation for each subject are also shown.

Subject	Micah's Mark	Mean	Standard Deviation
English	70	60	7.5
Maths	72	60	10
Chemistry	71	63	4
Biology	68	58	8

In which subject did Micah achieve his best standardised result?

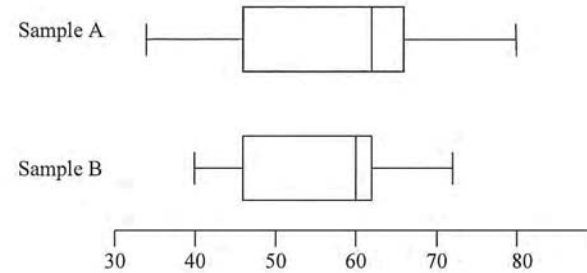
- (A) English
- (B) Maths
- (C) Chemistry
- (D) Biology

15. How many square millimetres are in  $0.000075$  square metres?

- (A) 0.075
- (B) 705
- (C) 75
- (D) 7500

$$1 \text{ m}^2 = 1000 \text{ m} \times 1000 \text{ m}$$

16.



Which of the following can't be found from the above box and whisker plot?

- (A) Mean
- (B) Range
- (C) Median
- (D) Interquartile range

17. A bag contains red, black and yellow marbles. There are more red marbles than black marbles, and more black marbles than yellow marbles. There are 3 yellow marbles and 10 red marbles.

Josh draws a marble at random.

Which of the following statements could be true?

- (A) The probability of drawing a yellow marble is  $\frac{4}{17}$
- (B) The probability of drawing a black marble is  $\frac{7}{21}$
- (C) The probability of drawing a red marble is  $\frac{10}{22}$
- (D) The probability of drawing a red marble is  $\frac{10}{23}$

$$R \quad B \quad Y$$

$$10 \quad 9-4 \quad 3$$

$$17 < \text{total} < 22$$

18. A machine produces 6000 items in a week. A systematic sample of 200 items is required. The 20<sup>th</sup> item is selected first.

Which of the following sequences should be used to select the rest of the items?

- (A) 50<sup>th</sup>, 80<sup>th</sup>, 110<sup>th</sup>, 140<sup>th</sup>, .....  
 (B) 200<sup>th</sup>, 400<sup>th</sup>, 600<sup>th</sup>, 800<sup>th</sup>, .....  
 (C) 110<sup>th</sup>, 170<sup>th</sup>, 230<sup>th</sup>, 290<sup>th</sup>, .....  
 (D) 250<sup>th</sup>, 450<sup>th</sup>, 650<sup>th</sup>, 850<sup>th</sup>, .....

$$6000 \div 200 = 30$$

19. Aaron measures the length and breadth of a rectangle to the nearest centimetre. His answers are 12 cm and 16 cm.

Between what lower and upper values must the actual area of the rectangle lie?

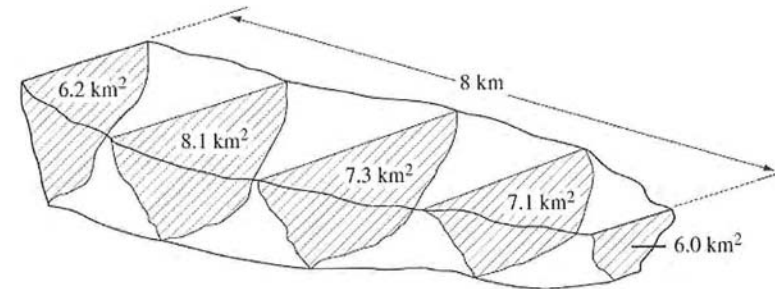
- (A)  $(11.5 \times 15.5) \text{ cm}^2$  and  $(12 \times 16) \text{ cm}^2$   
 (B)  $(11.5 \times 15.5) \text{ cm}^2$  and  $(12.5 \times 16.5) \text{ cm}^2$   
 (C)  $(12 \times 16) \text{ cm}^2$  and  $(12.5 \times 16.5) \text{ cm}^2$   
 (D)  $(11.5 \times 15.5) \text{ cm}^2$  and  $(13 \times 17) \text{ cm}^2$

20. What is  $\frac{6x^2y}{3} \div \frac{2y}{5}$  expressed in its simplest form?

- (A)  $5x^2$   
 (B)  $30x^2y$   
 (C)  $\frac{1}{5x^2}$   
 (D)  $\frac{5}{4x^2y^2}$

$$\frac{6x^2y}{3} \times \frac{5}{2y} = 5x^2$$

21. The equally spaced cross-sectional areas of a water reservoir are shown

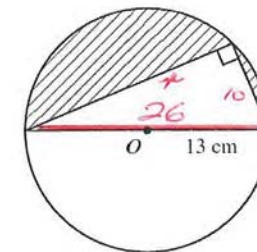


Using Simpson's rule twice, what is the approximate volume of the reservoir?

