

456/1
MATHEMATICS
Paper 1
2½ hrs

STANDARD HIGH SCHOOL ZZANA

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 shown clearly with the rest of the answers.

Therefore, no paper should be given for rough work.

Graph papers are provided.

Silent non – programmable scientific calculators and Mathematical tables with a list of formulae may be used.

Turn Over

SECTION A: (40 marks)

Answer **all** questions in this section.

1. If $*n = \frac{m}{n} + \frac{n}{m}$, find the value of $3 * \left(\frac{2}{3} * \frac{2}{3}\right)$. (04 marks)

2. Factorise completely $2x^2y^3 - xy^3 + xy - 2x^2y$. (04 marks)

3. Determine the solution set of the inequality $x^2 - x < 12$. (04 marks)

4. Solve for p in the equation $\frac{p-3}{5} - \frac{p+2}{3} = \frac{p-6}{2} + 3$. (04 marks)

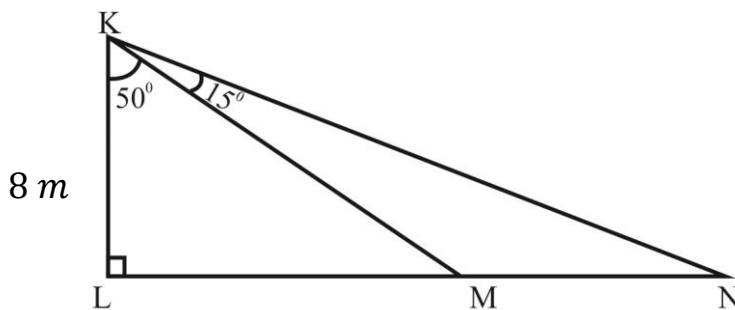
5. Use matrix method to solve the pair of simultaneous equations:

$$0.5x + 0.6y = 5$$

$$0.2y = 0.25x \quad (04 \text{ marks})$$

6. Point $A(4, 3)$ was mapped onto $A'(-2, 0)$ after an enlargement of linear scale factor -2 . Find the coordinates of the centre of enlargement. (04 marks)

7. Find the length of MN in the diagram below. Give your answer to 3 decimal places. (04 marks)



8. The table below shows the number of goals scored by a team, in a series of football matches.

| | | | | | | | | |
|-------------------|---|---|---|---|---|-----|---|---|
| Number of goals | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Number of matches | 3 | 6 | 4 | 7 | 5 | x | 5 | 2 |

If the mean number of goals scored was 3.475, find the value of x . (04 marks)

9. The shortest distance of a chord of 16 cm length from the centre of the circle is 6 cm. Calculate the perimeter of the circle. (Use $\pi = 3.142$). (04 marks)
10. A fair coin having a court of arm (C) on one face and a fish (F) on the other, is tossed together with a fair die whose six faces are respectively labelled with 1, 2, 3, 4, 5 and 6. Find the probability that a fish and a triangle number will appear on top. (04 marks)

SECTION B: (60 marks)

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

11. The table below shows the time in seconds, taken by students in a 900 – metre Junior competition.

| | | | | | |
|--------------------|-------------|-------------|-------------|-------------|-------------|
| Time (s) | 12.5 – 12.9 | 13.0 – 13.4 | 13.5 – 13.9 | 14.0 – 14.4 | 14.5 – 14.9 |
| Number of students | 8 | 35 | 52 | 17 | 8 |

- (a) Calculate the;
- (i) average time,
 - (ii) modal time,
 - (iii) median time. (09 marks)
- (b) Represent the time taken by the students in the competition on a bar chart. (03 marks)

