



CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION
MATHEMATICS

Paper 02 – General Proficiency

2 hours 40 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of TWO sections: I and II.
2. Section I has EIGHT questions and Section II has THREE questions.
3. Answer ALL questions in Section I, and any TWO questions from Section II.
4. Write your answers in the booklet provided.
5. Do NOT write in the margins.
6. All working MUST be shown clearly.
7. A list of formulae is provided on page 2 of this booklet.
8. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra page(s) provided at the back of this booklet. Remember to draw a line through your original answer.
9. If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.

Required Examination Materials

Electronic calculator
Geometry set

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(2 marks)

(ii) $(4.14 \div 5.75) + (1.62)^2$

(1 mark)

(i) $2\frac{2}{5} - 1\frac{1}{3} + 3\frac{1}{2}$

1. (a) Using a calculator, or otherwise, determine the EXACT value of:

All working must be clearly shown.

Answer ALL questions in this section.

SECTION I



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(2 marks)

(iv) $\sqrt{2.89} \times \tan 45^\circ$

(1 mark)

(iii) $2 \times 3.142 \times 1.25$



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Total 12 marks

(3 marks)

(iii) A tax of 10% of the total cost price of the three items is added to Mrs Rowe's bill. What is Mrs Rowe's TOTAL bill including the tax?

(2 marks)

(ii) If the cost price of 1 kg of rice is 80 cents MORE than for 1 kg of flour, calculate the values of Y and Z.

(1 mark)

(i) Calculate the value of X, the cost of 1 kg of sugar.

Shopping Bill		
Item	Unit Cost Price	Total Cost Price
3 kg sugar	X	\$10.80
4 kg rice	Y	Z
2 kg flour	\$1.60	\$3.20

(b) The table below shows a shopping bill prepared for Mrs Rowe. The prices of some items are missing.



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(1 mark)

(ii) q glasses each containing r ml.

(1 mark)

(i) p ml

The amount of juice left in the bottle after pouring out

(b) A bottle contains 500 ml of orange juice. Write an expression for EACH of the following.

(1 mark)

(ii) $2a^b$

(1 mark)

(i) $a - b + c$ 2. (a) Given that $a = 4$, $b = 2$ and $c = -1$, find the value of:



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(1 mark)

.....
 y represents

 x represents

(ii) State clearly what x and y represent.

(2 marks)

(i) Write a pair of simultaneous equations in x and y to represent the information given above.

(d) Four mangoes and two pears cost \$24.00, while two mangoes and three pears cost \$16.00.

(2 marks)

(c) Write as a single fraction, as simply as possible

$$\frac{2k}{2-k} + \frac{3}{5}$$



GO ON TO THE NEXT PAGE

Total 12 marks

(2 marks)

(ii) $2x^2 - 5x + 3$

(1 mark)

(i) $a^3 - 12a$

(e) Factorize completely:



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(2 marks)

(iv) How many students play the guitar?

(1 mark)

in the class.

(iii) Write an equation which may be used to determine the total number of students

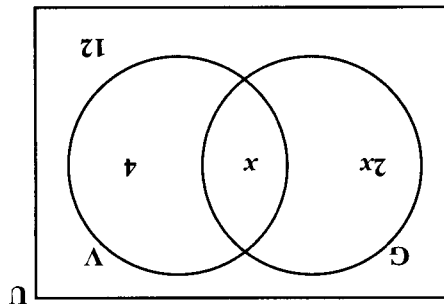
(1 mark)

students in the class.

(ii) Write an expression, in terms of x , which represents the TOTAL number of

(1 mark)

(i) How many students play neither the guitar nor the violin?



(a) The Venn diagram below shows the number of students who play the guitar (G) or the violin (V) in a class of 40 students.

3. (a)



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Total 12 marks

(iii) On the diagram, show the point D such that ABCD is a parallelogram. (2 marks)

(1 mark)

(ii) Measure and state the size of angle BAC.

(4 marks)

(b) (i) Using a ruler, a pencil and a pair of compasses, construct triangle ABC with AB = 9 cm, angle ABC = 90° and BC = 6 cm.

