456/1
MATHEMATICS
PAPER 1
July/August 2023
2½ hours

WAKISSHA 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 same answer booklet/sheets provided, with the rest of the answers. 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 $x \Delta y = x^2 - 6y^2$, evaluate $(3 \Delta 6) \Delta 4$. (4 marks)

2. The bearing of point A from point B is 210^0.
Find the bearing of point B from point A. (4 marks)

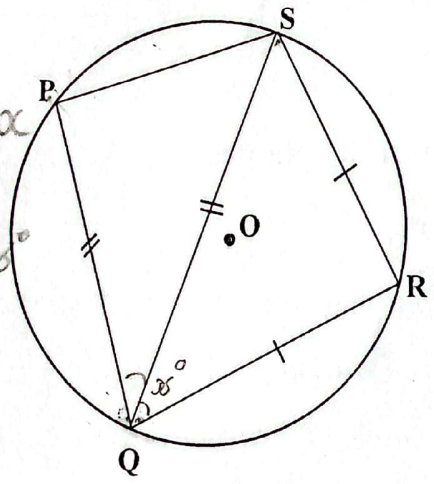
3. Given that matrix $P = \begin{pmatrix} 3 & 0 \\ 5 & 1 \end{pmatrix}$. Show that $P^2 - 4P + 3\mathbf{I} = 0$ where **I** is the identity matrix of order 2 by 2. (4 marks)

4. Factorise completely $12p^2 - 27q^2$. (4 marks)

5. A school bus carries 78 passengers when full. The bus has a total of 30 seats.
Some of the seats are for 3 passengers and others are for 2 passengers.
Determine the number of seats for three passengers and for two passengers. (4 marks)

6. Given that $\tan x = 0.5774$. Find the two possible values of x for which $\tan x = -0.5774$. (4 marks)

7. In the figure below PQ = QS and RQ = RS, angle PQS = 36^0, where O is the centre. (4 marks)



let the angle SQR = bex
$x + 36^0 = 180^0$
$x = 136^0 - 36 = 180^0 - 36^0$

$\overline{PQ} = QS$
$RQ = RS$

Find angle SQR. (4 marks)

8. Solve the inequality
$\frac{1}{4}(2x + 3) \leq 4 - \frac{1}{4}(3 - x)$, hence show your answer on the number line. (4 marks)

9. Make L the subject of the expression $T = 2\pi\sqrt{\frac{L^2+M}{MH}}$ (4 marks)

10. A number is chosen at random from the integers 1 to 10.
Find the probability that the number chosen is either a factor of 10 or a prime number. (4 marks)

SECTION B (60 marks)

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

11. The table shows marks scored by 46 students in a mathematics test.

Marks	Cummulative frequency
29.5 – 34.5	2
34.5 – 39.5	7
39.5 – 44.5	17
44.5 – 49.5	32
49.5 – 54.5	40
54.5 – 59.5	44
59.5 – 64.5	46

(a) Caculate the mean mark, using the working mean of 47 marks. (8 marks)

(b) Draw a cumulative frequency curve and use it to estimate the number of students who scored above 47 marks. (4 marks)

12. (a) Draw a graph of $y = x^2 - 2x - 3$ for $-2 \leq x \leq 4$.
Use a scale of 2 cm to represent 1 unit on both axes. (6 marks)

(b) Use your graph in (a) above to solve equations:-

(i) $x^2 - 2x - 3 = 0$. (2 marks)

(ii) $x^2 - 3x = 0$. (4 marks)

13. (a) Given that $\begin{pmatrix} 3 & 2 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 3 & p \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 11 & q \\ 3 & 3 \end{pmatrix}$ Find the values of p and q. (3 marks)

(b) A painter bought 40 tins of Red paint, 25 tins of Yellow paint and 40 tins of Orange paint. In Kikuubo market, the price of a tin of Red, Yellow and Orange paint is Shs. 20,000/=, Shs. 15,000/= and Shs. 25,000/= respectively.
In Nakasero market, the price of a tin of Red, Yellow and Orange paint is Shs. 21,000/=, Shs. 14,000/= and Shs. 26,000/= respectively.
By writing the matrices, for the items bought as row matrix and the cost of items bought as column matrix. Use matrix multiplication to find;

(i) the cost of the paints in each market. (6 marks)

(ii) where is it cheaper to buy the paints from and by how much? (3 marks)