Turn Over

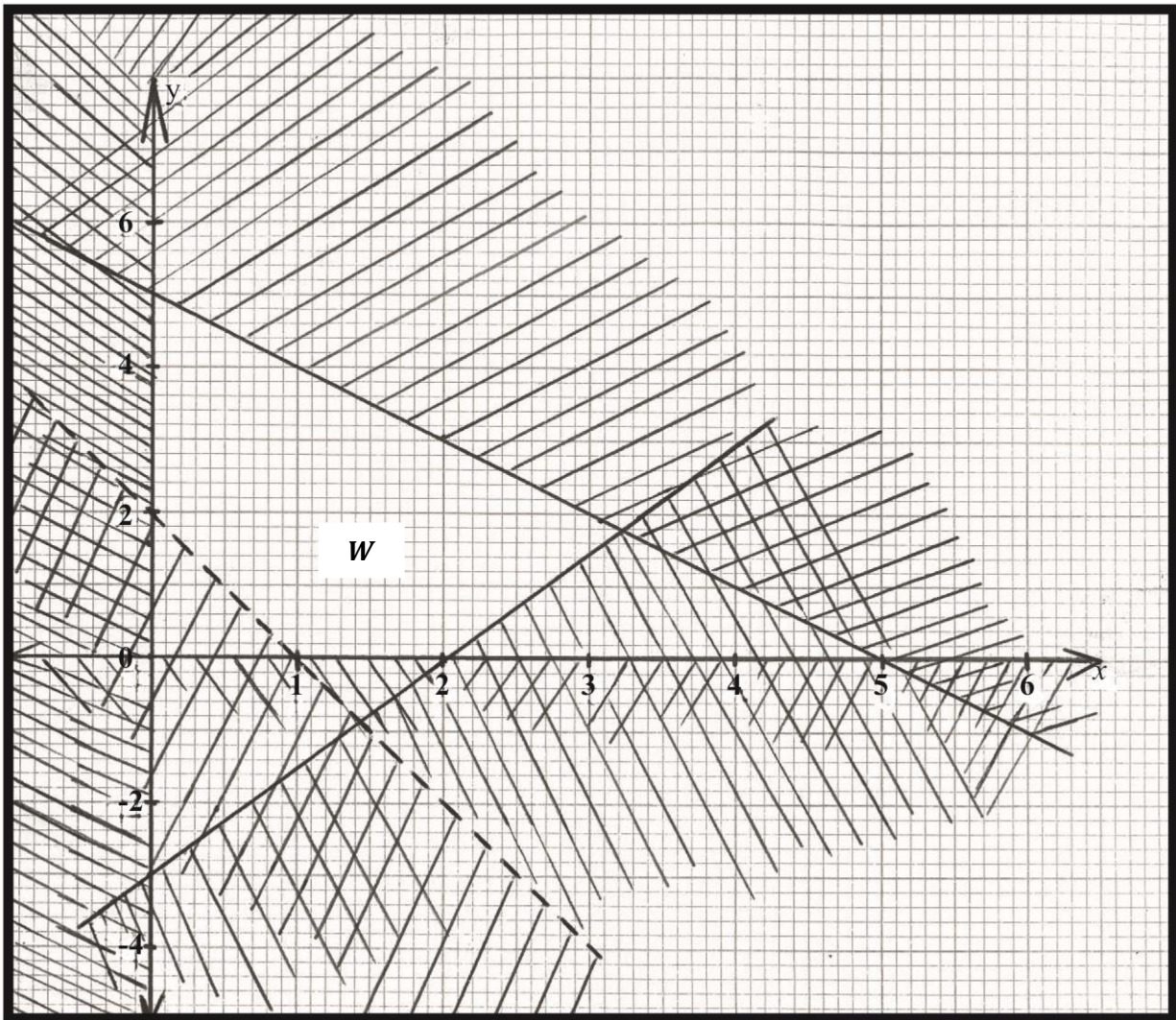
12. Consider a two – digit number PQ in base ten, the sum of whose digits is 8. When the order of the digits is reversed, the figure QP exceeds PQ by 36.
- (a) Form two suitable equations in P and Q . (06 marks)
- (b) Use the equations in (a) above to find the values of the two – digit numbers PQ and QP . (06 marks)
13. A helicopter left Kampala at 0600 hours and flew on a bearing of 090° , at a velocity of 300 km per hour . It landed at Nairobi Airport at 0830 hours. At exactly 0900 hours, it left Nairobi Airport and flew on a bearing of 340° , at the same original velocity. It then landed at Kitgum Airstrip at 1200 hours.
- Using graphical construction and a scale of $1\text{cm} : 100\text{km}$, find the:
- (a) distance of Kitgum from Kampala
- (b) bearing of Kampala from Kitgum. (12 marks)
14. (a) Draw a table showing the values of $\sin 2\theta$ for $0^\circ \leq \theta \leq 180^\circ$, using values of θ at intervals of 30° .
- (b) Use the table in (a) above, a horizontal scale of 2cm for 30° and a vertical scale of 2cm for 0.5 units to draw a graph of $\sin 2\theta$.
- (c) From the graph, find the values of θ for which $\sin 2\theta = -0.7$. (12 marks)
15. Triangle PQR with vertices; $P(2, 1)$, $Q(4, 1)$ and $R(4, 4)$ is reflected in the line $x = 0$ to get triangle $P'Q'R'$. Triangle $P'Q'R'$ is then given a negative half turn about the origin, to get triangle $P''Q''R''$.
- (a) Use $I(1, 0)$ and $J(0, 1)$ to find the matrix of ;
- (i) reflection in the line $x = 0$,
- (ii) rotation of negative half turn about the origin. (04 marks)

- (b) Use the matrices in (a) above to find the coordinates of
- (i) P' , Q' and R'
 - (ii) P'' , Q'' and R''
- (05 marks)
- (c) Determine a matrix for the single transformation which maps $P''Q''R''$ back onto PQR . (03 marks)

16. (a) Given the matrix $A = \begin{pmatrix} 3n & n - 6 \\ -6 & n + 2 \end{pmatrix}$, find the values of n for which A is a singular matrix. (05 marks)
- (b) Matrices P and Q are such that $P = \begin{pmatrix} -2 & 4 \\ -3 & 3 \end{pmatrix}$ and $PQ = \begin{pmatrix} 6 & 0 \\ 0 & 6 \end{pmatrix}$. Find the matrix Q . Hence determine the inverse of matrix P . (07 marks)

Turn Over

17. Study the graphical diagram below and answer the questions that follow:



- (a) Determine the five inequalities satisfied by the unshaded region, W , shown in the diagram above. (11 marks)
- (b) State the integral coordinate point of the faesible region, that gives the maximum value of the expression $2x + y$. (01 mark)

END