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4.

A graph sheet is provided for this question.

The table below is designed to show values of x and y for the function $y = x^2 - 2x - 3$ for integer values of x from -2 to 4 .

x	y
-2	5
-1	
0	-3
1	-4
2	-3
3	
4	5

(a) Complete the table for the function $y = x^2 - 2x - 3$. (2 marks)

(b) On the graph on page 13, plot the graph of $y = x^2 - 2x - 3$ using a scale of 2 cm to represent 1 unit on the x -axis and 1 cm to represent 1 unit on the y -axis. (4 marks)

(c) On the graph on page 13, draw a smooth curve passing through the points on your graph. (1 mark)

(d) Complete the following sentences using information from your graph.

(i) The values of x for which $x^2 - 2x - 3 = 0$ are and (1 mark)

(ii) The minimum value of $x^2 - 2x - 3$ is (1 mark)

(iii) The equation of the line of symmetry of the graph of

$y = x^2 - 2x - 3$ is (1 mark)

Total 10 marks

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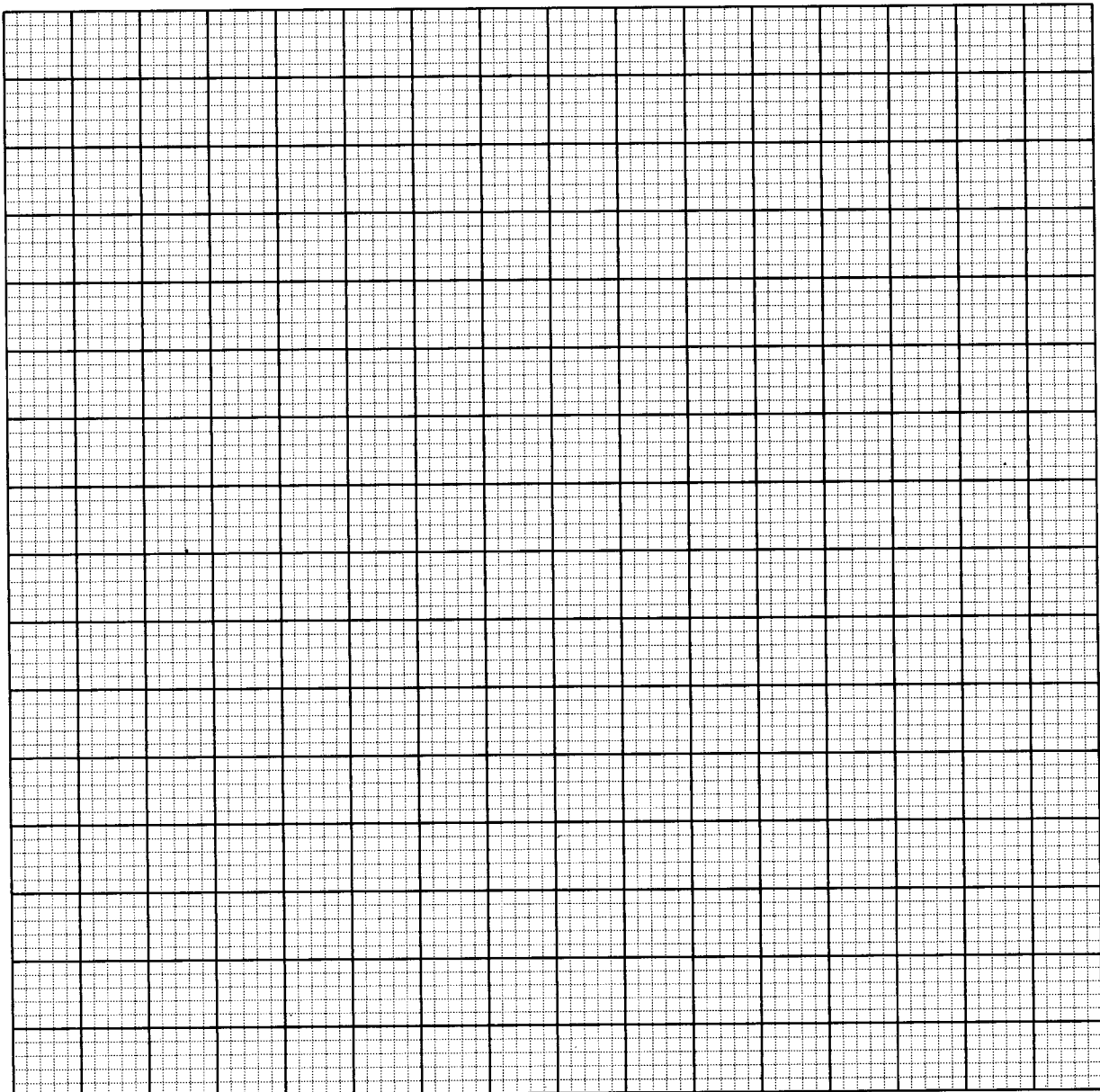
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(1 mark)

