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MATHEMATICS
Paper 1
July/Aug. 2019
$2^1/_2$ hours

''Together for Mathematics''

SECONDARY MATHEMATICS TEACHERS' ASSOCIATION

SMATA JOINT MOCK EXAMINATIONS 2019
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.

3

All necessary calculations **must** be done on the same answer booklet provided. 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.

State the **degree of accuracy** at the end of each question attempted using calculator or mathematical table and indicate **Cal** for calculator or **Tab** for mathematical tables.

SECTION A : (40 MARKS)

Answer **all** the questions in this section.

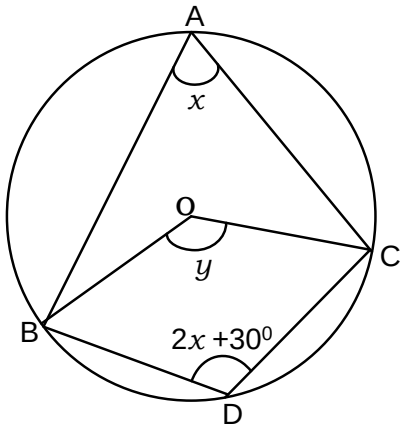
1. Given that $x * y = x^2 - (-1)^y$,
   (i) evaluate $3 * 2$ *(02 marks)*
   (ii) Find the values of x such that $x * 5 = 65$ *(02 marks)*

2. Find the greatest integral value of y which satisfies the inequality.
   $2 - \frac{3y}{2} > y + 3$ *(04 marks)*

3. Find the matrix A such that $A^{-1} = \begin{pmatrix} 2 & -2 \\ -3 & 4 \end{pmatrix}$ *(04 marks)*

4. A bag contains 2 yellow and 7 green pens. How many green pens must be added to the bag so that the probability of drawing a green pen is $\frac{6}{7}$?
   (04 marks)

5. In the diagram below, ABCD is a cyclic quadrilateral in which angles BAC = x^o, BDC = 2x + 30^o and obtuse angle BOC = y



   Find the values of x and y. *(04 marks)*

6. Solve the equation $2x^2 + x = 36$. *(04 marks)*

7. A vertical electricity pole 3.2 m high casts a shadow 2.8 m long on the ground. Calculate to one decimal place the angle of elevation of the sun. *(04 marks)*

8. Given that $p = \dfrac{2q + r}{q - 3r}$, express q in terms of p and r. *(04 marks)*

9. In the recent mid term II examinations of Kabukunge secondary school, Fine Art paper 1 had 60 students with an average score of 68% whereas both paper 1 and paper 5 had 105 students with an average score of 76%. Find the average score of students in Fine Art paper 5. *(04 marks)*

10. The transformation T= $\begin{pmatrix} 3 & 0 \\ 4 & 1 \end{pmatrix}$ maps the points A and B onto A′(6, 9) and B′(12, 18) respectively. Determine the coordinates of A and B. *(04 marks)*

SECTION B : (60 MARKS)

Attempt **any five** questions from this section

11. (a) Using a ruler and a pair of compasses only, Construct a triangle PQR in which angle PQR = 120^o, length PQ = 6.2cm and QR = 7cm.

Measure the length PR.

(b) Drop a perpendicular from R to meet PQ produced at M measure the length QM.

(c) Construct a circle passing through the vertices of triangle QMR.

(12 marks)

12. (a) Given the matrices $M=\begin{bmatrix} y & z \\ 2 & 5 \end{bmatrix}$ and $N=\begin{bmatrix} 2 & 5 \\ -1 & x \end{bmatrix}$ such that $NM = \begin{bmatrix} 18 & 21 \\ 4 & 22 \end{bmatrix}$

Find the values of x, y and z *(06 marks)*

(b) 4 pens and 5 books cost Shs.4,400 while the cost of 2 pens and 7 books is Shs.4,900.

(i) Form a pair of equations.

(ii) Use matrix method to calculate the cost of each item. *(06 marks)*

13. A triangle P (1, 2) Q (7, 2) and R (3, 7) is rotated through 180° to give the image $P'Q'R'$. The image is then reflected in another line to give the second image $P''(-1,6)$, $Q''(-7,6)$ and $R''(-3,11)$.

