456/1
MATHEMATICS
Paper 1
July/August 2018
$2^{1}/_{2}$hours

MAKERERE MODERN SECONDARY SCHOOOL

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 30minutes

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 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.

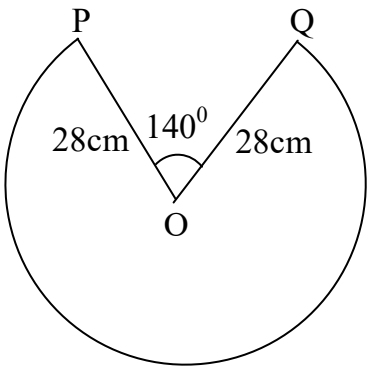
SECTION A

1. Simplify the expression $\frac{2x^2 - 5xy - 3y^2}{(x - 3y)}$ (4 marks)

2. Solve the equation. $(54 \times 0.5)^x = \frac{1}{9}$ (4 marks)

3. The line y = 2x + 3 is translated using the column vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ to form its image. Find the equation of the image line. (4 marks)

4. The figure below shows a net of a cone where $\angle POQ = 140^0$, OP = OQ = 28cm. Calculate the radius of the cone formed. (4 marks)



5. (i) Find sin 210^0, hence
   (ii) Solve the equation tanΘ = sin 210^0 in the range $0 \leq \Theta \leq 360^0$. (4 marks)

6. In a geography test, the total mark scored by 6 students was 420. If the mean mark for the first 5 students was 68. Find the mark scored by the sixth student. (4 marks)

7. Given the matrix T = $\begin{pmatrix} 2x & 3 \\ x & x \end{pmatrix}$. Find the values of x for which det. T = 2. (4 marks)

8. Solve the equation $(x - 2)^2 + 2x(x-2) = 0$ (4 marks)

9. Solve the inequality $\frac{x+7}{5} - \frac{x+3}{6} \leq 1$ and show your solution on a number line. (4 marks)

10. The opposite angles of a cyclic quadrilateral are such that one of them is thrice the other. Find the values of each of the angles. (4 marks)

11. The table below shows masses of 35 newly born babies in a hospital.

Mass	***x***	**f**	**d (x-A)**	**fd**
2.0 – 2.4	2.2	5	-1.5	-7.5
2.5 – 2.9				-4.5
3.0 – 3.4		8		
3.5 – 3.9		9		
4.0 – 4.4				
4.5 – 4.9				
5.0 – 5.4		2		3.0
		Σf =		Σfd =

(a) Copy and complete the table.
(b) Using assumed mean of 3.7, determine the mean.
(c) Calculate the median.
(d) Draw a histogram for this data and use it to estimate the mode. (12 marks)

12. (a) Given $y = 3x^2 - 5x - 7$. Copy and complete the table below for values of x in the range $-3 \leq x \leq 4$.

x	-3	-2	-1	0	1	2	3	4
y	35	-	-	-7	-	-	-	-

(b) Using the table in (a) above, draw a graph of $y = 3x^2 - 5x - 7$ for $-3 \leq x \leq 4$.

(c) Use your graph above to solve the following equations:-
(i) $3x^2 - 5x - 7 = 0$
(ii) $x^2 - 2x - 1 = 0$ (12 Marks)

13. A stubborn bull is tethered on a rope in a triangular field of grass which is surrounded by maize, cassava and beans. Given that the field measures 11m by 9.5m by 8.2m.
(a) Using 1cm to represent 1m, make an accurate drawing of the field.
(b) Determine the maximum length of the rope on which it can be tethered without eating the surrounding crops.
(c) Find the maximum area of the grass it can eat, hence the area of the grass not eaten by the stubborn bull. (12 marks)

Turn Over

14. Triangle ABC with vertices A (3,1), B (7,1) and C (3,4) is mapped on $A^{I}B^{I}C^{I}$ by the transformation matrix $\begin{pmatrix} 3 & 2 \\ 1 & 1 \end{pmatrix}$. Then $A^{I}B^{I}C^{I}$ is mapped onto $A^{II}B^{II}C^{II}$ by the transformation matrix $\begin{pmatrix} -1 & 1 \\ 0 & 2 \end{pmatrix}$ Find :-

(a) Find the coordinates of:-
   (i) A^{I} , B^{I} and C^{I}
   (ii) A^{II}, B^{II} and C^{II}

(b) Find a single matrix that would map A^{II} B^{II} C^{II} back onto ABC.

(c) Find the area of $A^{II}B^{II}C^{II}$. (12 marks)

15. (a) Find the values of *x* and *y* from the matrix equation.

$$\begin{pmatrix} y & 4 & 2 \\ 3 & 1 & x \end{pmatrix} \begin{pmatrix} 3 \\ -4 \\ x \end{pmatrix} = \begin{pmatrix} 4 \\ x+17 \end{pmatrix}$$

(b) Use matrices to solve the simultaneous equations.

$$x + 2y = -5$$
$$3x = 13 + y.$$

(c) Given the matrices $P = \begin{pmatrix} 4 & -2 \\ 5 & 3 \end{pmatrix}$ and $Q = \begin{pmatrix} 5 & 0 & 2 \\ -1 & 4 & 5 \end{pmatrix}$

State the order of matrix (P.Q) (12 marks)

16. (a) A straight road runs uphill 400m inclined at 13^{0} to the horizontal. Calculate the height of the hill.

(b) The hill is shown on a map of scale 1:100,000. Calculate the length in cm of the line on the map representing the road.

(c) If a number *x* is doubled, the result is twenty four less than it's square. Write the information as an equation in terms of *x* and hence find the possible values of *x*.

(12 marks)

17. Mr. Kato is going to bake chocolate cakes and yellow cakes to sell. He wants at least two chocolate cakes. Besides, he wants more yellow cakes than chocolate cakes. Due to limited time and facilities, he cannot bake more than ten cakes. The chocolate cakes are to be sold for Shs. 1500 each and the yellow cakes for Shs. 1000 each. To make profit, more than Shs. 8000 must be realized from the sales. (suppose he bakes *x* chocolate cakes and y yellow cakes).

(a) Write down **four** inequalities to represent this information. (4 marks)

(b) (i) On the same axes, plot the graphs of the inequalities and shade the unwanted regions. (4 marks)

   (ii) List all the possible numbers of chocolate cakes and yellow cakes Mr. Kato can bake. (2 marks)

(c) How many cakes of each type should Mr. Kato bake in order to make the maximum profits? (2 marks)

END