DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Geometry set
Electronic calculator

Required Examination Materials

The question part beside the answer in the box provided at the top of the extra page(s) and, where relevant, include where relevant in the question number clearly in the box provided at the top of the extra page(s) provided at the back of this booklet. Remember to draw a line through your original answer.

1. A list of formulae is provided on page 2 of this booklet.
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 one 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) provided at the back of this booklet.

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

2 hours 40 minutes

Paper 02 - General Paper

MATHEMATICS

EXAMINATION
CARIBBEAN SECONDARY EDUCATION CERTIFICATE

CARIBBEAN EXAMINATIONS COUNCIL

FORM TP 2015089

TEST CODE 01234020

MAY/JUNE 2015
GO ON TO THE NEXT PAGE

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

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

All working must be clearly shown.

Answer ALL questions in this section.

SECTION I
GO ON TO THE NEXT PAGE

(2 marks)

(1 mark)

\[ 2 \times 3.142 \times 1.25 \times 2.89 \text{ cm} \times \sin 45^\circ \]

(1W)

(11W)
Total 12 marks

2 marks

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? (iii)

2 marks

The values of $X$ and $Z$

If the cost price of $1$ kg of rice is 80 cents MORE than for $1$ kg of sugar, calculate the total cost price. (iv)

1 mark

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

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2 kg rice

4 kg rice

3 kg sugar

2 kg hour

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GO ON TO THE NEXT PAGE

(i) Glass each containing $a$ ml

(ii) Glass each containing $b$ ml

(iii) Amount of juice left in the bottle after pouring out

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

(i) $d$ ml

(ii) $2d$ ml

(iii) $c + q - p$ ml

Given that $a = 4$, $q = 2$, and $c = -1$. Find the value of:
1 mark)

\[ \frac{5}{x-y} + \frac{3}{2y} \]

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)

(ii) State clearly what \( x \) and \( y \) represent.

(c) Write as a single fraction, as simply as possible:
Total 12 marks

(2 marks)

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

(1 mark)

(i) $a - 12a$

(e)
(i) How many students play the guitar?

(ii) Write an equation which may be used to determine the total number of students in the class.

(iii) Write an expression, in terms of $x$, which represents the total number of students in the class.

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

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

\[ Venn \text{ diagram} \]
Total 12 marks

(2 marks)

On the diagram, show the point D such that ABDC is a parallelogram.

(1 mark)

(4 marks)

Measure and state the size of angle BAC.

= 9 cm, angle ABC = 90° and BC = 6 cm.

Using a ruler, a pencil and a pair of compasses, construct triangle AB'C with AB
Total 10 marks

(1 mark) The equation of the line of symmetry of the graph of

(1 mark) The minimum value of \( x^2 - 2x - 3 \) is \( \ldots \)

(1 mark) The values of \( x \) for which \( x^2 - 2x - 3 = 0 \) are \( \ldots \)

Complete the following sentences using information from your graph.

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

(4 marks) On the graph on page 13, plot the graph of \( y = x^2 - 2x - 3 \). Use a scale of 2 cm to represent

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

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td></td>
</tr>
<tr>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>-3</td>
<td>-1</td>
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<tr>
<td>-2</td>
<td>0</td>
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<td>-1</td>
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<td>0</td>
<td>-2</td>
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<td>1</td>
<td>-2</td>
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<tr>
<td>2</td>
<td>-1</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

The table below is designed to show values of \( x \) and \( y \) for the function \( y = x^2 - 2x - 3 \) for integer

A graph sheet is provided for this question.
(i) \[ 2 \text{ cm} = 6 \text{ m} \]

(ii) \[
1 \text{ millimetre} = 1 \text{ metre}
\]

(i) Write the following scales in the form \(x:y\).

(ii) \[
1 \text{ km/h} = \frac{18}{5} \text{ m/s}
\]

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

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

(ii) \[
\text{Calculate the distance it travels in } 2\frac{1}{2} \text{ hours.}
\]
(iii) Calculate the actual distance, in kilometres, between $\Delta$ and $\Gamma$.