- (A)  $31 \text{ km}^3$   
 (B)  $58 \text{ km}^3$   
 (C)  $117 \text{ km}^3$   
 (D)  $234 \text{ km}^3$

$$V = \frac{2}{3}(6.2 + 4 \times 8.1 + 7.3) + \frac{2}{3}(7.3 + 4 \times 7.1 + 6.0) = 58.4$$

- 22.



$$x = \sqrt{26^2 - 10^2} = 24$$

The centre of a circle is  $O$  and the radius is 13 cm. One side of the triangle is 10 cm long. Calculate the size of the shaded area correct to 1 decimal place.

- (A)  $145.5 \text{ cm}^2$   
 (B)  $223.9 \text{ cm}^2$   
 (C)  $410.9 \text{ cm}^2$   
 (D)  $941.9 \text{ cm}^2$

$$A = \frac{1}{2} \pi \times 13^2 - \frac{1}{2} \times 24 \times 10 = 145.464$$

23. A car is travelling at 80 km/h. It takes the driver two seconds to react to a dangerous situation before applying the brakes.

Approximately how far will the car travel in this time?

- (A) 44 m  
(B) 160 m  
(C) 288 m  
(D) 576 m

$$\frac{80000 \text{ m}}{60 \times 60} \times \frac{1}{5} \times 2$$

$$22.2 \times 2$$

24. Aleck borrows \$20 000 to purchase a motorcycle. His payments are set out at \$195 per fortnight. The total interest charged over the period of the loan will be \$10 420. Over how many years will Aleck repay his loan?

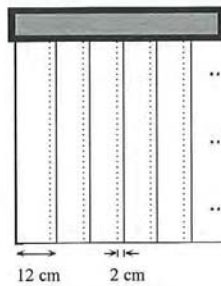
- (A) 2  
(B) 4  
(C) 5.5  
(D) 6

$$195 \times 26 \times n = 20000 + 10420$$

$$n = \frac{30420}{195 \times 26}$$

$$= 6$$

25. Vertical blinds 12 cm wide overlap by 2 cm when they are closed.



12 10 10 10

Which of the following expressions represents the width, in centimetres, covered by  $n$  blinds when they are closed?

- (A)  $10n + 2$   
(B)  $10n - 2$   
(C)  $12n$   
(D)  $12n - 2$

## Section II

75 marks

Attempt Questions 26 – 30

Allow about 1 hour and 55 minutes for this section

Answer all questions in the spaces provided.

Your responses should include relevant mathematical reasoning and/or calculations

Extra writing space is provided on page 32. If you use this space, clearly indicate which question you are answering.

### QUESTION 26 (15 marks)

- (a) Isaac needs to give his nephew some medicine. He uses Clark's rule:

$$D = \frac{kA}{70}$$

(where  $D$  is the dosage,  $k$  is the weight of the child in kilograms and  $A$  is the adult dosage.)

2

Isaac's nephew is six years old and weighs 21 kg. The adult dosage is 10 mL every morning and 10 mL every night.

How many days will a 300 mL bottle of medicine last for Isaac's nephew?

$$D = \frac{21 \times 10}{70}$$

(1)

$$\frac{300}{6} = 30$$

(1)

$$= 3 \text{ mL}$$

$$6 \text{ mL}$$

will last 50 days

- (b) Lachlan buys a new car for \$18 560. Using the declining balance method of depreciation, calculate the value of Lachlan's car after three years if it depreciates at a rate of 15% p.a.

2

$$S = V_0 (1 - r)^n$$

$$= 18560 (1 - 15\%)^3$$

(1)

$$= \$11,398.16$$

(1)

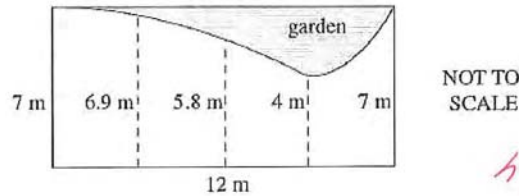
Question 26 continues on page 14



Question 26 continued

- (c) Three straight fences and a garden border a piece of land

2



Find the area of the land by applying Simpson's rule twice. Answer correct to the nearest square metre.

$$A = \frac{3}{2}(7 + 4 \times 6.9 + 5.8) + \frac{3}{2}(7 + 4 \times 4 + 7)$$

$$= 69.2$$

$$= 69 \text{ m}^2$$

- (d) A design of numberplates has a two-digit number, two letters and then another two-digit number. Examples include 02 AC 15 and 52 XJ 13.