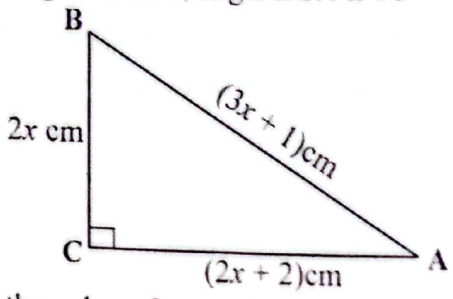
14. A transformation matrix $\begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ maps the vertices of a quadrilateral ABCD on to
$A^{I}(13,8)$ $B^{I}(21,12)$ $C^{I}(33,20)$ and $D^{I}(25, 16)$

(a) Find the coordinates of ABCD. (5 marks)

(b) The image $A^{I}B^{I}C^{I}D^{I}$ is rotated through a negative quarter turn about the origin to form $A^{II}B^{II}C^{II}D^{II}$. Write down the coordinates of $A^{II}B^{II}C^{II}D^{II}$ (4marks)

(c) Find a single transformation matrix that would map quadrilateral $A^{II}B^{II}C^{II}D^{II}$ back to ABCD. (3marks)

15. (a) In the figure below, angle BCA is 90^0



Find the value of x and hence determine the height BC. (5 marks)

(b) The angle of elevation of the top of the cliff from Tom's home is 30^0. Tom moved from his home towards the cliff, after covering a distance of 400 m, the angle of elevation of the top of the cliff at that point is 47^0. Determine the height of the cliff. (7 marks)

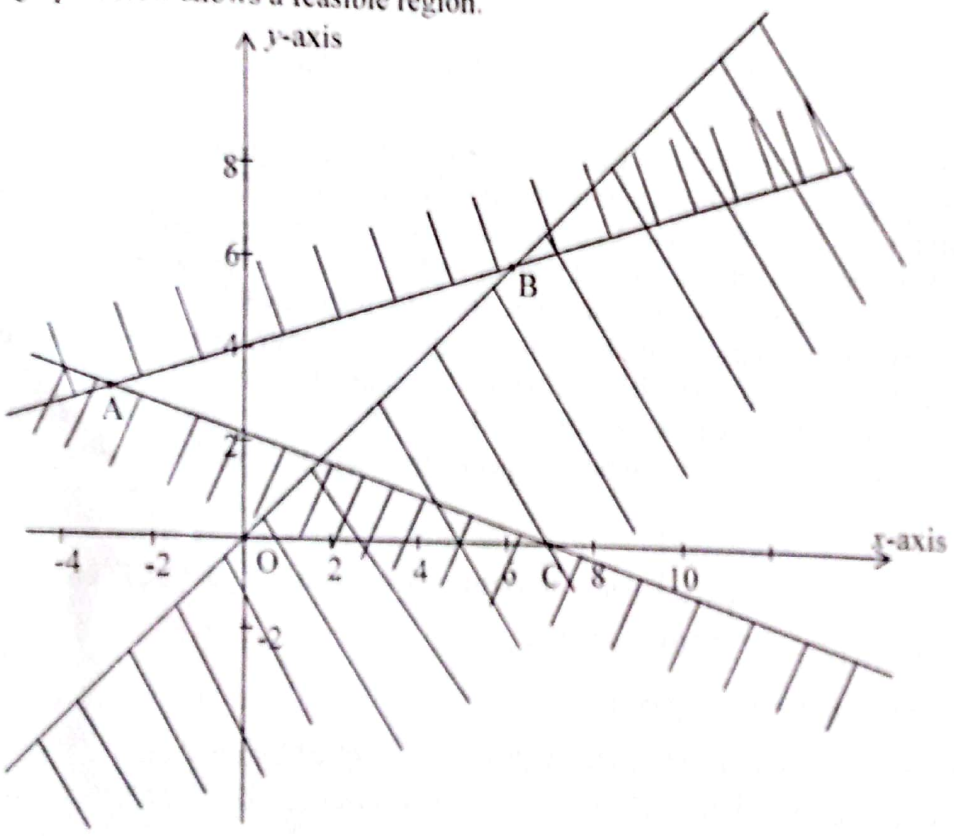
16. (a) Using a pair of compasses, a ruler and a pencil only, construct a triangle PQR where $\overline{QR}$ = 7.2 cm, angle PQR = 75^0 and $\overline{PR}$ = 8.4 cm

(b) Draw a circle to circumscribe the triangle PQR.
Measure the radius of a circle and the length $\overline{PQ}$.

(c) Find the area of the circle formed, through PQR. (Use π = 3.143).
Correct your answer to one decimal place.

(12 months)

17. The graph below shows a feasible region.



Use the graph above to;

(a) form inequalities representing the feasible region. (9 marks)

(b) find the maximum value of $5x + 3y$ from the feasible region. (3 marks)

END