(ii) 2 cm = 6 m

(1 mark)

(i) 1 millimetre = 1 metre

(b) Write the following scales in the form 1 : x.

(2 marks)

$$1 \text{ km/h} = \frac{5}{18} \text{ m/s.}$$

(ii) Calculate the time, in seconds, it takes to travel 315 metres, given that

(1 mark)

(i) Calculate the distance it travels in $2\frac{1}{4}$ hours.

5. (a) A car is travelling at a constant speed of 54 km/h.



(2 marks)

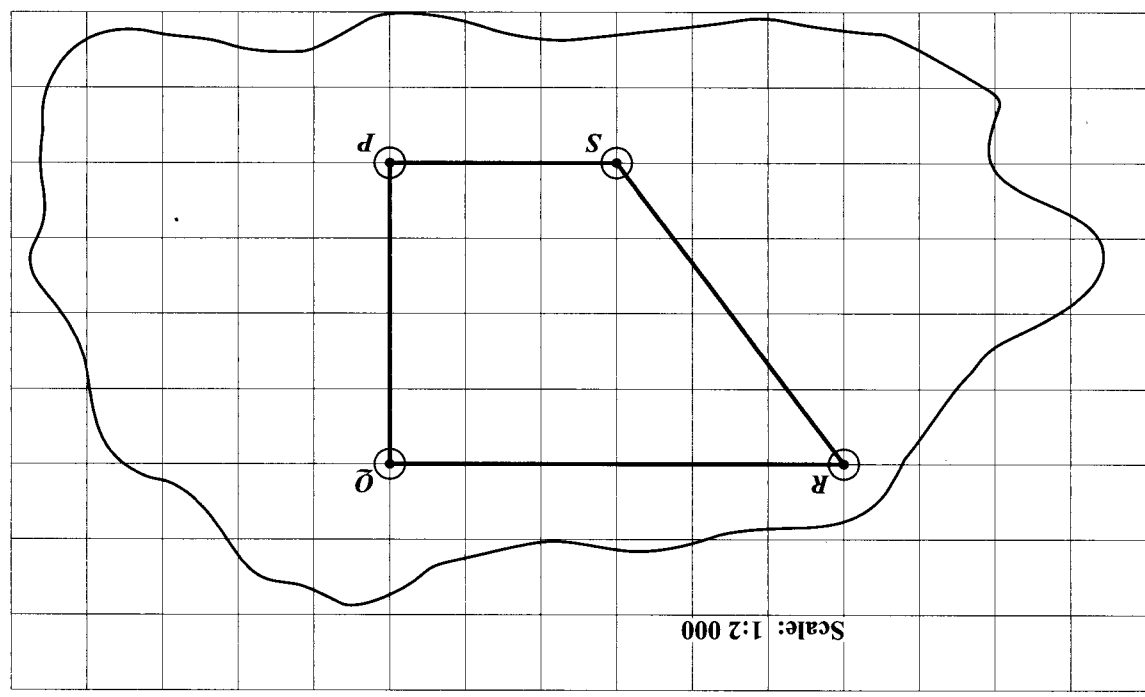
(iii) Calculate the ACTUAL distance, in kilometres, between Q and R.

