NORTH REGION	**ACADEMIC YEAR 2024-2025**
REGIONAL DELEGATION OF SECONDARY	**REGIONAL MOCK EXAMINATION**
EDUCATION	**LEVEL: ORDINARY LEVEL**
REGIONAL INSPECTORATE OF PEDAGOGY IN	**SUBJECT: MATHEMATICS**
CHARGE OF SCIENCE EDUCATION	**SUBJECT CODE: 0570 MATHEMATICS 2**
MATHEMATICS DEPARTMENT	

Time Allowed: 2 Hours 30 Minutes

Instructions to Candidates

1. **No electronic calculators or phones are allowed inside the examination hall.**

2. **This paper is divided in to two sections; Section A and Section B. Follow the instructions directed on each section**

3. **Attach the answer sheet for question in Section B to this paper or slot it in this paper.**

4. **You are reminded of the necessity for good English and orderly presentation in your answer sheets.**

5. **Avoid dirty work at all cost**

SECTION A:

Answer **ALL** the questions in the spaces provided

1. (i) Evaluate $\frac{3}{4} + \left(2^2 - 2\frac{1}{3}\right) \div \frac{4}{9}$, leaving your answer in simplest form.

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    (ii) Given that $p = 6 \times 10^3$, $q = 2 \times 10^{-4}$ and $r = 4 \times 10^{-5}$, find the value of $\frac{p \times q}{r}$, expressing your answer in standard form.

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    ……… **6marks**

2. Consider the following simple statements

    p: Alidou is a fisherman

    q: Alidou is a good swimmer.

    (a) Express the following compound statements in ordinary English

        (i) $p \implies q$

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        (ii) $p \wedge q$

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        (iii) $\sim q \implies \sim p$

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    (b) Using T for true and F for false, draw the truth tables for $p \implies q$ and $p \wedge q$

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    ……… **6marks**

3. A circle has radius $2x$. Given that the circumference of this circle is $\frac{132}{7}$ cm. Taking $\pi = \frac{22}{7}$,

(a) What is the value of x

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.... **3marks**

(b) Find the Area of the circle

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.... **2marks**

4. A student, standing at given point, B, looks at the top of a vertical tower, C at an angle of elevation 60°. If the foot (A) of the tower is 20m from the student: Calculate:

(i) the height, h, of tower

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(ii) the distance BC from the student to the top of the tower

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4marks

5. Given two vectors $\vec{U} = 2i + 3j$ and $\vec{V} = -3i + 2j$

(a) Find $\|\vec{U}\|$, the magnitude of $\vec{U}$.

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(b) Show that $\vec{U}$ and $\vec{V}$ are perpendicular.

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(c) Find the vector $\vec{W}$ for which $\vec{W} = 3\vec{U} - 2\vec{V}$

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....**6marks**

6. Consider two functions f and g defined as follows

$f : \mathbb{R} \to \mathbb{R}$ such that $f : x \mapsto 8x - 5$ $g : \mathbb{R} - \{-1\} \to \mathbb{R}$ such that $g : x \mapsto \frac{4}{x+1}, x \neq -1$

(a) Find $f(2)$ and $g(3)$

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(b) Find f^{-1}, the inverse of f and define it in similar manner.

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(c) State the domain of the function g

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....**7marks**

7. In the figure below M and N are midpoints of the diagonals **AC** and **BD** respectively. Given that $\overrightarrow{AB} = \underline{a}$, $\overrightarrow{BC} = \underline{b}$ and $\overrightarrow{DC} = k\underline{a}$, where k is a scalar.
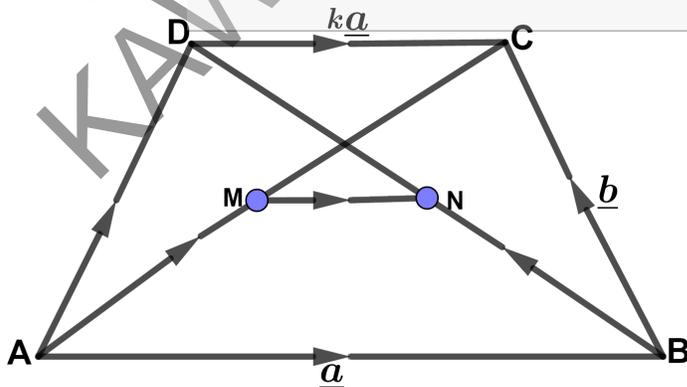
(a) Find $\overrightarrow{AC}$, $\overrightarrow{AM}$, $\overrightarrow{BD}$ and $\overrightarrow{BN}$ in terms of $\underline{a}$ and $\underline{b}$

