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MATHEMATICS
Paper 1
July/ August 2023
2½ hours

WESTERN JOINT MOCK EXAMINATIONS
Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **all** *questions in Section* **A** *and any* **five** *questions from Section* **B**.

Any additional question(s) answered will **not** *be marked.*

All *necessary calculations must be done in the Answer booklet(s) provided. Therefore, no paper should be given for rough work.*

Graph paper is provided.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

Answer **all** *questions in this section.*

1. Given that $\begin{pmatrix} 20 & x \\ 2 & y \end{pmatrix}$ is a singular matrix and $x + y = 11$, determine the values of x and y. *(04 marks)*

2. Solve the inequality:
$\frac{x+3}{3} - \frac{x+2}{2} < \frac{x+5}{4}$ *(04 marks)*

3. Study the table below and use it to answer the following questions.

Marks	10	12	14	16	18	20
Frequency	5	4	8	n	6	2

(i) Determine the value of n if the mean mark is 15. *(03 marks)*
(ii) Find the modal mark. *(01 mark)*

4. Factorize completely: $4x^2 - 8x + 3$. Hence find the value of x when $4x^2 - 8x + 3 = 0$. *(04 marks)*

5. Given that A and B are two matrices such that $A = \begin{pmatrix} 1 & 3 \\ 4 & 6 \end{pmatrix}$, $B = \begin{pmatrix} -2 & 7 \\ 5 & 3 \end{pmatrix}$. Find;

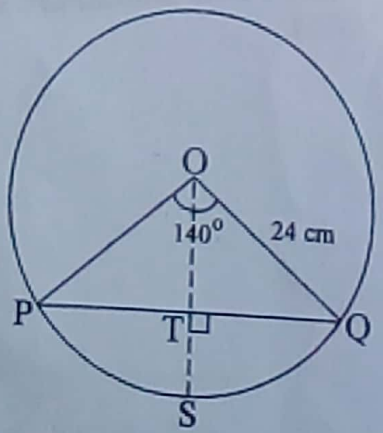
(i) Matrix $P = (AB)$, *(02 marks)*
(ii) $P^{-1} = \frac{1}{det}$ (co-factor) *(02 marks)*

6. Given that $a * b = a^2 - b^2$ find the value of x in $x * \sqrt{3} = 7 * 4$. *(04 marks)*

7. A pole is fixed on horizontal ground. The angle of depression of the foot of the pole from the top of a cliff is 38.4 m high is 30^o. Find how far away the foot of the cliff is from the pole. *(04 marks)*

8. Make K the subject of $T = \frac{3K}{d+4}$, hence find the value of K when $T = 3$ and $d = 1$. *(04 marks)*

9. In the diagram below, O is the centre of the circle, T is the midpoint of PQ and the angle $POQ = 140^o$.



Find the length of TS. (04 marks)

10. Solve for y in $8^{2/3} \div y^{1/2} = 2$. (04 marks)

SECTION B: (60 MARKS)

Answer any **five** *questions from this section. All questions carry equal marks.*

11. (a) Use matrix method to solve the following pair of simultaneous equations.

$2x + 5y - 12 = 0,$

$x - 5 = -2y.$ (06 marks)

(b) A transformation maps $(1,2)$ onto $(-1,4)$ and $(2,3)$ onto $(-1,7)$.

(i) Find the matrix of this transformation. (04 marks)

(ii) Determine the image of $(3,0)$ under this transformation. (02 marks)

12. (a) Draw the graph of $y = 6 + 3x - 2x^2$ for $-2 \leq x \leq 3$, taking 2 cm as one unit on the x-axis and 1 cm as one unit on the y-axis.

(b) Use your graph to obtain solutions for the equations.

(i) $6 + 3x - 2x^2 = 0,$

(ii) $2 + 3x - 2x^2 = 0.$ (12 marks)

13. Three towns A, B and C are such that B is 400 km on a bearing of 100° from A while C is 600 km on a bearing of 170° from A.

(a) Using a scale of 1 cm: 50 km, represent the positions of ABC on an accurate diagram.

(b) Determine the

(i) distance $\overline{BC}$ in km,

(ii) bearing of B from C.

(c) A plane flying at 200 km/ hr moves from A to B to C and then directly to A. How long does it take? (12 marks)

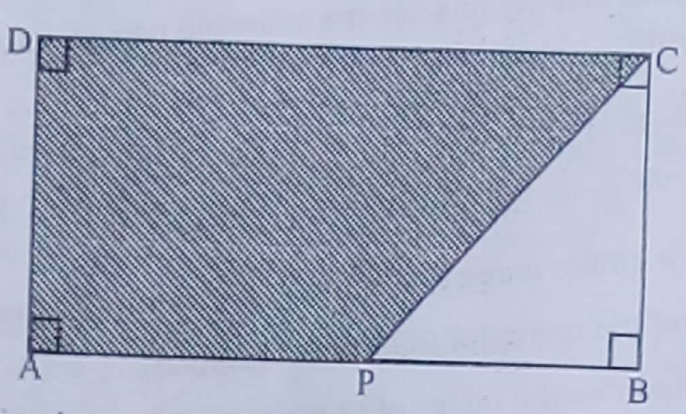
14. (a) Given that matrices $A = \begin{pmatrix} -2 & 3 \\ 5 & x \end{pmatrix}$, $B = \begin{pmatrix} y & -z \\ -3 & 2 \end{pmatrix}$ and $BA = \begin{pmatrix} -7 & -4 \\ 16 & 5 \end{pmatrix}$. Find the values of x, y and z. (07 marks)

(b) If $M\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, find matrices $MN = \begin{pmatrix} -2 & -2 \\ 3 & 4 \end{pmatrix}$. (05 marks)

15. (a) In a class, the probability of picking a female student is $^2/_3$. Given that the number of female students is 12. Determine the number of male students in the class. *(04 marks)*

(b) A bag contains 14 marbles of which 10 are red and 4 are green. Two marbles are picked at random one at a time without replacement. Find the probability of picking marbles of different colours. *(08 marks)*

16. (a) ABC is a rectangle in which P is a point on $\overline{AB}$ such that $\overline{AP} = PC = x$ cm, $\overline{AB} = 8$ cm and $\overline{AD} = 4$ cm.



(i) Write down an equation involving x and determine the value of x, *(05 marks)*

(ii) Find the length of $\overline{PB}$. *(03 marks)*

(b) Find the area of trapezium $APCD$. *(04 marks)*

17. (a) By shading the unwanted regions, show on a graph the regions satisfying the inequalities below;

$$x \geq 1$$
$$y \geq 1$$
$$x + y \leq 8$$
$$3x + 5y \leq 30$$

(08 marks)

(b) Use your graph above to find the values of x and y which give the maximum values for both $x + y$ and $3x + 5y$. *(04 marks)*

END