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MATHEMATICS
Paper 1
July/Aug. 2022
$2^1/_2$ hours

''Together for Mathematics''

SECONDARY MATHEMATICS TEACHERS' ASSOCIATION

SMATA JOINT MOCK EXAMINATIONS 2022
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.

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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 $a * b = \frac{3a}{a+b}$, find the value of:
   (i) 2 * 1 ***(02 marks)***

   (ii) k if 1 * k = 1 ***(02 marks)***

2. Make R the subject of the formula.

   $$P = \frac{R^2}{(R-b)(R+b)}$$ ***(04 marks)***

3. Find the value of x and y if:

   $$\begin{pmatrix} 3 & x \\ 2 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 2 \\ y \end{pmatrix}$$ ***(04 marks)***

4. Determine the radius of a circle which passes through all the four vertices of a rectangle of sides 5 cm and 12 cm. ***(04 marks)***

5. A quadratic curve cuts the x – axis at points A(-2,0) and B $(\frac{2}{3}, 0)$. Find the equation for this curve. ***(04 marks)***

6. A bag contains 3 black balls, 4 blue balls and 2 yellow balls. How many black balls must be added to the bag so that the probability of drawing a black ball should be $\frac{1}{2}$? ***(04 marks)***

7. Given that W : Z = 4:7 and Z : Y = 5:3.
   (i) Find the ratio W : Z : Y ***(02 marks)***

   (ii) Find the value of w when Y = 10. ***(02 marks)***

8. Solve the inequality $\frac{2}{3}x + \frac{11}{6} \leq x + \frac{1}{2}$ and present the solution on a number line. ***(04 marks)***

9. The point A(-3,2) is reflected in the x-axis onto A^I. Find the coordinates of A^I. ***(04 marks)***

10. Given that $13\text{Cos}\theta = 5$ for $180^0 \leq \theta \leq 360^0$. Without using logarithm tables and a calculator, find the value of $\sin\theta$.

    (04 marks)

SECTION B: (60 MARKS)

Answer any ***five*** questions from this section.

11. (a) Draw the graph of $y = 2x^2 - x - 6$ for $-2 \leq X \leq 3$. Use a horizontal scale of 2 cm to represent 1 unit and a vertical scale of 1cm to represent 1 unit.

(b) Use your graph in (a) above, to find roots of the equations.

(i) $2x^2 - x - 6 = 0$

(ii) $4x^2 - 6x - 10 = 0$ ***(12 marks)***

12. The weights in grammes of 35 mangoes are shown below.

62.3	61.4	61.1	62.1	61.9	62.4	62.3
62.8	63.4	63.1	61.1	62.4	64.2	64.6
64.7	65.6	66.3	62.8	64.2	65.7	65.4
62.6	61.4	64.3	64.0	65.7	62.5	61.2
63.6	63.6	65.2	63.4	62.5	66.1	61.0

(a) Starting with a class 61.0 – 61.9, construct a frequency distribution table for data.

(b) Use your data to calculate the,

(i) Mean weight of the mangoes using a working mean of 63.45.

(ii) Modal weight of the eggs. ***(12 marks)***

13. (a) Using a scale of 2cm to represent 1 unit on both axes, plot the points P(-2, -1), Q(4,-1) and R(2,4) .

(b) Construct a circle that passes through the points P, Q and R.

(c) Record and record down the coordinates for the centre of the circle in (b) above.

(d) Find the area of the circle. ***(12 marks)***

14. During the lock down, Mrs. Adikini a teacher, started supplying wines to her neighbours in the community. The wine was of two types, the Red label bottle and the Black label bottle. She supplied atleast two Red label bottles. Also she supplied more Black label bottles than the Red label bottles. Due to curfew time, she could not supply more than ten bottles. The Red label was sold for Shs 1500 each and the Black label was sold for Shs. 1000 each. For her to make profit, more than Shs 8000 was realized from her sales.

(a) How many bottles of each type did she sale to sale maximum profit?

(b) What was the minimum number of bottles she sold and still made profits? ***(12 marks)***

15.(a) A bag contains 12 Coffee berries of which 7 are Red and the rest Green two berries are picked at random from the bag in succession without replacement.

(i) Find the probability that the two berries are both green.

(ii) Find the probability that the two berries are different colours.

(b) A fair die and a biased die labelled {2,2,3,4,4,6} are tossed together, where the product of the numbers appearing on top recorded.

(i) Draw a table for the sample space.

(ii) What is the probability that the product is a triangular number? ***(12 marks)***

16. Joseph, Chris and Peter went for shopping in mini – price super market. Joseph bought 2 tins of blue band, 3 packets of biscuits, 5 markers and 4 pencils, Chris bought 4 tins of blue band, 2 markers and 3 pencils, Peter bought 3 tins of blue band, 4 packets of biscuits and 4 pencils.

A tin of blue band costs Shs 1500, a packet of biscuits costs Shs 800, a marker and a pencil costs Shs 1000 and Shs 600 respectively.

(a) Write down a **3 x 4** matrix for the costs.

(b) Write down a **4 x 1** matrix for the costs.

(c) By matrix multiplication, find how much each, spent at the supermarket.

(d) Given that each paid a tax of 5% of the total expense, find how much tax was paid by all. ***(12 marks)***

17. The points A(1,-3), B(1,1) and C(2,1) are vertices of a triangle ABC. The points A^I, B^I and C^I are the images of ABC under transformations M followed by N.

Given that $\mathbf{M} = \begin{pmatrix} \mathbf{0} & \mathbf{-1} \\ \mathbf{1} & \mathbf{0} \end{pmatrix}$ and $\mathbf{N} = \begin{pmatrix} \mathbf{3} & \mathbf{1} \\ \mathbf{-2} & \mathbf{0} \end{pmatrix}$,

Find;

(i) A single transformation for ABC onto $A^I B^I C^I$.

(ii) What are the coordinates of $A^I B^I C^I$?

(iii) Find the ratio of the areas ABC to $A^I B^I C^I$.

(12 marks)

END