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MATHEMATICS
PAPER 1
August, 2023
$2\frac{1}{2}$ hrs

UNNASE MOCK EXAMINATIONS

UGANDA CERTIFICATE OF EDUCATION

MATHEMATICS

PAPER 1

2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES

- *Answer **all** the questions in Section **A** and any **Five** from Section **B**.*
- *Any additional question(s) answered will **NOT** be marked.*
- *All necessary calculations **must** be done in the same page as the answer. 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 where not prohibited.*

SECTION A (40 MARKS)

Answer ALL questions in this section.

1. The symbol ϕ represents a mathematical rule. The rule for ϕ is "add the two numbers and then multiply their sum by the second number".

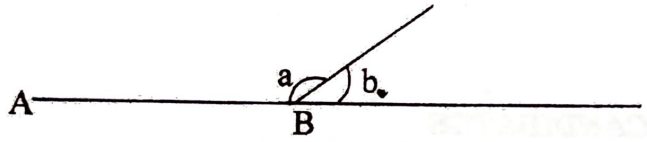
   (a) Evaluate ; $2 \varphi 6$

   (b) If $p \varphi p = 72$, find the values of p.

2. From a point on the ground, the angles of elevation of the bottom and top of a tower fixed at the top of a 20 m high building are 45^0 and 60^0 respectively. Find the height of the tower.

3. In a school, $\frac{2}{3}$ of the students study a language. Of those students who study a language, $\frac{2}{5}$ study Spanish. Find the ratio of students who study Spanish to students who do not study Spanish.

4. In the figure below ABC is a straight line and $a - b = 80^0$, find a and b.

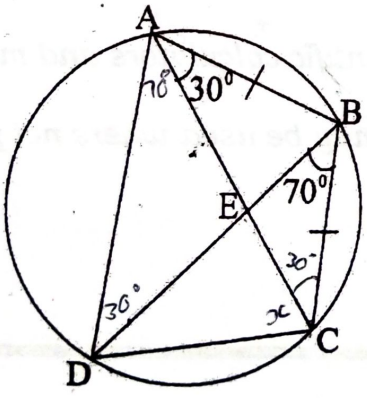


5. Solve by matrix method $\begin{matrix} 2y - 3x = 5 \\ 5x - 6y = 21 \end{matrix}$

6. Simplify $(m-2)(m+2)$. Hence evaluate 38×42.

7. Make x the subject of the formula; $m = \sqrt{\frac{5x}{p} - n^2}$, hence find the value of x when $p = -2, n = 3$ and $m = -1$

8. ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. Given that $\angle DBC = 70^0, \angle BAC = 30^0$ and $AB = BC$.

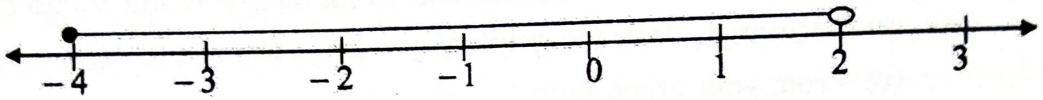


Find (i) $\angle BCD$

(ii) $\angle ECD$.

9. The mean of 100 observations is 50. If one of the observations which was 50 is replaced by 150, what will be the new mean?

10. The solution of an inequality is represented in the number line below. Write down the inequality.



SECTION B (60 MARKS)

Answer* ONLY 5 *questions in this section

11. Use a ruler and a pair of compasses only to construct;

(i) Triangle PQR in which PR = 8cm, QR = 11cm and PQ = 9cm.

(ii) Measure and record angle PRQ.

(iii) Construct the angle bisector of angle QPR

(iv) The perpendicular bisector of PQ.

(v) The perpendicular bisector of PQ meets the angle bisector of angle QPR at X, mark X and write down the length of QX

12. In a 3 track meet, the following numbers of 1^{st}, 2^{nd} and 3^{rd} place finishes were recorded

School	1^{st} place	2^{nd} place	3^{rd} place
Naalya S.S	4	10	6
Seeta High School	7	6	9
Makerere College	8	3	4

If 5 points are awarded for 1^{st} place, 3 for 2^{nd} place and 2 for 3^{rd} place;

(a) Write down a 3 x 3 placement matrix (S) for the 3 schools.

(b) Write down a 3 x1 matrix (P) for the award of points.

(c) Use matrices P and S to calculate how many points each school got.

(d) State which school won?

13. The table below is for the function $y = 2x^2 - 5x - 3$

x	−1.5	−1	0	0.5	1	2	3	4
y	a	4	−3	−5	−6	−5	0	9

(a) Find a

(b) use a scale of 2cm to represent 1 unit on x-axis and 2cmto represent 5 units on the y- axis , draw the graph of $y = 2x^2 - 5x - 3$

(c) From your graph find;

(i) the values of x when $y = 5$

(ii) the minimum value of y.

(iii) the values of x for which $2x^2 - 5x - 3 = 0$

(d) By adding a suitable line on the same axes , find the solution to the equation; $2x^2 - 7x = 0$

14. The table below shows the number of hours of exercise by a group of 90 adults in a week.

No. of hours / week	2	3	4	5
No. of adults	22	x	20	y

(a) Given further that the average number of hours of exercise by each adult in a week is 3hours, form 2 equations in equation in x and y. Hence solve the equations.

(b) Hence determine the;

(i) modal number of hours of exercise per week by each adult.

(ii) the median number of hours of exercise per week by each adult.

15. Matrix R represents a reflection in the line $y = x$.

(a) Write down transformation matrix R

(b) Calculate the coordinates of the vertices of image triangle $A_1B_1C_1$ of triangle $A(-20,-10), B(-20,20)$ and $C(-10,20)$ under transformation R.

(c) Triangle $A_1B_1C_1$ then mapped on to $A_2B_2C_2$ be matrix E that represents a positive three- quarter turn about the origin.

(d) Write down the transformation matrix E.

(e) Calculate the coordinates of the vertices of $A_2B_2C_2$ under transformation E.

(f) Find ER(ABC)

16. The table shows information about all students S.2 class.

	No. of boys	No. of girls
Blue eyes	4	6
Brown eyes	18	8

(a) How many students are there in the class?

(b) What is the probability that a student is chosen at random has blue eyes?

(c) A student was chosen at random from the class. It was found that he was a boy. What is the probability that he had brown eyes?

17. A car hire company has x Subaru cars and y Prado cars. The company has at least 6 cars in total. The number of Prado cars is less than or equal to the number of Subaru cars. The largest number of Subaru cars is 8.

(a) Write down three inequalities, in terms of x and/or y, to show this information

(b) A Subaru car can carry 4 people and a Prado car can carry 6 people. One day,the largest number of people to be carried is 60. Show that $2x+3y \leq 30$

(c) By shading the unwanted regions on the grid, show and label the region R that satisfies all four inequalities.

(d) Find the number of Subaru cars and the number of Prado cars needed to carry exactly 60 people.