

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

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REPUBLIC OF CAMEROON
Peace-Work-Fatherland

MINISTRY OF SECONDARY EDUCATION

TEACHERS' RESOURCE UNIT
REGIONAL BRANCH FOR THE NORTH WEST

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MARCH 2023

The Teachers' Resource Unit and the Regional Inspectorate of Pedagogy, in collaboration with MTA	SUBJECT CODE NUMBER 0575	PAPER NUMBER 2
GENERAL CERTIFICATE OF EDUCATION REGIONAL MOCK EXAMINATION ORDINARY LEVEL	SUBJECT TITLE ADDITIONAL MATHEMATICS	

Time Allowed: TWO and a half hours
INSTRUCTIONS TO CANDIDATES

Mobile phones are NOT ALLOWED in the examination room.

- ❖ Answer ALL QUESTIONS IN SECTION A and ANY TWO QUESTIONS FROM EITHER SECTION B or SECTION C. IN SECTIONS B AND C, ALL QUESTIONS CARRY EQUAL MARKS.
- ❖ Candidates are expected to answer a combination of Section A and Section B OR Section A and Section C NOT a combination of all three.
- ❖ All necessary working must be shown. No marks will be awarded for answers without brief statements showing how the answers have been obtained.
- ❖ Electronic calculators may be used.
- ❖ Where necessary take g as $10ms^{-2}$.
- ❖ Formulae Booklets may be used.

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SECTION A: PURE MATHEMATICS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN THIS SECTION.

1. (i) Given that $x = 2$ is a root of the equation $f(x) = 0$. Where $f(x) = 2x^3 + kx^2 - x + 6$,
 (a) Find the value of k . (1 mark)
 With this value of k ,
 (b) Factorise $f(x)$ completely. (3 marks)
 (ii) Given that the roots of the quadratic equation $2x^2 - 7x + 6 = 0$ are α and β , find
 (a) The values of $\alpha + \beta$ and $\alpha\beta$. (1 mark)
 (b) The quadratic equation with integral coefficients whose roots are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$. (3 marks)

2. (i) Find the number of ways in which a committee of 3 boys and 2 girls can be selected from a class of 5 boys and 4 girls. (2 marks)
 (ii) In how many different ways can the letters of the word ADDITIONAL be arranged? (2 marks)
 (iii) Find the coefficient of x^4 in the binomial expansion of $(x + \frac{1}{x})^{12}$. (4 marks)

3. Ngong, Lum and Sih started a business with a total amount of 3,500,000FCFA. Of this amount, Ngong contributed 500,000FCFA, Lum contributed 1,000,000FCFA and Sih contributed 2,000,000FCFA. The monthly profit they made was shared among the three of them in the ratio of the amount they each contributed. Given that they made a total profit of 110,000FCFA in the first month, 280,000FCFA in second month and 350,000FCFA in the third month and that the profit kept increasing in this manner for the first 12 months, find,
 (a) The profit they made in the 12th month. (2 marks)
 (b) The profit Ngong made in the first, second and third months. (4 marks)
 (c) The total profit Ngong made in the first 12 months. (2 marks)

4. (i) The operation $*$ is defined on the set $S = \{2, 4, 6, 8\}$ as $a * b =$ the unit digit of the product ab .
 (a) Copy and complete the table below. (3 marks)

$*$	2	4	6	8
2	4			
4				
6			6	
8		2		

From the table above

- (b) State the identity element. (1 mark)
 (c) State the inverse of each element. (1 mark)
 (ii) The linear transformation T is represented by the matrix M , where $M = \begin{pmatrix} 3 & -2 \\ -1 & 2 \end{pmatrix}$. Find
 (a) The image of the point (2,3) under the transformation T . (2 marks)
 (b) The image of the line $2x + 3y - 4 = 0$ under the transformation T . (2 marks)

5. A certain parent of a school has 19200FCFA only to buy x Mathematics and y English text books as gifts, for the school library.
 (a) Given that each Mathematics text book costs 2400FCFA and each English text book costs 3200FCFA show that, $3x + 4y = 24$. (2 marks)
 (b) Given also that the number of English text books must be at most 75% of the number of Mathematics text books, write down another inequality in terms of x and y that satisfies this condition. (1 mark)
 (c) On a graph paper, taking 2cm to represent 1 unit on both axes, shade so as to leave unshaded, the region satisfied by these inequalities. (3 marks)
 Hence,
 (d) find the maximum number of text books the parent can buy. (2 marks)

6. (i) Solve, for θ , in the range $0^\circ \leq \theta \leq 180^\circ$ the equation $\cos\theta - \sin 2\theta = 0$. (3 marks)
 (ii) The function f is defined as $f(x) = \sqrt{3}\sin x - \cos x$, where $0 \leq x \leq 2\pi$

(a) Copy and complete the table below.

(3 marks)

x	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
$f(x)$	-1			1.7	2		1		-1	-1.7		-1.7	-1

Taking 1cm to represent $\frac{\pi}{6}$ radian units on the x -axis and 2cm to represent 1 unit on the y -axis,

(b) draw the graph of $y = f(x)$.

(2 marks)

From the graph or otherwise,

(c) write down the values of x in the range $0 \leq x \leq 2\pi$ for which $\sqrt{3}\sin x - \cos x = 0$.

(1 mark)

7. A straight line l_1 passes through the point P with position vector $2i + j$ and is parallel to the vector $3i - 2j$

(a) Write down the vector equation of the line l_1 in the form $r = a + sb$.

(1 mark)

Another line l_2 has equation $r = 3i + j + t(2i - j)$. Find,

(b) The position vector of the point of intersection of the two lines.