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(b) Show that $\overrightarrow{MN} = \frac{(1-k)\underline{a}}{2}$

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…………………………………………………………………………………… **7marks**

8. The matrices P and Q are given by P= $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ and Q= $\begin{pmatrix} -2 & 0 \\ 0 & 2 \end{pmatrix}$. Find the matrix

(a) 2P+ Q

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(b) P − Q

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(c) Show that $P^2 + Q^2 = 5I$, where I= $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

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…………………………………………………………………………………… **7marks**

9. (a) Solve the pair of equations below simultaneously by elimination method

$$x - y = 4 \cdots\cdots (1)$$

$$2x + y = 5 \cdots\cdots (2)$$

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(b) Solve the inequality $4x - 3 > 9$ and represent your solution on a number line.

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10. A concrete mixture is made up of 20% cement, 25% gravel 45% sand and the rest being water.

(a) What is the fraction of water in the mixture?

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(b) Suppose the total mass of the mixture is 480kg, what is the mass of gravel?

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11. Let A, B, and C be sets defined as follows:

$A = \{x : x \text{ is a prime number less than } 10\}$

$B = \{x : x \text{ is an even number less than } 10\}$

$C = \{x : x \text{ is an odd number less than } 10\}$

(a) List the elements of sets A, B and C.

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(b) List the elements of the sets defined by

(i) $A \cap B$ ……………………………………………………………………………………………………

    (ii) $A \cap B \cap C$ ....

    (iii) $B \cup C$ ....

    (iv) $A^c \cup B^c$ ....

(c) Draw a Venn Diagram showing the relationship between the sets A, B and C.

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.... **7marks**

12. The nth, term of an Arithmetic progression is given by $U_n = 3n + 1, n \geq 1$

    (a) List the first three terms of this sequence

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    (b) Calculate the common difference

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    (c) The sum of the first n^{th} is given by $S_n = \frac{n}{2}[2a + (n-1)d]$ where a is the first term and d is the common ratio. Find the sum of the first ten terms of this sequence.

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.... **6marks**

13. Consider the network below

(a) State the number of:

    (i) Vertices (V) ....

    (ii) Regions (R) ....

    (iii) Edges(E) ....

(b) Verify the Euler's relation $V + R - E = 2$

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.... **4marks**

14. The data shows the shoe sizes of twenty students obtained from a class of twenty students:

    $37, 36, 35, 40, 42, 37, 40, 41, 38, 39, 40, 35, 41, 42, 43, 36, 40, 39, 39, 41.$

    (a) State the mode of the distribution ....

    (b) Calculate the mean of the distribution

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    (c) Calculate the median of the distribution

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    .... **5marks**

15. Consider the points $A(2, 3)$ and $(-3, 5)$

    (i) (a) Calculate the gradient of the line segment AB

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    (b) Calculate the distance between A and B.

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    .... **5marks**

SECTION B:

INSTRUCTIONS: ANSWER ALL THE FOUR QUESTIONS IN THIS SECTION. EACH QUESTION CARRIES **15 MARKS**

1. (a) Consider the quadratic function $f(x) = -2x^2 + 8x + 2$, with an incomplete table of values for $f(x)$ given below

x	-1	0	1	2	3	4	5
$y = f(x)$	-8					2	

(i) Copy and complete the table above.

Taking $2cm$ to represent $1unit$ on the x-axis and $1cm$ to represent $1unit$ on the y-axis, draw the graph of $y = f(x)$.

