

456/1
MATHEMATICS
PAPER 1
JULY/AUGUST, 2022
2½ hours

KANUNGU DISTRICT 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 from section B.
- Any additional questions answered will not be marked.
- All necessary calculations must be done in the booklet provided. Therefore, no paper should be provided for rough work.
- Silent non programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 marks)

Attempt all questions in this section.

1. Given the matrices $A = \begin{pmatrix} m & -n & 4 \\ 2 & & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 4 \\ n & -3n \end{pmatrix}$. Find the values of m and n such that $5A - 3B = \begin{pmatrix} 4m & 8 \\ 7 & 24 \end{pmatrix}$. (04 marks)

2. Make R the subject of the formula

$$P = \sqrt{\frac{3+9R}{5R-2}} \quad \text{Hence find the value of } R \text{ when } P = 2 \quad (04 \text{ marks})$$

3. A translation $T = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$ maps point $R(a, b)$ onto $R'(5, 6)$. Determine the co-ordinates of R . (04 marks)

4.



The above figures are two similar cylinders A and B . The height of A is $2x$ cm while that of B is $\frac{1}{4}x$ cm. Given that the volume of B is 2000 cm^3 . Determine the volume of A . (04 marks)

5. Given that $4 \cos^2 \theta - 1 = 0$ for $90^\circ \leq \theta \leq 180^\circ$. Find the value of $\tan \theta + \sin \theta$. (04 marks)

6. Without using calculators simplify, $4(0.04)^{-\frac{1}{2}} - 8(4^{-1})(16)^{\frac{3}{4}}$. (04 marks)

7. Use matrix methods to solve the following pair of simultaneous equations. (04 marks)

$$2x = \frac{x}{2} + 3y$$

$$2y = -x - \frac{1}{2}$$

8. Factorize completely $5x^4 - 80y^4$. (04 marks)

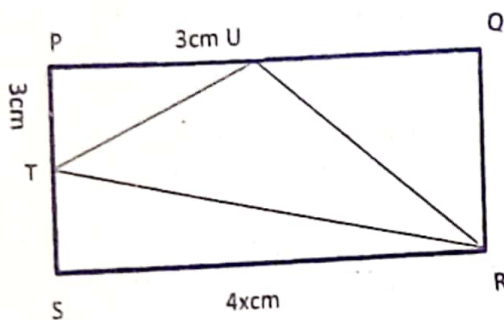
9. The mean and median of four integers are both equal to 6, taking the integers to be $U, 7, 9, V$ where $U < V < 7$. Find the values of U and V . (04 marks)

10. Given that $P * q = P^2 - q^2$, find the value of x in $x * \sqrt{5} = 4 * 3$. (04 marks)

SECTION B (60 MARKS)

Answer any five questions from this section all questions carry equal marks.

11. Using a ruler, pencil and a pair of compasses.
- Construct triangle PQR with angles $\angle RPQ = 60^\circ$, $\angle PQR = 45^\circ$ and $PQ = 8.4\text{cm}$. Measure length PR and QR .
 - Construct a line ST of 12.6cm long bisecting and perpendicular to QR and meeting PQ at T. Find the size of the angle STQ.
 - Join S to R and Q. Draw a circle circumscribing the triangle QRS. Measure and record the radius of the circle. (12 marks)
- 12.



In the diagram above PQRS is a rectangle in which $SR = 4x\text{cm}$ and $RQ = x\text{cm}$. T and U are points on SP and PQ respectively such that $TP = PU = 3\text{cm}$

- Find the areas of triangles SRT and triangle RQU in terms of x.
- Given that the area of Triangle TUR is 40.5cm^2 . Determine the value of x.
- Express the area of triangle TUR as a percentage of the area of rectangle PQRS. (12 marks)

13. The table below shows the ages of 60 S.1 students. Study it and answer the questions that follow

Age(years)	Number of students
12.5-12.9	8
13.0-13.4	$\frac{1}{2}p$
13.5-13.9	10
14.0-14.4	7
14.5-14.9	6
15.0-15.4	$\frac{3}{4}p$
15.5-15.9	9

- State the class interval.
- Find the value of P
- Calculate the (i) mean (ii) modal age.
- Draw a histogram for this information and use it to estimate the modal age. (12 marks)

14. (a) A three digit number is formed using 2, 3 and 4 only once.
 (i) Write down the possible numbers that are formed
 (ii) What is the probability that the number formed is less than 320?
 (iii) Find the probability that the number formed is greater than twice the range of the numbers formed.
- (b). The probability of picking a white ball from the bag is 0.4 and the probability for a red ball is 0.25, given that there are 7 green balls in the same bag, find the number of:
 (i) Total balls in the bag
 (ii) Red balls
 (iii) White balls. (12 marks)
15. A triangle ABC with vertices A (1,1), B (1,4) and C (3,4) is given a positive quarter turn about the origin to give triangle $A_1 B_1 C_1$. $A_1 B_1 C_1$ is followed by a reflection along the line $y + x = 0$ giving a second image as $A_{11} B_{11} C_{11}$
 (a) State the co-ordinates of triangles $A_1 B_1 C_1$ and $A_{11} B_{11} C_{11}$
 (b) On the same axes, draw triangles ABC, $A_1 B_1 C_1$ onto $A_{11} B_{11} C_{11}$
 (c) (i). Determine a single matrix which maps triangle ABC on to $A_{11} B_{11} C_{11}$ (12 marks)
 (ii). What name is given to this matrix of transformation.

16. (a). Copy and complete the table below for $y = 3\cos x - 4\sin x$ for $0^\circ < x < 300^\circ$

X	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°
$3\cos x$					-1.5						1.5
$4\sin x$					3.5						-3.5
$3\cos x - 4\sin x$	3.0	0.6			-5.0						5.0

- (b). Use 1cm to represent 30° on the X-axis and 1cm to represent 0.50 on the y-axis to draw a graph of $y = 3\cos x - 4\sin x$
 (c). Use your graph to solve the equations:
 (i). $3\cos x^\circ = 4\sin x^\circ$ (12 marks)
 (ii). $3\cos x^\circ = 4\sin x^\circ - 1$.

17. (a). By shading the unwanted regions, show on the same axes the region satisfying the inequalities below.

$$\frac{1}{3}x + \frac{1}{3}y \leq 1$$

$$y > x - 4$$

$$y + 7x \geq -4$$

- (b). Use your graph to find the values of x and y which give maximum values for both $2x+y$ and $3x+y$ where x and y are whole numbers.

- (c). State the minimum value for both $2x+y$ and $3x+y$. (12 marks)

END