(2 marks)

(ii) Determine, by counting, the area in square centimetres of the plane PQRS on the map.

(1 mark) $QR = \dots \dots \dots$ cm

(i) Determine, in centimetres, the distance from Q to R on the map.



(c) The map shown below is drawn on a grid of 1 cm squares. P, Q, R and S are four tracking stations. The scale of the map is 1:2 000.



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Total 12 marks

(2 marks)

(iv) Calculate the ACTUAL area, in square metres, of the plane PQRS.

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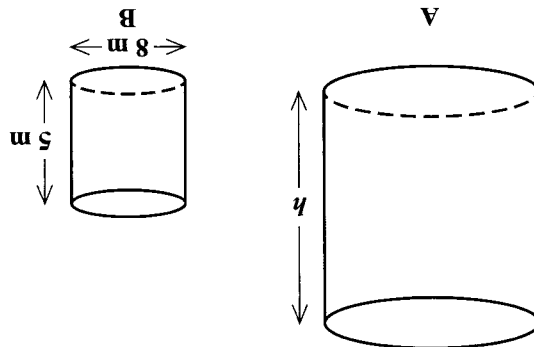
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(1 mark)

(ii) If the area of the base of A is 314 m^2 , calculate the length of the radius of Tank A.

(2 marks)

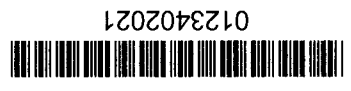
(i) Calculate the volume of water in Tank B.

Take $\pi = 3.14$.

6. (a) The diagram below, **not drawn to scale**, shows two cylindrical water tanks, A and B. Tank B has base diameter 8 m and height 5 m . Both tanks are filled with water.

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(2 marks)

(iii) Tank A holds 8 times as much water as Tank B. Calculate the height, h , of Tank A.



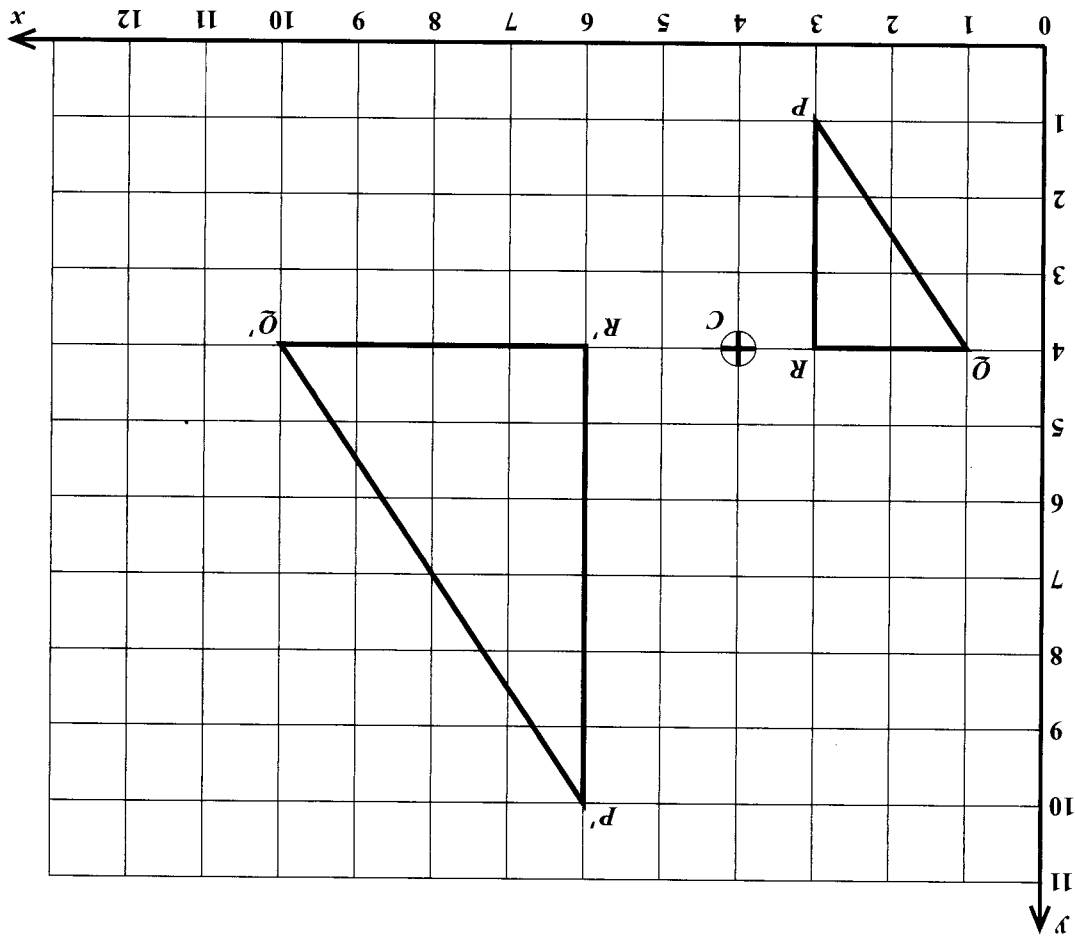
(1 mark)

