

TEST CODE 01234020/SPEC

FORM TP 01234020/SPEC

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE
EXAMINATION

MATHEMATICS

SPECIMEN PAPER

Paper 02 – General Proficiency

2 hours and 40 minutes

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **TWO** sections.
2. There are **EIGHT** questions in Section I and **THREE** questions in Section II.
3. Answer **ALL** questions in Section I, and any **TWO** from Section II.
4. Write your answers in the booklet provided.
5. All working must be clearly shown.
6. A list of formulae is provided on page 2 of this booklet.
7. The overall total for Paper 02 is **120 marks**.

Required Examination Materials

Electronic calculator
Mathematical Instruments
Graph paper (provided)

SECTION I

Answer ALL the questions in this section.

All working must be clearly shown.

1. (a) Calculate the exact value of:

$$\frac{1\frac{1}{3}}{\frac{1}{3}} + \frac{5}{6}$$

$$1\frac{1}{3} \times \frac{5}{6}$$

(3 marks)

- (b) The cash price on a camera is \$450.00. It can be bought on hire purchase by making a deposit of \$90.00 and 12 monthly installments of \$34.50 EACH.

Calculate

- (i) the TOTAL hire purchase price of the camera (2 marks)
- (ii) the amount saved by buying the camera at the cash price. (1 mark)

- (c) Brent exchanged BD \$200.00 for EC currency, using the exchange rate BD \$1.00 = EC \$1.35

- (i) Calculate the amount he received in EC dollars. (1 mark)

Brent shared the amount of money he received among Pat, Calvin and Lyn.

Pat received $\frac{1}{3}$ of the amount.

Calvin received EC \$108.00.

Lyn received the remainder.

- (ii) Calculate
- a) Calvin's share as a percentage of the total amount shared
- b) Lyn's share as a fraction of the total amount shared.

(4 marks)

Total 11 marks

2. (a) Express as a single fraction:

$$\frac{5}{q} - \frac{p}{3}$$

(2 marks)

- (b) If $a \diamond b = 2p - 5q$, calculate the value of:

(i) $3 \diamond 2$

(1 mark)

(ii) $(3 \diamond 2) \diamond 1$

(2 marks)

- (c) Factorise completely:

(i) $4x^2 - 9$

(2 marks)

(ii) $mp + mq - np - nq$

(2 marks)

(iii) $2x^2 + 3xy + y^2$

(2 marks)

Total 11 marks

3. (a) Given the formula

$$V = \pi r^2 h$$

rearrange the formula to make r the subject of the formula.

(2 marks)

- (b) Solve the equation:

$$2x^2 + 3x - 2 = 0$$

(3 marks)

(c) In a group of 35 students,

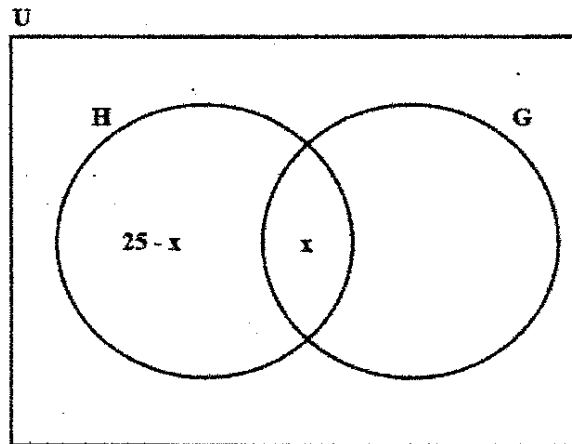
25 students passed History

15 students passed Geography

x students passed BOTH History and Geography

6 students passed neither History nor Geography.

(i) Copy and complete the Venn diagram below to illustrate this information.



(2 marks)

(ii) Write, in terms of x , an expression that represents the total number of students.

(1 mark)

(iii) Determine the number of students who passed BOTH subjects.