- (i) How many different such numberplates are possible?

1

$$10 \times 10 \times 26 \times 26 \times 10 \times 10 = 6\,760\,000$$

- (ii) James's birthday is 5<sup>th</sup> March, 1998. He would like the numberplate

2

05 JK 03 or the numberplate 19 JK 98.

James can order a numberplate with 'JK' in the middle but will have to randomly selected numbers on either side.

What is the probability that James will be issued with one of the number plates he would like?

$$\frac{2}{10\,000} = \frac{1}{5000}$$

Question 26 continues on page 15

Question 26 continued

- (e) The table shows the fortnightly ABSTUDY allowances available to independent indigenous students.

Category of eligibility	Maximum fortnightly payment
<b>Single, no dependents</b>	
less than 16 years old	\$414.40
16-21 years old	\$414.40
Less than 16 years old, at home	\$226.80
16-17 years old, at home	\$226.80
18-21 years old, at home	\$272.80
22 to less than 60 years old	\$501.00
aged 60 years old or more	\$542.10
<b>Partnered, no dependents</b>	
Less than 16 years old	\$414.40
16-21 years old	\$414.40
22 years old or more	\$452.30
<b>Single, with dependent children</b>	
Less than 16 years old	\$542.90
16-21 years old	\$542.90
22 years old or more	\$542.10
<b>Partnered, with dependent children</b>	
Less than 16 years old	\$455.00
16-21 years old	\$455.00
22 years old or more	\$452.30

Source : Australian Government Department of Human Services

Peter and Samantha are indigenous students who recently married. Peter is 23 years old and Samantha is 20. They have no dependent children.

2

Calculate their combined maximum fortnightly allowance.

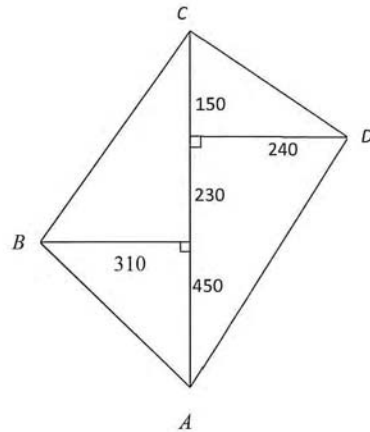
$$\text{Total Allowance} = \$452.30 + \$414.40$$

$$= \$866.70$$

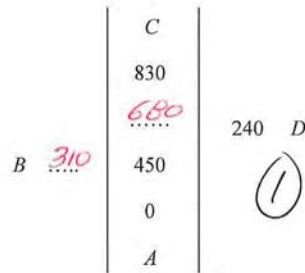
Question 26 continues on page 16

Question 26 continued

- (f) Ben surveys a fenced paddock on his farm. Ben completes a traverse survey as shown in the diagram below. All dimensions are in metres.



- (i) Complete the missing values in the field diagram below



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

$$AB^2 = 450^2 + 310^2$$

$$= 298600$$

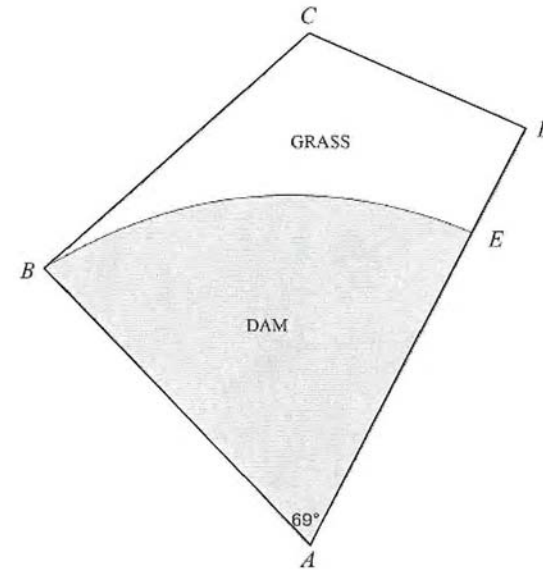
$$AB = 546.443$$

$$= 546.4 \text{ metres (1dp)} \quad \textcircled{1}$$

Question 26 continues on page 17

Question 26 continued

- (iii) Ben wishes to construct a new dam in this paddock. He uses his traverse survey measurements as a guide. The dam is in the shape of a sector as shown in the shaded part of this diagram.



