456/1
MATHEMATICS
Paper 1
7 August 2023
2 ½ hours

ENTEBBE JOINT EXAMINATION BUREAU

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt **all** *questions in* Section **A** *and any* **five** *in* Section **B**.

Any extra question(s) answered shall **not** *be marked.*

All necessary calculations must be done in the answer booklet provided. Therefore, no paper should be given for rough work.

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

Graph papers **are** *provided.*

SECTION A: 40 MARKS

Attempt **all** *questions*

1. Given that $\begin{pmatrix} 3 & 0 \\ 2 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 6 \\ 1 \end{pmatrix}$ find the value of $x + y$. *(04 marks)*

2. The mean weight of 30 girls in a class is 52. The mean weight of the 10 older girls is 56kg. Find the mean weight of the other 20 girls. *(04 marks)*

3. If $a^2 - b^2 = 18$ and $a - b = 6$, find $a + b$. *(04 marks)*

4. The image of $(3, 2)$ under a translation is $(5, 1)$. Determine the point which has image coordinates $(-1, 5)$ under the same transformation. *(04 marks)*

5. If $\varepsilon = \{integers\}, P = \{x: -3 \leq x < 5\}$ and $Q = \{y: 1 \leq y < 9\}$. Find $n(P \cap Q)$. *(04 marks)*

6. Find the required length marked with x. *(04 marks)*

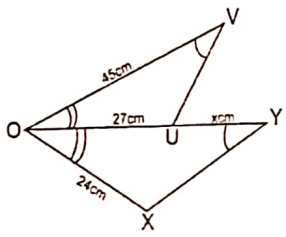

Fig 1

7. Find the values of $a + \frac{c}{b}$ when $a = \frac{1}{2}, b = 3$, and $c = \frac{-3}{4}$. *(04 marks)*

8. A two digit number is formed using the digits 2, 3 and 4 without repetition;

(i) Write down the possibility space. *(02 marks)*

(ii) Find the probability that the number formed is divisible by 3. *(02 marks)*

9. Given that $\tan\theta = \frac{7}{24}$ and $180° \leq \theta \leq 360°$ without using a calculate or mathematical tables, find the value of $\sin\theta + \cos\theta$. *(04 marks)*

10.

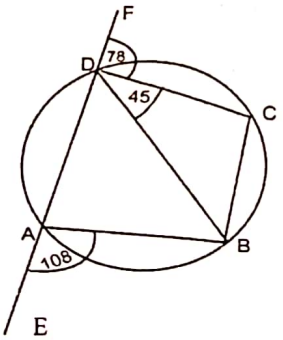

Fig 2

In figure 2, $ABCD$ is a cyclic quadrilateral and BD is a diagonal. $EADF$ is a straight line. $CDF = 78°, BDC = 45°$ and $BAE = 180°$ Calculate the size of angle:

(i) ABD

(ii) CBD *(04 marks)*

SECTION B

Attempt **five** *questions in this* Section

11. Given that $y = (x-1)(x+2)$, copy and complete the table;

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

(a) Draw the graph of $y = (x-1)(2x-5)$ for $-4 \leq x \leq 3$. Use your graph to determine the equation of line of symmetry.

(b) Find the least value of the graph and the corresponding value of x.

(c) Use your graph to solve $(x-1)(x+2) \leq 1$.

(12 marks)

12. The table below shows the mass in kilograms of children sampled in a certain school.

Mass	Number of children
15 – 19	2
20 – 24	4
25 – 29	7
30 – 34	3
35 – 39	5
40 - 44	6
45 – 49	1

(a) State the modal frequency hence modal class.

(b) Calculate the mean mass using the working mean of 32.

(c) Find the probability that a child selected at random from the school has a mass of 40kg and above. *(12 marks)*

13. (a) A triangle has vertices $A(1,1), B(2,4)$ and $C(4,0)$. The triangle undergoes a positive quarter-turn of $90°$ about the origin to be mapped onto triangle $A'B'C'$. State the co-ordinate of $A'B'$ and C'.

(b) The triangle $A'B'C'$ is then reflected in the line $y = -x$ to be mapped on to triangle $A''B''C''$. State the coordinates of $A''B''C''$.

(c) Describe a single transformation which is equivalent to the two successive transformations above.

(d) Find the single matrix of transformation which maps triangle ABC on to triangle $A''B''C''$. *(12 marks)*

14. (a) Using a ruler and a pair of compasses only. Construct a parallelogram $ABCD$ whose diagonals AC and BD intersect at a point O, given that $AC = 16$ and $BD = 10.8cm$ and angle $AOB = 120°$.

(b) Measure and state the length of AB and BC.

(c) Construct the circumcircle of triangle BOC.

(d) Calculate the area of the circumscribed circle. *(12 marks)*

15. (a) Peter cycles regularly along a certain road, a distance of $18km$, at a speed of xkm/hr. On day when the wind is behind him, his speed is $x + 2km/hr$ and he takes 18 minutes less than his normal time to complete the journey. Find x.

(b) A right angled triangle has sides of lengths $(2x + 1), 2x$ and $(x - 1)cm$. Find the area of the triangle. *(12 marks)*

16. A mother buys x note books at *shs* 600 each and y pens for *shs* 800 each. She has *shs* 8,000 to spend on this items and ther must be at least 4 note books and there inequalities in x and y which satisfy these conditions. Illustrate them graphically shading out the unwanted regions. Write down atleast three number pairs which are within the wanted region. Which pair gives the minimum expenditure and calculate the minimum expenditure. *(12 marks)*

17. (a) Two pencils are picked at random from a box containing five pencils. All the five pencils have different length. Assuming the pencils in their increasing order of lengths are a, b, c, d, e copy and complete the possibility space below.

a	a	a	a	b	b	b	c	c	—
b	c	d	e	c	—	—	—	—	—

Find the probability that the two pencils picked include;

(i) the shortest pencil,

(ii) the longest and shortest pencils,

(iii) at least one pencil with a length greater than the median length.

(09 marks)

(b) Given that $\left(\frac{2}{3}\right)^n = \frac{27}{8}$, find the value of n. *(03 marks)*

END