(ii) Determine, by counting, the area in square centimetres of the plane $P\Delta\Gamma$ on the map.

(i) Determine, in centimetres, the distance from $\Delta$ to $\Gamma$ on the map.

Solutions

The scale of the map is 1:2 000.

The map shown below is drawn on a grid of 1 cm squares. $P$, $\Delta$, $\Gamma$ and $\Delta$ are your marking.
Total 12 marks

(2 marks)

Calculate the actual area, in square metres, of the plane PQR.

(10)
NOTHING HAS BEEN OMITTED.
(1 mark)

(i) The area of the base of \( A \) is \( 3.14 \) m\(^2\). Calculate the length of the radius of tank \( A \).

(2 marks)

(ii) If the base of the cylinder is 3.14 m\(^2\), calculate the length of the radius of tank \( A \).

6.

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.

The volume of water in tank \( B \) is \( V \). Calculate the volume of water in tank \( B \).

Take \( r = 3.14 \).
GO ON TO THE NEXT PAGE

2 marks)

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

(!!!)

Page 19
(i) The scale factor is negative because (ii) The size of the scale factor is ___.

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

The diagram below shows triangle $\triangle PQR$ and its image, triangle $\triangle P'Q'R'$ after an enlargement.

Connected at the point $C$ on the diagram.
Total 11 marks

(2 marks) 

... square units

The area of \( \triangle PQR \) is \( \ldots \) times the area of \( \triangle PQR \) which is \( \cdots \) square units. 

(1 mark) 

\( \cdots \) square units

The area of \( \triangle PQR \) is \( \cdots \) square units.

(1 mark) 

\( \cdots \)

The length of \( \overline{PQ} \) is \( \cdots \) units. 

Therefore, 

(3 marks) 

The length of \( \overline{PQ} \) is \( \sqrt{13} \) units.
(a) Complete the table below to show the sales for EACH month.

<table>
<thead>
<tr>
<th>Month</th>
<th>$ Thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>November</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td></td>
</tr>
</tbody>
</table>

Sales (thousands)

Period July to November 2014.

The line graph below shows the monthly sales, in thousands of dollars, at a car dealership for the
GO ON TO THE NEXT PAGE

Total 11 marks
(2 marks)
Complete the line graph to show the sales for December:

(ii)

(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)

(e)

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

(2 marks)

(2 marks)

W hat feature of the line graph enables you to infer that the increase in sales between two consecutive months was the greatest or the smallest?

(iii)

(1 mark)

and

(1 mark)

(ii)

Between which two consecutive months was there the smallest increase in sales?

(ii)

(1 mark)

(i)

Between which two consecutive months was there the greatest increase in sales?

(i)
Draw Figure 4 of the sequence:

\begin{figure}[h]
\centering
\begin{subfigure}[b]{0.3\textwidth}
\centering
\includegraphics[width=\textwidth]{figure1}
\caption{Figure 1}
\end{subfigure} \hfill
\begin{subfigure}[b]{0.3\textwidth}
\centering
\includegraphics[width=\textwidth]{figure2}
\caption{Figure 2}
\end{subfigure} \hfill
\begin{subfigure}[b]{0.3\textwidth}
\centering
\includegraphics[width=\textwidth]{figure3}
\caption{Figure 3}
\end{subfigure}
\end{figure}

The first three figures in the sequence are shown below. A sequence of figures is made up of equilateral triangles, called unit triangles, with unit sides.
<table>
<thead>
<tr>
<th>Marks</th>
<th>Total Marks</th>
<th>Figure</th>
<th>Number of Unit Triangles</th>
<th>Number of Unit Shelves</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
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<td>44</td>
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<td>1</td>
<td>1</td>
<td></td>
</tr>
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</table>

Complete the rows numbered (i) (ii) (iii) (iv) and (v).