If  $AB = AE$  and  $\angle BAE = 69^\circ$ , find the area of the dam, correct to 2 significant figures

$$A = \frac{69}{360} \times \pi \times 546.4^2 \quad \textcircled{1}$$

$$= 179770.259 \text{ m}^2$$

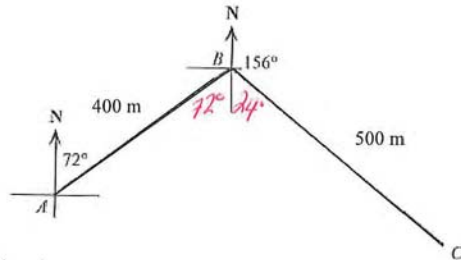
$$= 180000 \text{ m}^2 \text{ (2sf)} \quad \textcircled{1}$$

mark for approximation

End of Question 26

**QUESTION 27 (15 marks)**

- (a) A class is on a treasure hunt as part of their Sports, Lifestyle & Recreation course. They are given the following directions from base camp A. They are to walk on a bearing of  $072^\circ$  for 400 metres to point B. They are then to continue on a bearing of  $156^\circ$  for 500 metres to Point C. They then return to base camp A.



- (i) Show that angle  $ABC = 96^\circ$ . 1

$$\angle ABC = 72 + 24 = 96^\circ$$

- (ii) Calculate,  $AC$ , the distance that the class needs to travel on their final leg of their journey. Give your answer correct to the nearest metre. 2

$$b^2 = 400^2 + 500^2 - 2 \times 400 \times 500 \cos 96^\circ$$

$$= 451811.3853$$

$$b = 672.169$$

$$= 672 \text{ metres (nearest m)}$$

Question 27 continues on page 19

**Question 27 continued**

- (iii) Find the bearing that the class needs to take from Point C to return to base camp A. 2

$$\frac{\sin C}{400} = \frac{\sin 96^\circ}{672}$$

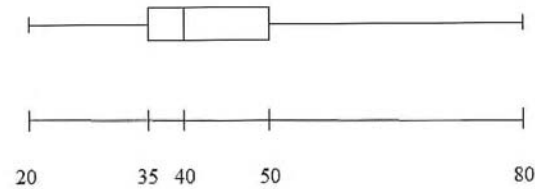
$$\sin C = \frac{400 \times \sin 96^\circ}{672}$$

$$C = 36^\circ$$

$$\text{Bearing} = 360 - (36 + 24)$$

$$= 300^\circ$$

- (b) Drew created this box and whisker plot from data that he had collected.



He said that the highest score was an outlier.

- Is Drew correct? Justify your answer with appropriate calculations. 2

$$IQR = 50 - 35 = 15$$

$$\text{Outlier} = Q3 + 1.5 \times IQR$$

$$= 50 + 1.5 \times 15$$

$$= 72.5$$

$\therefore$  Drew is correct as 80 is an outlier.

Question 27 continues on page 20

**Question 27 continued**

(c) Penny works as a part-time waiter in a club bistro.

Use his Payment Summary and other information to answer the questions below.

PAYG Payment Summary – Individual Non Business			
Payee	PENNY LANE		Tax File Number 149 370 011
Address	13 ABBEY ROAD STRAWBERRY FIELDS NSW 2527		Gross Payments \$28 480
Payer	PEPPERS HEARTS CLUB PTY LTD		
Authorised Person E RIGBY	Payer Number 555-301-24		
Deductions UNION FEES	Amount \$241.00		
Total Tax Withheld-whole dollars only in words Thousands Tens Hundreds Units FIVE ONE EIGHT NINE	Total Tax Withheld \$5189		

Other details:	
Penny's age this year	18
Other Income this year:	
Youth Allowance	\$9 183.68
Interest: Bank Account	\$75.90
Other tax deductions this year:	
Work related expenses	\$95.14
Donations to charities	\$54.00

(i) Calculate Penny's total income to the nearest dollar.

$$\begin{aligned} \text{Total Income} &= \$28\,480 + \$9\,183.68 + \$75.90 \\ &= \$37\,740 \end{aligned}$$

(ii) Calculate her total tax deductions to the nearest dollar.

$$\begin{aligned} \text{Total tax deductions} &= \$241 + \$54 + \$95.14 \\ &= \$390.14 \\ &= \$390 \end{aligned}$$

Question 27 continues on page 21

**Question 27 continued**

(iii) Use the tax table below to calculate the tax payable on Penny's taxable income.  
(Answer to the nearest dollar)

2

Taxable Income	Tax on this Income
0 - \$18 200	Nil
\$18 201 - \$37 000	19c for each \$1 over \$18 200
\$37 001 - \$80 000	\$3572 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