.....

(ii) The scale factor is negative because

(i) The size of the scale factor is

Use the information from the diagram to complete the statements below.



(b) The diagram below shows triangle PQR and its image, triangle $P'Q'R'$, after an enlargement centred at the point C on the diagram.



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Total 11 marks

(2 marks) square units.

(v) The area of PQR is times the area of triangle PQR which is

(1 mark)

(iv) The area of triangle PQR is square units.

(1 mark)

the length of PQ is units.

(iii) The length of PQ is $\sqrt{13}$ units, therefore,

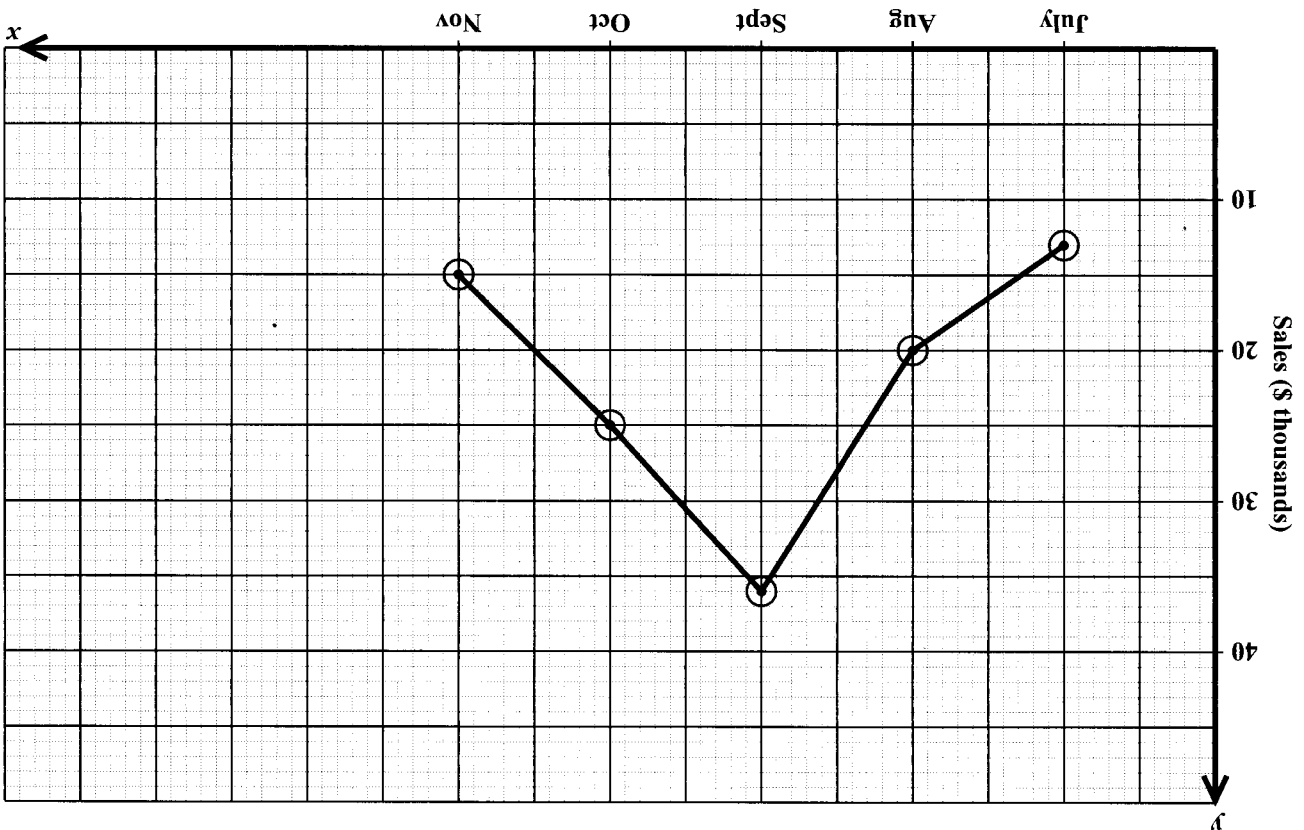


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(2 marks)

Month	Sales in \$ Thousands
July	13
August	
September	36
October	
November	

(a) Complete the table below to show the sales for EACH month.



7. The line graph below shows the monthly sales, in thousands of dollars, at a car dealership for the period July to November 2014.



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Total 11 marks

(ii) Complete the line graph to show the sales for December. (2 marks)

(1 mark)

(i) Calculate the sales, in dollars, for the month of December.

(d) The TOTAL sales for the period July to December was \$130 000.

(2 marks)

(c) Calculate the mean monthly sales for the period July to November 2014.

(2 marks)

.....
.....
.....
.....

(iii) What feature of the line graph enables you to infer that the increase in sales between two consecutive months was the greatest or the smallest?

(1 mark)

..... and

(ii) Between which TWO consecutive months was there the SMALLEST increase in sales?

(1 mark)

