

456/1
MATHEMATICS
PAPER 1
2 ½ HOURS

UGANDA CERTIFICATE OF EDUCATION
MATHEMATICS

PAPER 1

2 hours 30 minutes.

Instructions to candidates:

- Answer **all** questions in section **A** and any **five** in section **B**.
- Any additional question (s) answered will not be marked.
- All necessary calculations must be done on the same page as the rest of the answer. 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 where not prohibited.

TURN OVER

Section A (40 marks) . Answer **all** questions in this section.

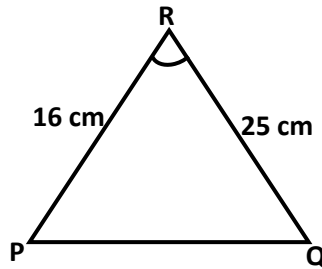
1. If $a \Delta b = a^2 - b$, evaluate $7 \Delta (4 \Delta 6)$. (04 marks).

2. Using the method of completing squares, solve the quadratic equation:

$$X^2 - 18x + 77 = 0.$$
 (04 marks)

3. If $M = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix}$.
 (a) Find M^2 .
 (b) Name the matrix M^2 . (04 marks)

4. Find the area the triangle PQR shown below; correct your answer to one decimal place.



(04 marks)

5. The marks of a student in 5 subjects were 63,87,59,81 and 54. The average mark in 6 subjects was 71. Determine the mark in the sixth subject. (04 marks)

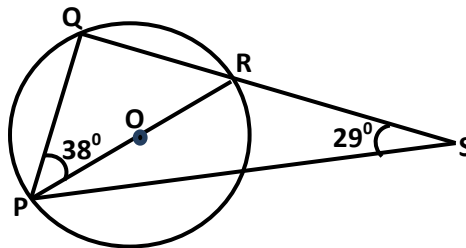
6. Make p the subject in the equation ;

$$\sqrt{\frac{3p-q}{p+q}} = m. \quad (04 \text{ marks})$$

7. Solve the inequality;

$$\frac{x-2}{2} - \frac{3x+6}{3} > \frac{1}{2}. \quad (04 \text{ marks})$$

8. In the figure below, O is the Centre of the circle. Angle OPQ = 38° and angle RSP = 29° .



Find the value of angle RPS. (04 marks)

9. A translation T, maps (8, 6) on to (-2, 2). Determine the coordinates of the image of (3, 1) under T. (04 marks)

10. A bag contains white balls and black balls. The probability of choosing a white ball is $\frac{5}{8}$, if the bag contains 40 balls; find the number of black balls in the bag. (04 marks)

SECTION B (60 marks). Answer any five questions from this section.

11. (a) Find the highest common factor (HCF) of $4a^2b^4$, $10a^4b^3$ and $14a^3b^2$. (06 marks)

(b) Simplify; $\frac{x}{x-2} - \frac{4}{x+2} - \frac{8}{x^2-4}$. (04 marks)

12. (a) If $A = \begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 5 \\ 0 & -6 \end{pmatrix}$. Find $2A - BA$. (04 marks)

(b) Determine the inverse of matrix $M = \begin{pmatrix} 3 & 2 \\ -1 & 2 \end{pmatrix}$. (04 marks)

(c) Given that matrix, $C = \begin{pmatrix} 2 & 5 \end{pmatrix}$, matrix $D = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$ and matrix $E = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$, find $CD + CE$.

(04 marks)

13. The table below shows the ages in years of 80 people who were allowed to enter a cinema hall.

Age(years)	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
Number of people	6	5	8	12	21	18	10

(a) Calculate the mean age. (05 marks)

(b) (i) Draw a cumulative frequency curve (Ogive) for the data.

(ii) Use the Ogive to estimate the median. (07 marks)

14. (a) Using matrix method, solve the simultaneous equations;

$$4y + 5x = 1$$

$$2y - 3x = 17.$$

(05 marks)

(b) The quadratic equation $ax^2 + bx - 8 = 0$ has 4 as one of its roots. The difference between the smaller roots of the equation and 4 is 5. Determine the value of a and b. (07 marks)

15. The points A(1, 0), B(3, 0), C(3, 1) and D(1, 1) are vertices of a rectangle ABCD. The images A', B', C', and D' under a transformation $T = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$ are A', B', C', and D' respectively. The images A', B', C' and D' are then mapped on to the points A'', B'', C'', and D'' respectively, under a transformation $M = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

- (a) Determine the coordinates of the points;
- (i) A', B', C', D' .
- (ii) A'', B'', C'', D'' . **(06 marks)**

- (b) Find a single matrix of transformation which would map rectangle $A''B''C''D''$ back onto ABCD. **(06 marks)**

16. In a triangle PQR, angle QPR = 120° , $\overline{PQ} = 5$ cm and $\overline{PR} = 4$ cm.

Using a pair of compasses, a ruler and a pencil only.

- (i) Construct the triangle PQR.
- (ii) Draw a circle passing through the vertices P, Q, and R.
- (iii) Measure the length \overline{RQ} and the radius of the circle.
- (iv) Find the area of the circle (use $\pi = 3.142$) **(12 marks)**

17. A transport company has a small lorry which can carry 48 tonnes of cement per trip and a big lorry which can carry 60 tonnes of cement per trip. The maximum number of trips a small lorry can make in a day is 8. The maximum number of trips a big lorry can make in a day is 5. The company has to transport a minimum of 480 tonnes of cement on a certain day. The number of trips the two lorries should make together on that day should not exceed 10 trips.

- (a) If x and y represent the number of trips made by the small lorry and big lorry on that day respectively, use the given information to write down four inequalities.
- (b) By shading the unwanted region, plot the graph of the inequalities in (a) on the same axes.
- (c) The company charges shs 50,000 per trip made by the small lorry and shs 80,000 per trip made by the big lorry.
- (i) Use your graph in (b) to determine the possible number of trips each lorry can make so as to maximize the company's earnings.
- (ii) Find the maximum amount of money that the company would earn that day.

(12 marks)

END