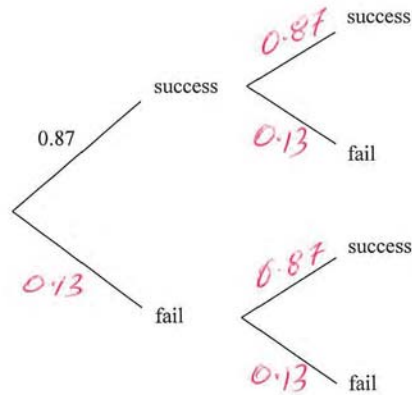
$$\begin{aligned} \text{Taxable Income} &= 37\,740 - 390 \\ &= \$37\,350 \\ \text{Tax Payable} &= \$3\,572 + (37\,350 - 37\,000) \times 0.325 \\ &= 3\,685.75 \\ &= \$3\,686 \text{ (nearest \$)} \end{aligned}$$

Question 27 continues on page 22



**Question 27 continued**

- (d) A new drug has a probability of 0.87 of being successful in preventing the spread of a virus. Two people are selected at random to test the drug.



- (i) What is the probability of the drug failing? 1

$0.13$  (1)

- (ii) What is the probability of the drug being successful on both people? 1

$P(SS) = 0.87 \times 0.87$   
 $= 0.7569$  (1)

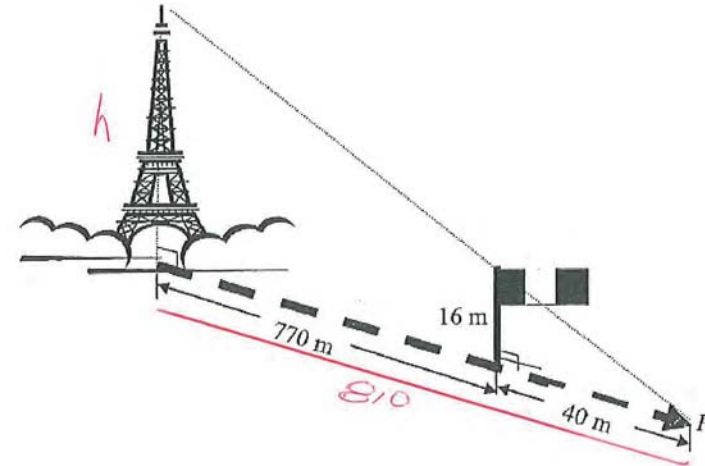
- (iii) What is the probability of the drug being successful on only one person? 2

$P(SF \text{ or } FS) = 0.87 \times 0.13 + 0.13 \times 0.87$   
 $= 0.2262$  (1)

End of Question 27

**Question 28 15 Marks**

- (a) The French flag is on a 16 metre pole perpendicular to the ground at a position 770 metres from the foot of the Eiffel Tower in Paris. The ground is level.



At night, a beam of light shines from the top of the tower and reaches appoint  $P$  along the ground, 40 metres from the flag pole.

- (i) Show that the height of the Eiffel Tower is 324 metres tall. 3

$\frac{h}{16} = \frac{810}{40}$  (1)  
 $h = \frac{810 \times 16}{40}$  (1)  
 $= 324 \text{ metres}$  (1)

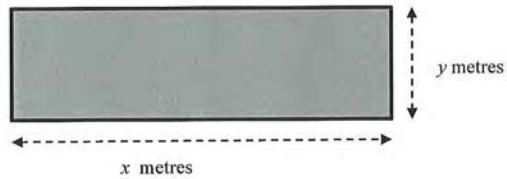
- (ii) What is the angle of depression (to the nearest degree) from the top of the Eiffel Tower to the bottom of the flagpole? 2

$\tan \theta = \frac{324}{770}$  (1)  
 $\theta = 22.820\dots$   
 $\theta = 23^\circ$  (nearest degree) (1)

Question 28 continues on page 24

**Question 28 continued**

- (b) Farmer Giddy wants to enclose some of his animals using 160 linear metres of fencing.  
Farmer Giddy initially draws a plan of a rectangular enclosure, as shown, and marks the length  $x$  metres and width  $y$  metres.



- (i) Write down one possible value of each of  $x$  and  $y$  that Farmer Giddy could write on the plan. 1

