456/1

MATHEMATICS

PAPER 1

JULY/AUG 2019

2½ HOURS

KAMULI JOINT EXAMINATIONS BOARD

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 question (s) answered will not be marked.

All necessary calculations must be shown clearly with the rest of the answer.

Graph papers are provided.

Silent non – programmable scientific calculators and mathematical tables with a list Of formulae may be used.

Turn Over

SECTION A (40 MARKS)

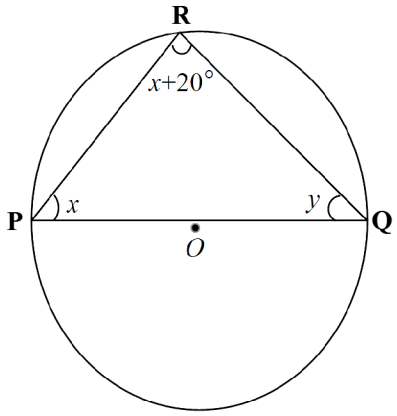
Answer ***all*** questions in this section.

1. Given that $x * y = xy(x - y)$, evaluate $6 * (4 * 2)$. **(04 marks)**

2. Determine the solution set of the inequality $x^2 - 5x - 14 < 0$.. **(04 marks)**

3. If $\begin{pmatrix} 20 & x \\ 2 & y \end{pmatrix}$ is a singular matrix and $x + y = 11$, determine the values of x and y. **(04 marks)**

4. In the figure below, PQ is a diameter and O is the centre of the circle.



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

5. Without using mathematical tables or calculator, evaluate:

$$\frac{32.135^2 - 17.865^2}{0.7135}$$ (04 marks)

6. Given that $Cosx^\circ = -0.4257$ and $0° \leq x \leq 360°$, find the two possible values of x. **(04 marks)**

7. Solve the quadratic equation $2x^2 + x - 6 = 0$ **(04 marks)**

8. The average mark of 20 candidates in a chemistry test was 63. The five weakest students had an average of 36. Find the average mark of the other 15 students. **(04 marks)**

9. A box has 30 black pens and some red ones. If the probability of picking a red pen from the box is $\frac{2}{5}$, how many pens are in the box? **(04 marks)**

10. An object at $P(7, -2)$ undergoes an enlargement, centre $O(0,0)$ and is mapped onto $P^{-1}(-14,4)$. Find the matrix for the enlargement. **(04 marks)**

SECTION B (60 MARKS)

Answer any **five** questions from this section. All questions carry equal marks.

11. (a) Copy and complete the table below for $y = (4 - x)(x + 2)$

x	-2	-1	0	1	2	3	4
$4 - x$	6				2		
$x + 2$	0				4		
y	0				8		

(b) Use your completed table to draw a graph of $y = (4 - x)(x + 2)$ using a scale of $2cm$ for 1 $unit\ on\ the\ x - axis$ and 1 $cm\ for$ 1 unit on the y-axis. **04 marks**

(c) Use your graph in (b) above to find the:

(i) Coordinates of the maximum point,

(ii) Equation of the line of symmetry,

(iii) Roots of the equation $x^2 - 4x = 0$. (**05 marks**)

12. 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

a) Draw a frequency distribution table starting with $1.0 - 1.4$.

b) Hence state the:

(i). class interval,

(ii). modal class.

c) Using the assumed mean of 3.2, calculate the mean

d) Draw an Ogive and use it to estimate the median

13. (a)Suppose A = $\begin{pmatrix} 3 & 1 \\ -1 & 0 \end{pmatrix}$, B = $\begin{pmatrix} -2 & 2 \\ 1 & -3 \end{pmatrix}$and A + 2C = −B, find matrix C.

(04 marks)

(b) It is given that $\mathrm{M} = \begin{pmatrix} 2 & q \\ p & 3 \end{pmatrix}$ and that $\mathrm{M}^2 - 5\mathrm{M} = 2I$, where I is the identity matrix.

(i). Find a relation connecting the constants $\boldsymbol{p}$ and $\boldsymbol{q}$. (04 marks)

(ii). Given that p and q are positive and that $det.\mathrm{M} = -3p$, find the values of $\boldsymbol{p}$ and $\boldsymbol{q}$. (04 marks)

14. (a) Draw a table showing the values of $\sin 2\theta$ for $0^0 \leq \theta \leq 90^0$ using values of θ at intervals of 15^0.

(a) Use the table in (a) above, a horizontal scale of *2cm* for 15^0 and a vertical scale of *2cm* for *0.5 units* to draw a graph of $\sin 2\theta$.

(b) From your graph, find the values of θ for which $\sin 2\theta = 0.6$. ***(12 marks)***

15. A boat leaves Waitumba and sails for 240 km on a bearing of 060^0 to reach Acholi inn. It then changes direction to a bearing of 135^o and sails for 320 km to Bukungu. Using a scale drawing with 1 cm representing 40 km, find;

(a) The distance of Waitumba from Bukungu

(b) The bearing of Waitumba from Bukungu

(c) How long it would take the boat to sail directly back to Waitumba at a speed of 40km/h. (**12 marks**)

16. The image of triangle $\mathrm{A}(4,1), \mathrm{B}(7,1)$ and $\mathrm{C}(5,4)$ under a rotation is triangle $\mathrm{A}'(2,3)$, $\mathrm{B}'(5,4)$ and $\mathrm{C}'(2,6)$.

a) Determine the centre and angle of rotation. (05 marks)

b) The triangle $\mathrm{A}'\mathrm{B}'\mathrm{C}'$ is then reflected in the line $y + x = 0$ to give triangle $\mathrm{A}''\mathrm{B}''\mathrm{C}''$. Use your graph to find the coordinates of A'', B'' and C''(04 marks)

c) Find a single matrix that maps triangle $\mathrm{A}''\mathrm{B}''\mathrm{C}''$ back onto triangle ABC

17. A shop keeper buys two types of cat food for his shop: Bruno at 0.4 US dollars a tin and Blaze at 0.6 US dollars a tin. He has 15 dollars available and he decides to buy at least 30 tins altogether. He also decides that at least one third of the tins should be Blaze. He buys x tins of Bruno and y tins of Blaze.

(a). Write down three inequalities which correspond to the above conditions.

(b). Illustrate these inequalities on a graph.

(c). He makes a profit of 0.1 dollars a Tin on Bruno and a profit of 0.2 dollars a Tin on Blaze. Assuming he can sell all his stock, find how many tins of each type she should buy to maximize his profit and find that profit.

END