From your graph, find:

(ii) the roots of the equation $f(x) = 0$

(iii) the maximum value of $f(x)$ and the corresponding value of x

(iv) Using the same scale, draw the line $y = 3x - 1$. then, from the graph,

(v) Estimate the solution of the quadratic equation $-2x^2 + 5x + 3 = 0$

(b) Solve the simultaneous equation

$$2x + 4y = 6$$

$$2x - y = -9$$

15marks

2. (i) An Opera orchestra group in collaboration with the Cameroon ministry of Arts and culture, organized a grand musical concert at the Roumde Adjia football stadium Garoua. The stadium has a total capacity of $60,000$ seats divided into two main sections; the Common Section and the VIP Section. The VIP section is further divided in two sections; VIP 1 which is the Presidential Stand, and VIP 2. The VIP Section takes $\frac{1}{40}$ of the total number of seats and $\frac{1}{5}$ of the seats in the VIP section are in the presidential Stand.

Entry tickets into the stadium for this grand musical concert sold at 2000 FCFA for seats in the Common Section, $5,000$FCFA in VIP 2 and $10,000$FCFA in VIP 1 Section.

On the concert day, $\frac{2}{3}$ of the the seats in the Common Section were occupied, all the seats in the presidential stand (VIP 1) were occupied and $\frac{3}{4}$ of the VIP 2 seats were occupied.

a) Find the number of seats in the

(i) Common Section

(ii) Presidential Stand(VIP 1)

(iii) VIP 2 section

b) Find the number of spectators who attended the concert and sat in the:

(i) Common Section

(ii) Presidential Stand

(iii) VIP 2 Section

c) How much was made from the sales of the tickets into this grand musical concert?

d) Given that the organizers of this event used $\frac{1}{6}$ of the money got from the sales of the tickets to pay some Taxes and cover other expenses, then shared the remaining money to three orphanages in the North Region in the ratio $2 : 4 : 3$

(i) How much did they use for the taxes and other expenses?

(ii) How much did each orphanage receive? Leave your answer to the nearest thousands.

_____ 15marks _____

3. a) Consider the figure below. The line **XPT** is a tangent to the circle at point **P** and the chord **QR = QS**. Given that angle $\angle SPT = 30°$ and angle $\angle PSQ = 20°$,
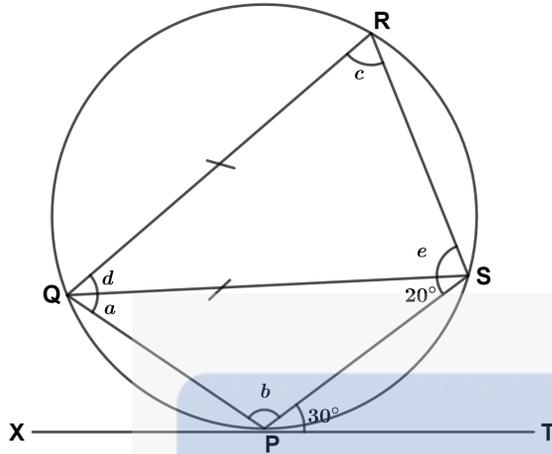
(i) Give the special names of the figures $PQRS$, and QRS

(ii) State the value of angle a

(iii) Calculate the value of and b hence,

(iv) Deduce the values of angles c, d and e

b) Use pencil, ruler, and compasses only in this question. In the middle of a new page;

i. Draw a line $ST = 6.5$cm

ii. Construct the perpendicular bisector of ST to meet ST at M.

iii. Locate N on one side of the perpendicular bisector such that $NM = 4$cm

iv. Connect NT and bisect angle NTM

v. Produce the bisector to meet MN at Q.

vi. Measure the length of SQ.

_____ **15marks** _____

4. (i) During a football tournament featuring some secondary schools in the Benoue division, the ages of 36 players randomly chosen from the schools were recorded as follows

10	19	14	10	13	18
17	11	18	11	12	14
12	17	14	13	15	12
20	13	12	10	14	16
15	12	18	13	11	12
17	15	14	17	13	12

i. Draw a frequency table for this data. hence,

ii. State the mode of this data

iii. Calculate the mean age

    iv. Calculate the median age

    v. Draw a cumulative frequency distribution table

    vi. Using 1cm to represent 2 units of age, and 1cm for 5 competitors, draw the cumulative frequency curve.

    vii. What is the probability of selecting at random a competitor whose age is 13?

(ii) Given a polynomial $P(x) = 2x^3 + 5x^2 + x + k$ where k is a real constant.

    a) Given that $(x + 1)$ is a factor of $P(x)$, Find the value of k

    b) With this value of k, factorize $P(x)$ completely

    c) Hence solve the equation $P(x) = 0$

15marks