..... and

(i) Between which TWO consecutive months was there the GREATEST increase in sales?



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(2 marks)

(a)

Draw Figure 4 of the sequence.

Figure 1



Figure 2

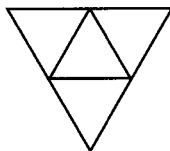
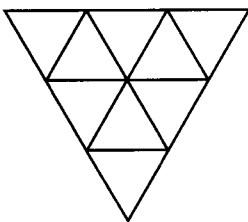


Figure 3



A sequence of figures is made up of equilateral triangles, called unit triangles with unit sides. The first three figures in the sequence are shown below.

8.



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Total 10 marks

(2 marks)	(iv)	n		
(2 marks)	(iii)	25		
(2 marks)	(ii)		144	
(2 marks)	(i)	4		
		3	9	$\frac{(3 \times 3)(3+1)}{2} = 18$
		2	4	$\frac{(3 \times 2)(2+1)}{2} = 9$
		1	1	$\frac{(3 \times 1)(1+1)}{2} = 3$
		Figure	Number of Unit Triangles	Number of Unit Sides

(b) Study the patterns of numbers in each row of the table below. Each row relates to one of the figures in the sequence of figures. Some rows have not been included in the table. Complete the rows numbered (i), (ii), (iii) and (iv).

SECTION II

Answer TWO questions in this section.

ALGEBRA AND RELATIONS, FUNCTIONS AND GRAPHS

9. (a) A graph sheet is provided for this question.

A teacher marks an examination out of a maximum of 120 marks. The marks are then converted to percentages.

(i) Calculate the percentage for a student who scores

• 60 marks

• 120 marks.

(2 marks)

(2 marks)

- (ii) On the graph sheet on page 27, plot a graph to show the information in (i).
- (iii) A candidate is awarded 95 marks on the examination. Use the graph drawn at (ii) to determine the candidate's percentage.

Draw lines on your graph to show how the percentage was obtained.