$x = 50, y = 30$  many solutions

①

- (ii) Show that  $y = 80 - x$ . 1

$2x + 2y = 160$

$x + y = 80$  ①

$y = 80 - x$

Question 28 continued on page 25

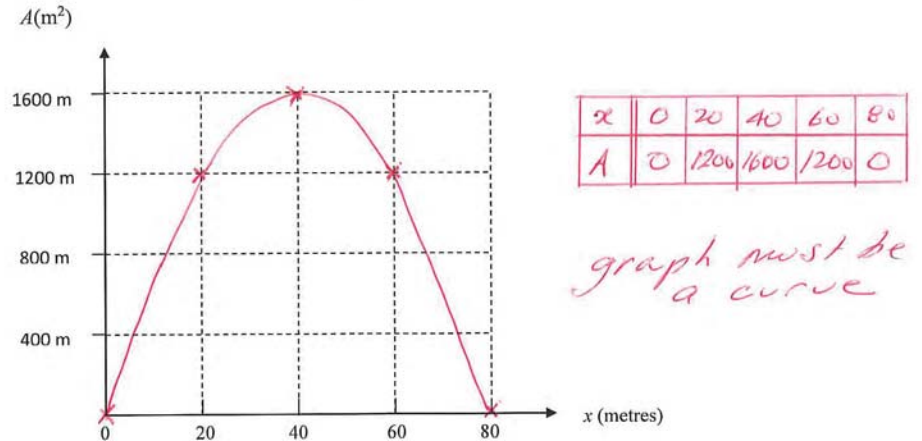
**Question 28 continued**

- (iii) Farmer Giddy writes an equation for the area ( $A$ ) of the enclosure as:

$$A = 80x - x^2$$

$$= x(80 - x)$$

On the axes below, draw a sketch of the graph represented by this equation using the values of  $x$  given. Show the corresponding  $A$  values on the vertical axis.



- (iv) Using the graph, determine the dimensions of the enclosure that will give the maximum area. 2

Max Area when  $x = 40$  ①

so  $y = 80 - 40 = 40$  ①

- (v) What conclusion can be drawn from the graph? 1

Farmer Giddy should have a square enclosure ①

Question 28 continued on page 26

QUESTION 28 continued

- (c) The maximum speed (km/h) of a ski lift going up an incline to a plateau, is inversely proportional to the square of the total weight (kg) of the skiers in the lift.

A ski lift with a total weight of 348 kg has a maximum speed of 35 km/h.

What would be the total weight (to the nearest kilogram) on the lift if it has a maximum speed of 25 km/h?

$$S = \frac{1}{W^2}$$

$$S = \frac{k}{W^2}$$

$$35 = \frac{k}{348^2}$$

$$k = 4238640$$

$$S = \frac{4238640}{W^2}$$

$$W^2 = \frac{4238640}{25}$$

$$= 169545.6$$

$$W = \sqrt{169545.6}$$

$$= 411.759...$$

$$= 412 \text{ kg (nearest kg)}$$

End of Question 28

Question 29 15 Marks

- (a) Kayleb has a personal loan of \$15 000 and has to repay this loan in equal monthly payments over 4 years. The interest rate on Kayleb's loan is 7.8% p.a.

The following table shows the present value interest factors for reducing balance loans at various monthly interest rates ( $r$ ) over different time periods ( $N$ ).

Table of present value interest factors

$r$	0.0060	0.0065	0.0070	0.0075	0.0080	0.0085
$N$						
45	39.33406	38.90738	38.48712	38.07318	37.66545	37.26383
46	40.09350	39.64965	39.21263	38.78231	38.35859	37.94133
47	40.84841	40.38714	39.93310	39.48617	39.04622	38.61311
48	41.59882	41.11986	40.64856	40.18478	39.72839	39.27924
49	42.34475	41.84785	41.35905	40.87820	40.40515	39.93975
50	43.08623	42.57113	42.06459	41.56645	41.07653	40.59470

- (i) Write down the present value interest factor from the table associated with Kayleb's loan.

$$7.8\% \text{ p.a.} = 0.0065 \quad \text{INTEREST FACTOR} = 41.11986$$

$$n = 48$$

- (ii) Calculate the interest that Kayleb will pay over the term of the loan.

$$PV = \text{Amt} \times f$$

$$15000 = \text{Amt} \times 41.11986$$

$$\text{Monthly Repay} = \frac{15000}{41.11986} = \$364.79$$

$$\text{Total} = \$364.79 \times 48$$

$$= 17509.92$$

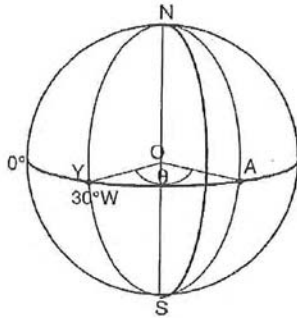
$$\text{INTEREST} = 17509.92 - 15000$$

$$= \$2509.92$$

Question 29 continued on page 28

Question 29 continued

- (b) Two cities  $A$  and  $Y$  are located on the equator, as shown in the diagram of the Earth's surface.



- (i) Write down the co-ordinates of city  $Y$ .

$(0^\circ, 30^\circ W)$  (1)

- (ii) The distance between city  $Y$  and city  $A$  is approximately 5000km.