(4 marks)

(c) The acute angle between the two lines.

(3 marks)

8. (i) Find the gradient of the tangent to the curve $y = \frac{3x+2}{2x+1}$ at the point (0, 2).

(4 marks)

(ii) Find the area bounded by the curve $y = 4x - x^2$ and the x -axis in the range $0 \leq x \leq 1$

(4 marks)

SECTION B: MECHANICS

IF THIS SECTIONS IS CHOSEN, THEN SECTION C MAY NOT BE CHOSEN
(ANSWER ANY TWO QUESTIONS)

9. (i) A particle P of mass 2kg moves so that its position vector after t seconds is given by

$$r = [(3t^2 - 2t)i + (t^3 - 6t)j] \text{ m}$$

Find:

(a) The speed of the particle when $t = 1$

(3 marks)

(b) The magnitude of the force exerted on the particle when $t = 1$

(3 marks)

(ii) A particle of mass 6kg rests on the surface of a smooth plane which is inclined at 30° to the horizontal. It is connected by a light inextensible string, passing over a smooth pulley, fixed at the top of the plane, to another particle mass of m kg ($m > 3$) which is hanging freely. Given that the system is released from rest with the string taut, the hanging part vertical and that the acceleration of each particle is 1 ms^{-2} .

(a) Draw a diagram showing all the forces acting on the particles

(2 marks)

Find:

(b) The value of m

(3 marks)

(c) The tension in the string

(1 mark)

(iii) A particle P of mass 4kg moving with velocity 7 ms^{-1} , collides and coalesces with a similar particle Q of mass 3kg which is at rest.

Calculate:

(a) Their common velocity after collision

(2 marks)

(b) The lost in kinetic energy

(3 marks)

10. (i) At a particular instant, the radius of a spherical balloon is 2cm and is increasing at the rate of 3 cms^{-1}

Find:

(a) The rate of increase of the volume of the balloon.

(3 marks)

(b) The rate of increase of the surface area

(2 marks)

[The volume of a sphere, $V = \frac{4}{3}\pi r^3$ and the surface area of a sphere, $A = 4\pi r^2$]

(ii) The finite area bounded by the line $y = 2x + 1$, the x -axis, the ordinates $x = 0$ and $x = 2$ is rotated completely about the x -axis. Find the volume of the solid generated.

(6 marks)

(iii) Three particles of masses 3kg, 2kg and 5kg are placed at the points A(6,-1), B(-4,-1) and C(6,-7) respectively. Find the position vector of the center of gravity of these particles.

(6 marks)

11. (i) A uniform rod AB of mass 15kg and length 6m rests in limiting equilibrium with the end B against a smooth vertical wall and the end A on a rough horizontal floor. If AB makes an angle of 45° with the floor,

(a) Draw a force diagram showing all the forces acting on the rod.

(3 marks)

- Hence or otherwise. (2 marks)
- (b) Find the normal reaction of the floor on the rod. (4 marks)
- By taking moments at A,
- (c) Find the coefficient of friction between the rod and the floor. (4 marks)
- (ii) A force $F = (3i + 4j)m$ moves a particle from the point P with position vector $5i - 6j$ to the point Q with position vector $-3i + 14j$. Find the work done by the force on the particle. (3 marks)
- (iii) A car is moving at a maximum speed of $17ms^{-1}$ on a level road against a constant resistance of 400N. Given that the power generated by the engine of the car is 2000W, find the value of v . (5 marks)

SECTION C: STATISTICS AND PROBABILITY
IF THIS SECTION IS CHOSEN THEN SECTION B MAY NOT BE CHOSEN.
(ANSWER ANY TWO QUESTIONS)

12. The table below shows the average time, in minutes, taken by a group of 50 students trekking from their homes to school each morning.

Marks (x)	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40
Number of students (f)	2	5	7	10	12	8	5	1

- (i) Taking 2cm to represent 5 units on both axes, (4 marks)
- (a) draw a cumulative frequency graph of the distribution. (2 marks)
- From your graph, estimate (3 marks)
- (b) the median time (8 marks)
- (c) the semi-interquartile range.
- (ii) Find the mean and the variance of the distribution.
13. (i) A linear transformation $f(x) = ax + b$ maps the set $X = \{2, 4, 6, 8, 10\}$ onto the set Y such that $f(2) = 1$ and $f(4) = 5$. (2 marks)
- Find: (4 marks)
- (a) the values of a and b (3 marks)
- (b) the mean and variance of X (3 marks)
- (c) the mean and variance of Y (2 marks)
- (ii) In a certain village, one out of every five men is a hunter. Eight men are selected at random from the village. Using the binomial distribution or otherwise, find to 4 decimal places, the probability that: (3 marks)
- (a) none of them is a hunter (3 marks)
- (b) at most one of them is a hunter. (2 marks)
- Find: (2 marks)
- (c) the mean and variance of the distribution.

14. (i) Two events R and S are such that $P(R) = \frac{1}{3}$, $P(S) = \frac{1}{4}$ and $P(R/S) = \frac{2}{5}$. (2 marks)
- Find: (3 marks)
- (a) $P(R \cap S)$ (3 marks)
- (b) $P(R \cup S)$ (3 marks)
- (c) $P(R^1/S)$
- (ii) In a certain community, there are 2000 adults: 800 men and 1200 women. 60% of the women and 30% of the men do fishing. An adult, X is chosen at random from this community. By drawing a tree diagram or otherwise, find the probability that: (3 marks)
- (a) X is a man who does fishing (3 marks)
- (b) X is a fish catcher. (3 marks)
- (c) X is a man given that X does fishing.



END