(1 mark)

Percentage:

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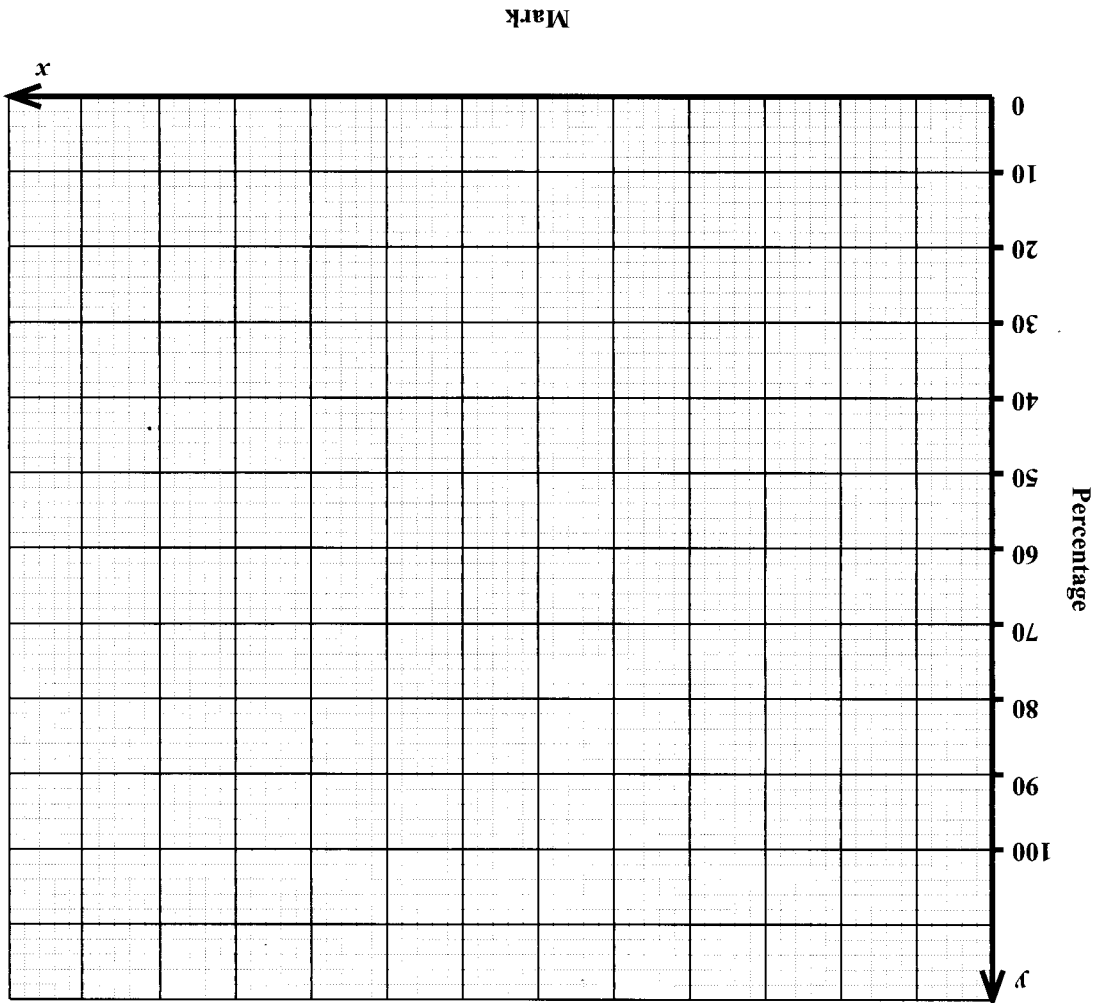
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(2 marks)

Minimum mark:

Draw lines on your graph to show how the percentage was obtained.

- (iv) A candidate is awarded a Grade A if her percentage is 85% or more. Use the graph drawn at (ii) to determine the minimum mark the candidate needs to be awarded a Grade A.





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Total 15 marks

(4 marks)

(iii) Write an expression for $g \circ f(x)$, in the form $(x + a)(x + b)$, where a and $b \in \mathbb{R}$.

(2 marks)

(ii) Write an expression in terms of x for $f^{-1}(x)$.

