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MATHEMATICS
Paper 1
July/ August, 2022
2 ½ hours

BUNYORO REGION EXAMINATIONS BOARD (ABREB)

Uganda Certificate of Education

Mock Examinations, 2022

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **All** *questions in section* **A** *and Not more than* **five** *from section* **B**

Any additional question(s) attempted will **NOT** *be marked.*

All necessary calculations **MUST** *be shown and should be done on the same page as the rest of the answer.*

Mathematical tables and graph papers will be provided.

Silent non-programmable scientific calculators may be used.

SECTION A (40 MARKS)

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

1. Factorize completely $a^3b - ab^3$ and use it to find the value of $3^3(2) - 3(2^3)$. *(04 marks)*

2. Solve the inequality $9 \leq 4x + 5 \leq 29$ and represent the solution on a number line. *(04 marks)*

3. Given that $T = {}^1/_2\sqrt{\frac{2}{x+y}}$

   (a) Express y in terms of T and x.

   (b) Calculate the value of y when $T = 2$ and $x = {}^{-15}/_8$ *(04 marks)*

4. Given that $sin\theta = 0.8$ and that $90^0 < \theta < 270^0$. Determine the value of $2\,cos\theta - tan\theta$ *(04 marks)*

5. The representative fraction of a map is ${}^1/_{400,000}$. Find the actual area of a swamp (km^2) which is represented by $5cm^2$ on the map *(04 marks)*

6. Under a transformation whose matrix is $\begin{pmatrix} a-1 & 2 \\ -a & 3 \end{pmatrix}$, a figure whose area is $5cm^2$ is mapped onto a figure whose area is $60cm^2$. Find a. *(04 marks)*

7. The mean height of 35 boys in a class is 152 cm. Recently, 5 other boys whose mean height is 160 cm joined the class. Find the new mean height of all the boys in the class. *(04 marks)*

8. A forest ranger sighted fire from the top of a tower 80m high. If the angle of depression of the fire was 17.5^0, how far was the ranger from the foot of the tower? Give your answer to 3 significant figures. *(04 marks)*

9. Given that $a * b = \frac{(2a+b)^2}{ba}$

Evaluate $(3 * 6)*4$ *(04 marks)*

10. A letter is chosen at random from the letters in the word PROBABILITY. Find the probability that the letter chosen will be

(i) B *(02 marks)*

(ii) a vowel *(02 marks)*

SECTION B (60 MARKS)

Attempt only **five** *questions*

11. The weights of pupils' bag at Ebenezer Primary School in Kilograms are given below.

3.3	6.0	4.0	2.5	5.4	5.2	4.0	4.3
3.6	5.2	5.5	7.3	4.9	4.4	4.8	5.4
4.5	4.4	2.2	4.9	3.8	4.4	2.5	3.8
3.0	4.8	5.4	3.0	6.1	6.4	4.5	6.0
6.2	3.8	6.5	3.5	4.5	3.0	4.7	4.5

(i) Starting with a class of $2.0 - 2.4$, $2.5 - 2.9$ and using equal class intervals, from a frequency distribution table for this data.

(ii) Plot a cumulative frequency curve (Ogive) for the data. Use your graph to estimate the median weight.

(iii) Calculate the mean weight using an assumed mean of 4.7 (correct your answer to 1d.p). *(12 marks)*

12. The figure with vertices A(2 ,2), B(4, 0), C(5, 3) and D(3, 4) is given a transformation represented by the matrix $\mathbf{M} = \begin{pmatrix} 1 & -1 \\ 0 & -2 \end{pmatrix}$ to form the image **A'B'C'D'**.

(a) Find the coordinaes of **A'B'C'D'**. *(04 marks)*

(b) **A''B''C''D''** is then mapped onto **A''B''C''D''** by another transformation matrix $\mathbf{N} = \begin{pmatrix} 0 & -1 \\ 2 & -1 \end{pmatrix}$.

Find the coordinates of **A''B''C''D''**. *(04 marks)*

(c) Find the single matrix that maps **A''B''C''D''** directly back onto **ABCD**. *(04 marks)*

13. (a) Given that $\frac{x+1}{x+2} - \frac{x+4}{3x+6} = \frac{kx+a}{bx+c}$, find the values of a, b, c, k

(06 marks)

(b) Solve the simultaneous equations.

$3x^2 + y^2 = 13$ and $y - x + 3 = 0$ *(06 marks)*

14. (a) A bag contains 3 green and 2 red balls. Two balls are randomly selected from the bag one after the other without replacement. Find the probability that;

(i) Both are of the same colour

(ii) The second ball is red

(iii) They are of different colours. *(07 marks)*

(d) A regular octahedron, whose faces are numbered 1 to 8 is thrown together with a coin. Show the possible outcomes in a table. Find the probability of getting.

(i) "T" with a prime number

(ii) "H" and a number less than 4. *(05 marks)*

15. (i) Draw the graph of $y = (3x + 1)(2x - 5)$ for values of x; $-1 \leq x \leq 4$.

(ii) On the same axes, draw the graph of $y = 8x - 7$

(iii) Use your graph to find the values of x which satisfy the simultaneous equations in part (i) and part (ii) above.

(iv) Write down the simplified quadratic equation satisfied by the values of x where the two graphs interest.

(12 marks)

16. (a) Given that $\mathbf{A}=\begin{pmatrix}2 & 0 & 1\\ 4 & 3 & 6\end{pmatrix}$ and $\mathbf{D}=\begin{pmatrix}2 & 3 & -1\\ 4 & 3 & 4\end{pmatrix}$

Find the matrix **C** such that $3A - 2c = \mathbf{D}$.

(06 marks)

(b) Grace, Hope and Sam went shopping at capital shoppers supermarket. Hope bought 2 dozens of exercise books at shs 6,000 per dozen, 5 kg of sugar at shs 2,800 per kg, 4 leaves of bread at shs 3500 each and 2 tins of Margarine at shs. 1500 each. Grace bought 3 kg of sugar, 1 dozen of exercise books and 2tins of margarine while Sam bought 3 dozens of exercise books, 2 tins of margarine, 4 kg of sugar and 2 loaves of bread.

(i) Write the items bought as a 3x4 matrix and the prices of each as a row matrix.

(ii) By matrix multiplication, find how much each spent.

(06 marks)

17. The Head teacher of Budongo Primary School has shs. 12,000,000 for buying photocopiers (x) and solar panels (y). A photocopier costs shs 1,000,000 and a solar panel shs 200,000. She had to buy at least 6 photocopiers and 20 solar panels.

(a) Write down three inequalities to represent the given information

(b) Represent the inequalities on a suitable graph and show the region satisfying the inequalities.

(c) Use your graph above to find the number of photocopiers and solar panels which should be bought so as to minimize costs and hence calculate the minimum cost. *(12 marks)*

END