Show that  $\theta$  (angle  $AOY$ ) is approximately  $45^\circ$

$$\frac{\theta}{360} \times 2\pi \times 6400 = 5000 \quad (1)$$

$$\theta = \frac{5000 \times 360}{2\pi \times 6400} \quad (1)$$

$$= 44.76232$$

$$= 45^\circ \text{ (nearest degree)}$$

(1)

Question 29 continued on page 29

Question 29 continued

- (iii) Write down the co-ordinates of city  $A$ .

$(0^\circ, 15^\circ E)$  (1)

- (iv) A plane takes off in city  $Y$  at 10.30 am local time with city  $A$  as its destination.

If the plane travels at an average speed of 625 km/h, at what local time will it touch down in city  $A$  (assuming its flight path is along the equator)?

$$45^\circ = 3 \text{ hrs} \quad (1)$$

$$\text{Flight time} = \frac{5000}{625}$$

$$= 8 \text{ h} \quad (1)$$

$$\text{Arrival time} = 10.30 \text{ am} + 8 + 3$$

$$= 9.30 \text{ pm} \quad (1)$$

Question 29 continued on page 30



Question 29 continued

- (c) The spreadsheet shows monthly loan repayments with interest rate changes from February to October 2012.

Monthly home loan repayments

	A	B	C	D	E
1					
2	Dates	Feb 2012	Apr 2012	Jun 2012	Oct 2012
3	Increase/Decrease	-1.0%	-0.1%	0.05%	0.25%
4	Rate (pa)	5.85%	5.75%	5.80%	6.05%
5	\$1000	\$6.35	\$6.29	\$6.32	\$6.47
6	\$50 000	\$318	\$315	\$316	\$324
7	\$100 000	\$635	\$629	\$632	\$647
8	\$150 000	\$953	\$944	\$948	\$971
9	\$200 000	\$1270	\$1258	\$1264	\$1295
10	\$250 000	\$1588	\$1573	\$1580	\$1618
11	\$300 000	\$1905	\$1887	\$1896	\$1942
12	\$350 000	\$2223	\$2202	\$2212	\$2266
13	\$400 000	\$2541	\$2516	\$2529	\$2589
14					

Campbell's bank approves loans for customers if their loan repayments are no more than 30% of their monthly gross salary.

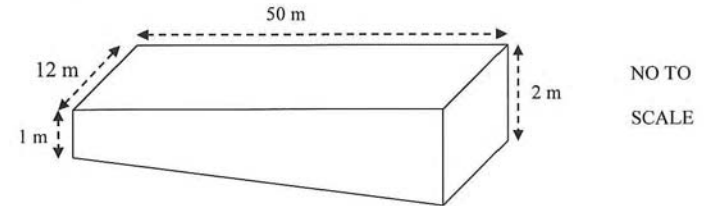
Campbell wanted to borrow money to buy a house. His monthly gross salary was \$7500. He applied for the loan in June 2012.

What was the maximum amount that his bank would approve for him to borrow?

$$\begin{aligned}
 & 30\% \times \$7500 = \$2250 \quad \text{①} \\
 & \frac{\$6.32}{\$1000} \times 2250 = 14.22 \quad \text{①} \\
 & \text{loan} = \frac{2250}{6.32} \times 1000 \\
 & = 356\,012.66 \\
 & = \underline{\underline{\$356\,012}}
 \end{aligned}$$

Question 30 15 Marks

- (a) A swimming pool is in the shape of a trapezoidal prism as shown in the diagram below. The pool is 50 m long and 12 m wide, and 1 m in depth at the shallow end and 2 metres in depth at the deep end.



- (i) Find the area of the trapezoidal cross section.

1

$$\begin{aligned}
 A &= \frac{50}{2} (1 + 2) \quad \text{①} \\
 &= 75 \text{ m}^2
 \end{aligned}$$

- (ii) Find the capacity of the pool in litres.