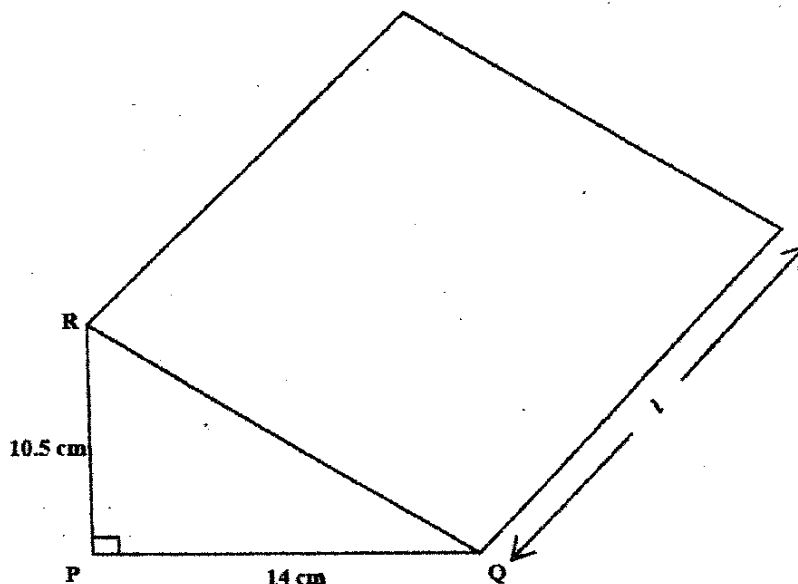
(2 marks)

Total 10 marks

4. (a) A map is drawn to a scale of 1:180 000. The actual distance between two towns shown on the map is 11.7 km. Calculate the distance between these two towns as shown on the map.

(3 marks)

- (b) The diagram below, **not drawn to scale**, shows a wooden prism. The cross-section PQR, is a triangle with $PQ = 14$ cm, $PR = 10.5$ cm and $\angle QPR = 90^\circ$.



- (i) Calculate the area, in cm^2 , of the cross-section PQR. (2 marks)

The volume of the prism is $1\,470$ cm^3 .

- (ii) Calculate the length of the prism l , in cm. (1 mark)

- (c) (i) Using a ruler, a pencil and a pair of compasses, construct a trapezium ABCD in which $AB = 8.0$ cm, $AD = 6.0$ cm, $CD = 5.0$ cm, $\angle BAD = 90^\circ$ and $\angle ADC = 90^\circ$.

(5 marks)

- (ii) Measure and state the length of the side BC. (1 mark)

Total 12 marks

5. (a) **An answer sheet is provided for this question.**

The answer sheet shows triangle JKL and its image $J'K'L'$.

- (i) Describe **FULLY** the transformation which maps triangle JKL onto its image $J'K'L'$.

(3 marks)

- (ii) Show **on your answer sheet**, triangle $J''K''L''$, the image of $J'K'L'$ after a reflection in the line $x = 3$.