(2 marks)

(i) Evaluate $g(5)$.

$$f(x) = 3x + 2 \quad g(x) = \frac{x^2 - 1}{3}$$

(b) The functions $f(x)$ and $g(x)$ are defined as

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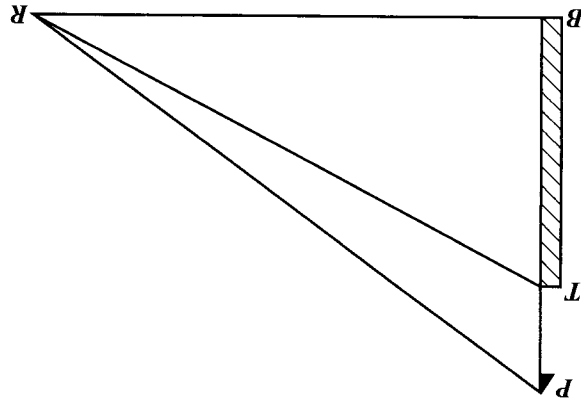


(4 marks)

(ii) Calculate the length of the flagpole, giving your answer to the nearest metre.

(3 marks)

- (i) Label the diagram to show
 - the distance 60 m
 - the angles of 35° and 42°
 - any right angle(s).



The diagram below, not drawn to scale, shows a vertical tower, BT , with a flagpole, TP , mounted on it. A point R is on the same horizontal ground as B , such that $RB = 60$ m, and the angles of elevation of T and P from R are 35° and 42° , respectively.

10. (a)

MEASUREMENT, GEOMETRY AND TRIGONOMETRY

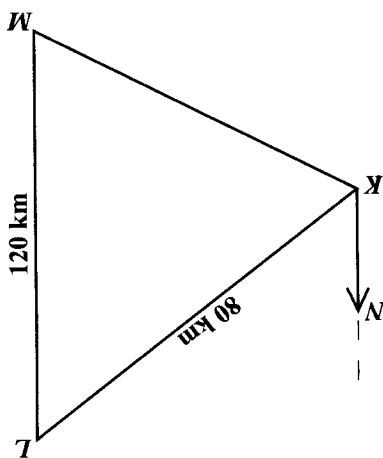


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(3 marks)

(iii) Calculate the length, to the nearest kilometre, of KM .

(1 mark)

(ii) Calculate the measure of $\angle KLM$.(i) On the diagram show the bearing of 040° . (1 mark)

(b) The diagram below, **not drawn to scale**, shows the relative positions of three fishing boats, K , L and M . L is on a bearing of 040° from K and M is due south of L . $LM = 120$ km and $KL = 80$ km.



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Total 15 marks

(1 mark)

(2 marks)

(v) Calculate the bearing of M from K .

(iv) Calculate the measure of $\angle LKM$ to the nearest degree.



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(2 marks)

(iii) Find A^{-1} , the inverse of A .

(2 marks)

(ii) Show that the matrix product of A and B is NOT commutative, that is, $AB \neq BA$.

(2 marks)

11. (a) (i) Calculate the matrix product AB where $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$.

VECTORS AND MATRICES



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(2 marks)

$$\overrightarrow{ST} =$$

$$\overrightarrow{RS} =$$

(ii) Express in the form $\begin{pmatrix} x \\ y \end{pmatrix}$, the vectors \overrightarrow{RS} and \overrightarrow{ST} .

(1 mark)

(i) Calculate the value of $|\overrightarrow{OR}|$.

$\begin{pmatrix} 5 \\ -2 \end{pmatrix}$ respectively.

(b) The position vectors of the points R, S and T, relative to an origin, O, are $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$, $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ and

(2 marks)

(iv) Given that $\mathbf{M} = \begin{pmatrix} 2x & 2 \\ 9 & 3 \end{pmatrix}$, calculate the value(s) of x for which $|\mathbf{M}| = 0$.



IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

END OF TEST

Total 15 marks

(2 marks)

(iii) Using the results of combining the vectors in (b) on page 33, justify that RS is parallel to ST and that RST is a straight line.



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EXTRA SPACE



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Question No.

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