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MATHEMATICS
Paper 1
July/August

TIME: 2 ½ Hours

BUIKWE DISTRICT JOINT MOCK EXAMINATIONS BOARD (BUSSHA)

MOCK EXAMINATIONS 2023

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 Hours 30 minutes

INSTRUCTIONS

- Answer all questions in section A and NOT more than five from section B.
- Show all the necessary calculations.
- Mathematical tables and silent, non-programmable calculators may be used.
- Where necessary, graph papers are to be provided.

SECTION A (40 MARKS)

1. Given that $p \wedge q = \frac{1}{3}(q^2 - 2p)$, evaluate

   (i) $2 \wedge -4$

   (ii) $3 \wedge (2 \wedge -4)$

2. Without using tables or calculators, evaluate $3.75 \times 3.85 - 3.75^2$.

3. If $\frac{a+b}{3a-2b} = \frac{3}{4}$, express a in terms of b. Hence find the value of $\frac{a^2-b^2}{2ab}$.

4. Given that matrix $P = \begin{pmatrix} 2 & 2 \\ -2 & -2 \end{pmatrix}$.

   Find (i) P^2

   (ii) Name matrix P^2

5. Point A(4,3) was mapped onto A'(-2,0) after enlargement of scale factor -2. Find the coordinates of the centre of enlargement.

6. Given that matrix $A = \begin{pmatrix} x^2 & \frac{1}{4} \\ 1 & 1 \end{pmatrix}$. Determine the values of x for which A is singular.

7. Solve the inequality $\frac{2x+3}{6} - \frac{x+8}{4} \leq \frac{1}{3}(2x - 3)$.

8. The sum of ages of the girls Ann and Martha is 30 years and twice Ann's age is 18 years more than Martha's. Find the ages of the two girls.

9. Factorise completely $27y^3 - 3y$.

10. The mean of the numbers m-2, m-1, -2, m+2, m+3, 2m is 4.

    Find (i) value of m.

    (ii) median of the data.

SECTION B (60 MARKS)

11. Below are the marks obtained by 40 students in a mathematics test.

43	70	50	35	64	62	50	53
46	62	65	83	59	54	58	64
55	54	32	59	48	54	85	48
40	58	64	40	71	74	58	70
72	48	75	45	55	40	57	53

(a) Starting with 30 as the lower class limit of the first class, and using interval of 5 marks, form a frequency distribution table for the data.

(b) Calculate the mean mark using a working of 57.

(c) Plot the ogive and use it to estimate the median mark. (12 marks)

12. (a) The unit square OIKJ where O(0,0), I(1,0), K(1,1) and J(0,1) is reflected in the line $y = -x$ to give image OI'K'J'.

(i) Find the matrix of transformation R for this reflection. (2 marks)

(ii) Find the image points of OI'K'J' under matrix R. (2 marks)

(b) If OI'K'J' is then enlarged by a linear scale factor -2 at the origin to give OI"K"J", find

(i) Matrix of enlargement (2 marks)

(ii) Coordinates of the image of OI"K"J". (2 marks)

(iii) The area of OI"K"J" (2 marks)

(iv) A matrix which maps OI"K"J" back onto OIKJ. (2 marks)

13. (a) The length of an equilateral triangle is ycm. With the help of a triangle find the value of $\cos 30^0$. (6 marks)

(b) A chord of a circle of radius r, subtends an angle 60^0 at the centre of the circle and that the area of the minor segment is $50cm^2$, calculate the radius r, of the circle to 4 significant figures. (6 marks)

Maths paper I

14. A plane flies 540km from station A on a bearing 060° to B. From B it travels 455km to station C in a direction of S32°E. From C it heads for station D for 400km away in a direction of S76°W.

(i) Draw to scale a diagram showing the route of the plane, use a scale 1cm to represent 50km. (7 marks)

(ii) From your diagram, determine the distance and the direction of station A from station D. (2 marks)

(iii) Calculate how long it would take a plane travelling at a speed of 400km/h to travel direct from station A to station C. (3 marks)

15. (a)(i) Draw on the same coordinates axes the graph $y = (2x + 3)(x - 1)$ and $y = 3x + 1$ for $-3 \leq x \leq 3$. (6 marks)

(ii)State the points of intersection of the curve and the line. (2 marks)

(b) Using your graph find the value of x for which

(i) $2x^2 + x - 3 = 0$

(ii) $2x^2 + x - 6 = 0$ (4 marks)

16. (a) Solve for x in $\frac{2x-5}{3} - \frac{3x-1}{4} = 1\frac{1}{2}$ (4 marks)

(b) Solve the simultaneous equations

$$x^2 + 3y^2 = 7$$

$$y - x = 3$$ (8 marks)

17. A farmer wishes to spray weeds in his coffee plantation, using type **A** and type **B** of weed killers. Type A costs shs. 4000 per litre and type B costs shs. 6000 per litre. The farmer has shs. 40,000 for buying the weed killers. Each litre of type **A** can spray 3 hectares of the plantation and each litre of type **B** weed killers can spray 4 hectares of the plantation 15 hectares. Three times the quantity of type **A** weed killers used should exceed two times the quantity of type **B** by less or equal to four. If the farmer uses x litres of type **A** and y litres of type **B**.

a) Write down the five inequalities representing this information.

b) By shading the unwanted regions show the region satisfying these inequalities.

c) Find the number of litres of each type of weed killers that minimizes the cost of spraying the plantation. (12 marks

END