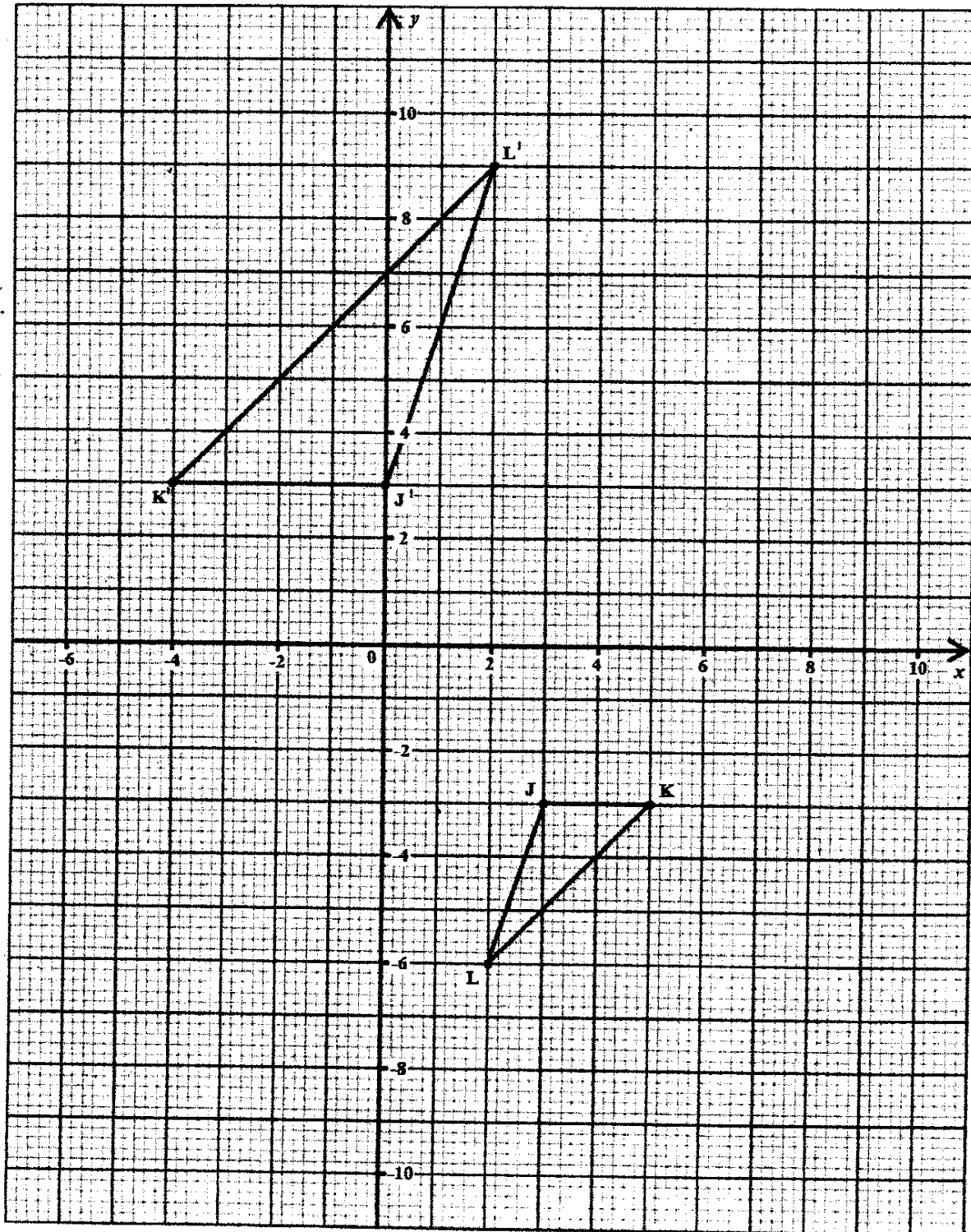
(3 marks)

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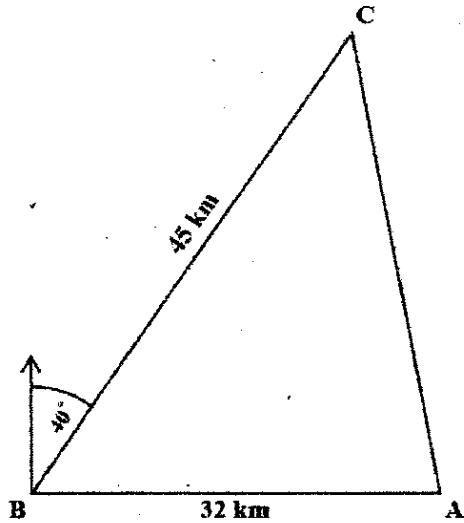
(To be attached in booklet with your other answers)

Candidates Registration Number: _____

Question Number: _____



- (b) The diagram below, **not drawn to scale**, shows the journey of a ship which sailed from Port A to Port B and then to Port C. Port B is located 32 km due West of Port A and Port C is 45 km from Port B on a bearing of 040° .



Calculate, giving your answers correct to 3 significant figures

- (i) the distance AC (3 marks)
- (ii) the bearing of Port C from Port A. (3 marks)

Total 12 marks

6. (a) The line segment BC passes through the point $A(-5,3)$ and has a gradient of $\frac{2}{5}$.
- (i) Express the equation of the line segment BC in the form $y = mx + c$. (3 marks)
- (ii) Show that BC is parallel to the line $2x - 5y = 1$. (2 marks)

- (b) The functions f and g are defined as:

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

$$g(x) = 4x - 5$$

- (i) Determine:
- a) $g(3)$
- b) $fg(2)$
- c) $f^{-1}(x)$

(7 marks)

Total 12 marks

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7. The data below shows the time spent, to the nearest minute, by 25 students at a bookstore.