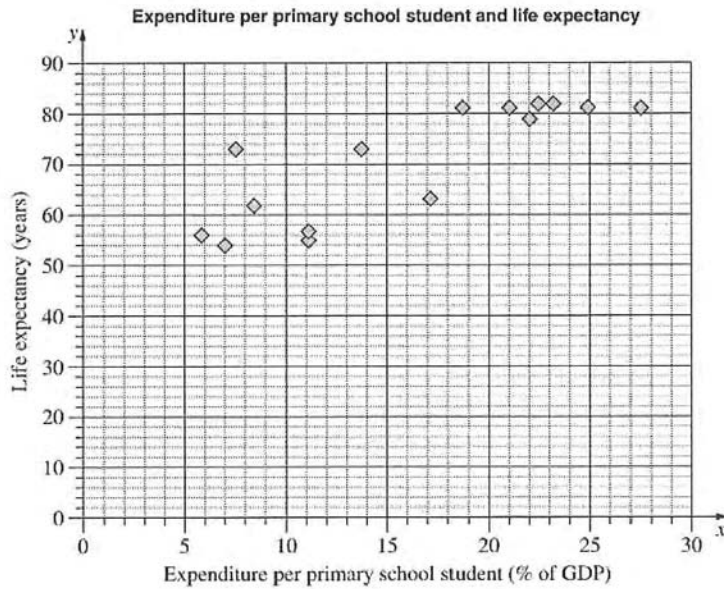
1

$$\begin{aligned}
 V &= 75 \times 12 \\
 &= 900 \text{ m}^3 \\
 \text{Capacity} &= 900\,000 \text{ Litres} \quad \text{①}
 \end{aligned}$$

Question 30 continued on page 32

**QUESTION 30**

- (b) The scatterplot shows the relationship between expenditure per primary school student, as a percentage of a country's Gross domestic Product (GDP), and the life expectancy in years for 15 countries.



- (i) For the given data, the correlation coefficient,  $r$ , is 0.83. What does this indicate about the relationship between expenditure per primary school student and life expectancy for the 15 countries? 1

*strong positive correlation OR  
life expectancy increases as  
expenditure per primary school student  
increases*

Question 30 continued on page 33

**Question 30 continued**

- (ii) The expenditures per primary school student for the 15 countries in the scatter plot are:  
5.9, 7, 7.6, 8.4, 11.2, 11.2, 13.7, 17.1, 18.7, 21.2, 22, 22.5, 23.2, 24.9, 27.6

Complete the table below by calculating the mean,  $\bar{x}$ , and the standard deviation,  $\sigma_x$ , of these data. Calculate both values to two decimal places. 2

	Mean	Standard deviation
Expenditure per primary school student	$\bar{x} = 16.14$	$\sigma_x = 7.03$
Life expectancy	$\bar{y} = 70.73$	$\sigma_y = 10.94$

- (iii) Using the values from the table in part (ii), show that the equation of the least-squares line of best fit is 2

$$y = 1.29x + 49.9$$

$$m = r \times \frac{\sigma_y}{\sigma_x} \qquad y_{int} = \bar{y} - m\bar{x}$$

$$= 0.83 \times \frac{10.94}{7.03} \qquad = 70.73 - 1.29 \times 16.14$$

$$= 1.2916 \quad \textcircled{1} \qquad \qquad \qquad \textcircled{1}$$

$$= 1.29$$

$$\therefore y = 1.29x + 49.9$$

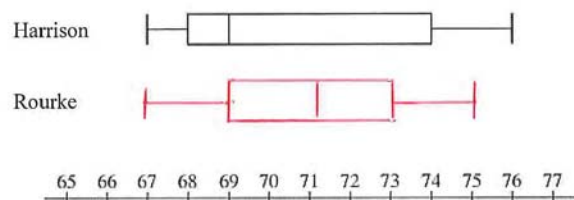
Question 30 continued on page 34

**Question 30 continued**

(c) Harrison and Rourke each sat twenty class tests. Harrison's results on the tests are displayed in the box-and-whisker plot shown in part (i).

(i) Rourke's 5-number summary for the tests is 67, 69, 71, 73, 75

Draw a box-and-whisker plot to display Rourke's results below that of Harrison's results.



(ii) What percentage of Harrison's results were below 69?

*50%*

(iii) Harrison claims that his results were better than Rourke's. Is he correct? Justify your answer by referring to the summary statistics and the skewness of the distributions.

*Harrison's results are positively skewed while Rourke's results are symmetrical* (1)  
*Rourke's median is higher than Harrison's* (1)  
*Harrison's IQR & Range are higher* (1)  
*75% of Rourke's results are over 69 while 50% of Harrison's are over 69.* (1)  
*∴ Harrison's claim is incorrect*

Question 30 continued on page 35

**Question 30 continued**

(d) Toby owns a credit card that has no annual fee and charges 19.6% interest per annum, compounding daily, on all purchases. The interest is charged, and includes, the day of purchase and the day of payment.

1

On the 28 July, Toby bought a new mobile phone for \$980 using his credit card. He paid his credit card account on 26 August.

What was the total amount Toby paid for his mobile phone? Answer correct to the nearest cent.

3

$$I = \$980 \times \frac{19.6\%}{365} \times 30$$

$$= \$15.79$$

$$\text{Total} = \$15.79 + \$980$$

$$= \$995.79$$

End of paper