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MATHEMATICS

PAPER 1

JULY/AUGUST.2023

2 ½ HOURS



Uganda Certificate of Education

SHAPTA JOINT ASSESSMENT BOARD 2023

MATHEMATICS

Paper 1

2 Hours 30 Minutes

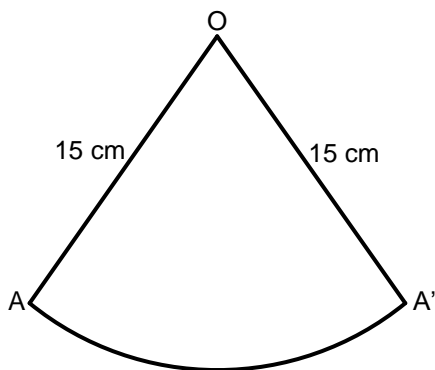
INSTRUCTIONS TO CANDIDATES:

- Attempt **ALL** the questions in Section **A** and any **FIVE** questions from Section **B**.
- All the necessary calculations must be done in the answer sheets provided. No paper for rough work is required.
- Silent non programmable calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 MARKS)

1. Factorise $x^2 - y^2$ hence find the value of $7.25^2 - 2.75^2$ without using tables or calculator.
2. Determine the solution set of the inequality $x^2 - 5x - 14 < 0$.
3. Given that $\sin \theta = 0.8$ and that $90^\circ < \theta < 270^\circ$. Determine the value of $2 \cos \theta - \tan \theta$.
4. In a class of 56 students, the average mark of 30 boys is 68 while that of girls is 72. Find the average mark of the whole class.
5. Find the coordinates of the centre of enlargement given that point $A(7, 1)$ is mapped onto $A'(-2, -2)$ by an enlargement of scale factor -2 .
6. Make P the subject of the formula $M = 2n \sqrt{\frac{P}{P-4}}$.
7. The representative fraction of a map is $\frac{1}{400,000}$. Find the actual area of a swamp (in km^2) which is represented by $5 cm^2$ on the map.
8. Under a transformation whose matrix is $\begin{pmatrix} x-1 & 2 \\ -x & 3 \end{pmatrix}$, a figure whose area is $5 cm^2$ is mapped onto a figure of area $60 cm^2$. Find x .
9. The operations \square and Λ are defined as $A \square B = XA + B$ and $A \Lambda B = A^2 - B$. Find the value of X if $-4 \Lambda (2 \square 3) = 9$.

10. The figure below is a net of a cone from a sector of radius 15 cm . Given that the arc $\overline{AA'}$ is of length 56.57 cm , find the height of the cone formed out of it.



Section B (60 marks)

11. (i). Draw the graph of $y = (3x + 1)(2x - 5)$ for $-1 \leq x \leq 4$.
(ii). Using the same axes, draw the graph of $y = 8x - 7$.
(iii). Hence, find the values of x which satisfy the simultaneous equations in part (i) and (ii) above.
(iv). Write down the simplified quadratic equation satisfied by the values of x where the two graphs intersect.
12. (a). Express $19 < 3(x + 2) < 35$ in the form $a \leq x \leq b$.
(b). To start a bus company, the Business association needed at least five “Taata”-buses and ten “Mini”-buses, and not more than 30 vehicles were needed altogether. Suppose that a Taata-bus required 3 units of parking space; while a mini-bus required required 1 unit, and only 54 units of parking space were available at the proposed site. If x and y represent the number of Taata-buses and Mini-buses respectively;
(i). Write down four inequalities representing the given information.
(ii). Draw a graph showing the region representing the given inequalities in (i) above.
(iii). Find the maximum number of vehicles that can be bought.

13. (a). Given that $\begin{pmatrix} 3a & a-8 \\ -6 & a-2 \end{pmatrix}$ is a singular matrix; find the values of a .
- (b). Find the values of x and y for which $P'(9, 2)$ is the image of $P(x, y)$ under transformation matrix $M = \begin{pmatrix} 1 & 2 \\ 1 & 0 \end{pmatrix}$ followed by $N = \begin{pmatrix} 3 & 0 \\ 0 & 2 \end{pmatrix}$.
- (c). Identify the matrix of transformation that maps the unit square $OIKJ$ onto $O(0, 0), I'(2, 7), K'(3, 7), J'(1, 0)$.
14. (a). Using a pair of compasses, and ruler only, construct a triangle PQR with base $\overline{PQ} = 3.7 \text{ cm}$, $\overline{QR} = 4.4 \text{ cm}$ and $\angle PQR = 120^\circ$.
- (b). on the same diagram,
- Locate the point S that makes PQRS a parallelogram.
 - Drop a perpendicular from point S to side \overline{PR} .
 - Use point D as the centre to draw a circle having \overline{PR} as its tangent. State the radius of this circle.
15. 40 students carried out an experiment and recorded the following measurements.

4.7	2.7	2.3	4.6	3.7	2.8	2.9	3.6
4.9	3.9	4.5	3.4	4.2	3.5	1.7	1.1
2.0	3.7	3.3	3.8	3.8	1.8	3.1	3.6
3.1	1.4	1.6	2.1	2.8	2.6	3.3	4.0
3.2	4.3	3.5	2.4	4.4	4.1	2.9	3.2

- Draw a frequency distribution table starting with $1.0 - 1.4$.
- Hence state the:
 - class interval,
 - modal class.
- Calculate the mean and median of the data.

16. (a). A bag contains 3 green and 2 red balls. Two balls are randomly selected from the bag without replacement. Find the probability that:
- (i). Both are of same color.
 - (ii). The second ball is red.
 - (iii). They are of different colors.
- (b). A regular octahedron, whose faces are numbered 1 to 8 is thrown together with a coin. Show the possible outcomes in a table. Find the probability of getting;
- (i). “T” with prime number,
 - (ii). “H” and a number less than 4.
17. (a). Expand and simplify: $(x + 3)(x^2 - x)$.
- (b). Find what must be added to $\left(x^2 - \frac{3}{4}x\right)$ to make it a perfect square.
- (c). (i). Factorise: $(x^2 - xy + 3x - 3y) = 0$.
- (ii). Hence solve $(x^2 - xy + 3x - 3y) = 0$ when $y = 2$.

END