20	6	22	16	13
22	26	18	22	28
11	21	27	24	15
25	28	33	9	17
12	25	18	21	23

- (a) Copy the frequency table below and complete to represent the data given above.

Time spent at the bookstore (minutes)	Frequency	Cumulative Frequency
6–10	2	2
11–15	4	6
_____	5	11
21–25	_____	20
26–30	4	_____
31–35	1	25

(4 marks)

- (b) Using a scale of 2 cm on the x-axis to represent 5 minutes and 2 cm on the y-axis to represent 5 students, draw a cumulative frequency curve of the time spent at the bookstore.

(4 marks)

- (c) Use your graph to estimate

- (i) the median time spent at the bookstore **(1 mark)**
- (ii) the number of students who spent LESS than 24 minutes at the bookstore **(1 mark)**
- (iii) the probability that a student, selected at random, spent LESS than 24 minutes at the bookstore. **(2 marks)**

Total 12 marks

8. The table below shows an attempt at calculating the sum of the cubes of the first n natural numbers. Information is missing from some rows of the table.

- (a) Study the pattern and complete, in your answer booklet, the rows marked (i), (ii) and (iii).

n	Series	Sum	Formula
1	1^3	1	$\frac{1^2}{4} (1+1)^2$
2	$1^3 + 2^3$	9	$\frac{2^2}{4} (1+2)^2$
3	$1^3 + 2^3 + 3^3$	36	$\frac{3^2}{4} (1+3)^2$
4	$1^3 + 2^3 + 3^3 + 4^3$	100	$\frac{4^2}{4} (1+4)^2$
(i) 5	_____	_____	_____
6	$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3$	441	$\frac{6^2}{4} (1+6)^2$
(ii) _____	_____	_____	$\frac{8^2}{4} (1+8)^2$
(iii) n	_____	_____	_____

(6 marks)

- (b) It was further noted that:

$$1 + 2 = \sqrt{9} = 3, \quad 1 + 2 + 3 = \sqrt{36} = 6 \quad \text{and} \quad 1 + 2 + 3 + 4 = \sqrt{100} = 10.$$

Using information from the table above and the pattern in the three statements above, determine

- (i) the value of x for which $1 + 2 + 3 + 4 + 5 + 6 = \sqrt{x}$ (1 mark)
- (ii) a formula in terms of n for the series: $1 + 2 + 3 + 4 + \dots + n$ (1 mark)
- (iii) the value of: $1 + 2 + 3 + 4 + \dots + 30$. (2 marks)

Total 10 marks

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SECTION II

Answer TWO Questions in this Section.

9. (a) Solve the pair of simultaneous equations:

$$x^2 = 4 - y$$

$$x = y + 2$$

(5 marks)

- (b) (i) Express $3x^2 + 2x + 1$ in the form $a(x + p)^2 + q$ where a , p and q are real numbers.

(3 marks)

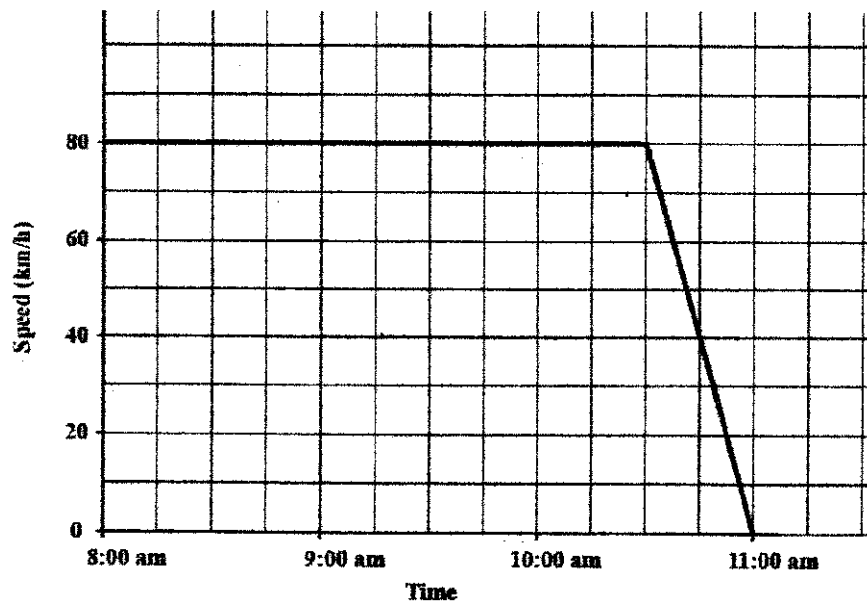
- (ii) Hence, determine for $f(x) = 3x^2 + 2x + 1$