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.

\[
\begin{align*}
\ell &= \frac{z}{(1 + \ell)(z \times \ell)} \\
6 &= \frac{z}{(1 + \ell)(2 \times \ell)} \\
3 &= \frac{z}{(1 + \ell)(1 \times \ell)}
\end{align*}
\]
(1) mark)

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

A candidate is awarded 95 marks on the examination. Use the graph drawn at (1).

(2 marks)

On the graph sheet on page 79, plot a graph to show the information in (1).

(2 marks)

120 marks.

60 marks

(1) Calculate the percentage for a student who scores 70 marks in examination out of a maximum of 120 marks. The marks are then converted to percentages.

A graph sheet is provided for this question.

ALGEBRA AND RELATIONS, FUNCTIONS, AND GRAPHS

Answer TWO questions in this section.

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

A candidate is awarded a Grade V if her percentage is 85% or more. Use the graph below to determine the minimum mark the candidate needs to be awarded a Grade V.

Minimum mark: [Diagram of a graph with axes labeled 'Mark' and 'Percentage']
Write an expression for $\beta(y)$ in the form $(x)(y + q)(q + x)$, where $a$ and $q \in R$. 

(3 marks) 

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

(3 marks) 

Evaluate $\beta(x)$. 

(i) 

\[ \frac{3}{1-x^2} = (x)(\beta) \quad 2 + 3x = (x)(\beta) \] 

The functions $f(x)$ and $\beta(x)$ are defined as 

(q)
10. (a) The diagram below, not drawn to scale, shows a vertical tower, TF, with a flagpole, FH, and a point, R, on the same horizontal ground as F, such that

\[ FR = 60 \text{ m}, \text{ and the angles of elevation of } T \text{ and } F \text{ from } R \text{ are } 35^\circ \text{ and } 42^\circ \text{, respectively}. \]

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

(i) 4 marks)

(ii) any right angle(s).

(iii) the angles of 35° and 42°.

(iv) the distance 60 m.

(v) Label the diagram to show...
Calculate the length, to the nearest kilometer, of KL.

(3 marks) (iii)

Calculate the measure of $\angle KLM$.

(1 mark) (iii)

On the diagram show the bearing of $040^\circ$.

(1 mark) (i)

The diagram below not drawn to scale shows the relative positions of three fishing boats.

$KL = 80$ km,

$K$ and $L$ are on a bearing of $040^\circ$ from $K$ and $L$ is due south of $L$. $M$ is the midpoint of $KL$ and $L$ is $120$ km and $N$ km from $K$.

$q$
Total 15 marks

(1 mark)

(v)

Calculate the bearing of \( P \) from \( K \).

(2 marks)

(vi)

Calculate the measure of \( \angle LKM \) to the nearest degree.
GO ON TO THE NEXT PAGE

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

(ii) Show that the matrix product of \( A \) and \( B \) is \textit{not} commutative, that is, \( AB \neq BA \).

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

Express in the form \( \begin{pmatrix} x \\ y \end{pmatrix} \):

(ii) \( \mathbf{S} \mathbf{R} \leftarrow \mathbf{S} \mathbf{F} \)

(1 mark)

Calculate the value of \( |\mathbf{R}| \) if \( \begin{pmatrix} 2 \\ 5 \end{pmatrix} \) and \( \begin{pmatrix} 1 \\ 2 \end{pmatrix} \) respectively.

(2 marks)

The position vectors of the points \( P, S \) and \( T \) relative to the origin \( O \) are \( \begin{pmatrix} 1 \\ 4 \\ 3 \end{pmatrix} \) and \( \begin{pmatrix} 2 \\ 5 \\ 2 \end{pmatrix} \) respectively.

(iv) Given that \( \mathbf{W} = \frac{3}{2} \mathbf{X} \), calculate the value(s) of \( x \) for which \( |\mathbf{W}| = 0 \).
IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

END OF TEST

Total 15 marks

(2 marks)

The line RS is parallel to ST and that RST is a straight line.

List the results of combining the vectors in (b) on page 33. Justify then.

((()))