(a) Draw the three triangles PQR, $P'Q'R'$ and $P''Q''R''$ on the same coordinate axes of 1cm to 1 unit on both axes. *(06 marks)*

(b) State the coordinates of $P'Q'$ and R' *(02 marks)*

(c) Find the equation through which $P'Q'R'$ was reflected onto $P''Q''R''$ *(04 marks)*

14. (a) Given that a + b = -20 and ab = 5, find the values of:

(i) $\frac{1}{a} + \frac{1}{b}$

(ii) $b \div \frac{1}{a}$

(04 marks)

(b) Factorise completely the expressions:

(i) $x^2 + y^2 + 2xy - 4$

(ii) $z^4 - 1$ *(08 marks)*

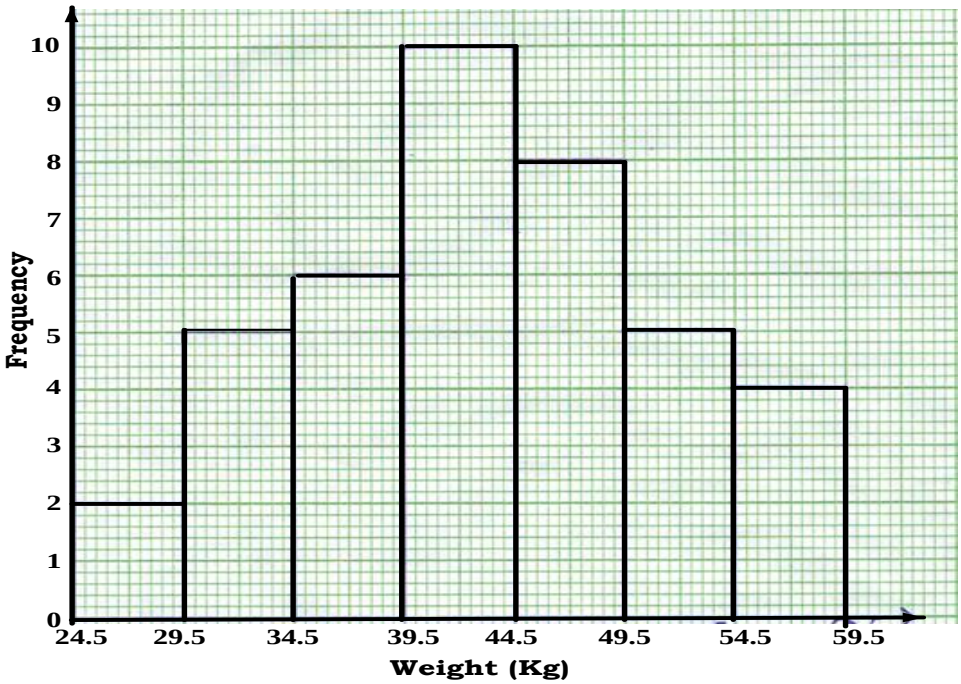
15. (a) Copy and complete the table below for y = (2x + 3)(3x – 7).

x	-2	-1	0	1	2	3
$2x + 3$						
$3x - 7$						
y						

(b) Draw a graph of $y = (2x + 3)(3x - 7)$ with a scale of 2cm to 1 unit and 2cm to 5 units on the horizontal and vertical axes respectively. *(04 marks)*

(c) Use your graph to solve the equation $6x^2 - 5x - 14 = 0$ *(03 marks)*

16. The histogram below shows the weights of students in a given class.



(a) Find the mode from the histogram. *(02 marks)*

(b) Draw a frequency distribution table and hence calculate to 2 decimal places the;

(i) Mean weight *(07 marks)*

(ii) Median weight *(03 marks)*

17. Nkozi High school is to transport a minimum of 480 students from the school premises to the equator. They are to use a coaster and a Bus at a cost of shs 30,000 and shs 45,000 per trip respectively. The capacity of the coaster is 40 students and that of the Bus is 60 students per trip. The coaster is expected not to go beyond twelve trips. Trips made by the Bus should not go beyond twice those made by the coaster. The department in charge is given a maximum of shs 600,000 for transport.

(a) Write down **four** inequalities. *(04 marks)*

(b) On the same coordinate axes, draw the graphs of the inequalities and shade the unwanted region. *(04 marks)*

(c) Find all the possible number of trips by the coaster and the Bus so as to minimize the transport costs. *(04 marks)*

END