a) the minimum value for $f(x)$

b) the equation of the axis of symmetry.

(2 marks)

- (c) The speed-time graph below shows the journey of a car from 8:00 am to 11:00 am.



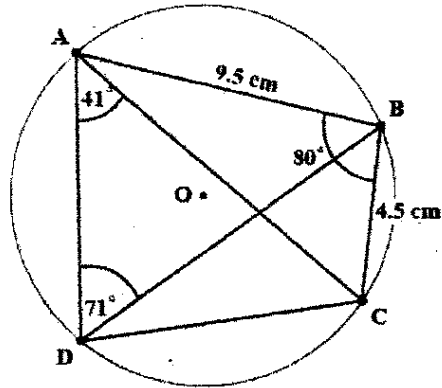
Using the graph, determine

- (i) the time at which the speed of the car was 40 km/h (1 mark)
- (ii) the distance the car travelled for the entire journey (2 marks)
- (iii) the average speed of the car for the entire journey. (2 marks)

Total 15 marks

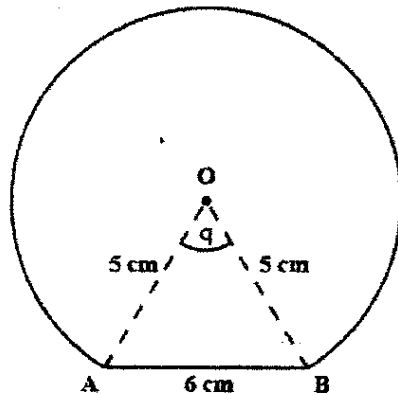
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10. (a) The diagram below, **not drawn to scale**, shows a quadrilateral ABCD with $AB = 9.5$ cm, $BC = 4.5$ cm, $\angle ABC = 80^\circ$, $\angle ADB = 71^\circ$ and $\angle DAC = 41^\circ$. The vertices of ABCD are on the circumference of a circle, center O, of radius 5 cm.



Determine, **giving reasons for each step** of your answer

- (i) $\angle CBD$ (2 marks)
 - (ii) $\angle CAB$ (2 marks)
 - (iii) the length of the chord BD (3 marks)
- (b) A machine produces circular discs of diameter 10 cm. The machine malfunctions and cuts a disc to produce the shape in the figure below, **not drawn to scale**, with center, O.



Use $\pi = 3.14$

Determine, **correct to three significant figures**,

- (i) the measure of angle θ (3 marks)
- (ii) the area of triangle AOB (2 marks)
- (iii) the area of the disc that was cut off (3 marks)

Total 15 marks

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11. (a) The vertices of a quadrilateral, OPQR are (0,0), (4,2), (6, 10) and (2,8) respectively.
- (i) Using a vector method, express in the form $\begin{pmatrix} x \\ y \end{pmatrix}$, the vector
- a) \overline{OP}
- b) \overline{RQ} (3 marks)
- (ii) Calculate $|\overline{OP}|$, the magnitude of \overline{OP} . (2 marks)
- (iii) State TWO geometrical relationships between the line segments OP and RQ. (2 marks)
- (b) The matrix, K, maps the point S(1,4) onto S'(-4,-1) and the point T(3,5) onto T'(-5,-3). Given that $K = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$,
- (i) Express as a matrix equation, the relationship between
- a) K, S and S'
- b) K, T and T'. (2 marks)
- (ii) Hence, determine the values of a , b , c and d . (4 marks)
- (iii) Describe COMPLETELY the geometric transformation which is represented by the matrix K. (2 marks)

Total 15 marks

END OF TEST