MOKASA II JOINT EXAMINATIONS – 2024

Kenya Certificate of Secondary Education

121/1 – MATHEMATICS Paper 1 (Alt. A)**FORM FOUR**

121 / 1 - Mathematics Paper 1
July 2024
Time: 8.00 a.m – 10.30 a.m

Name ……ADM NO……

IndexNumber…….....…….....……...Class……..Date……Signature……..

Instructions to candidates

(a) Write your name and Index number in the spaces provided above.
(b) Write your class, date of examination and sign in the spaces provided above.
(c) This paper consists of **two** sections, **Section I** and **Section II**.
(d) Answer all the questions in **Section I** and only **five** questions from **Section II**.
(e) **Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.**
(f) Marks may be given for correct working even if the answer is wrong.
(g) **Non – programmable** silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
(h) **This paper consists of 15 printed pages.**
(i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

MOKASA II MATHEMATICS JOINT EXAMINATION,

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total	Grand Total	

SECTION I (50 marks)

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

1. Express 21952 and 3136 as a product of the prime factors, hence evaluate

$\frac{\sqrt[3]{21952}}{\sqrt{3136}}\ of\ 26$ (3 marks)

2. The LCM and GCD of three numbers are 7560 and 18 respectively. If two of the numbers are 360 and 540, find the least possible value of the third number. (3 marks)

3. Without using a calculator, evaluate; (4 marks)

$$\frac{0.\dot{3}+0.1\dot{5}}{0.\dot{6}}$$

4. Solve using tables of square roots and reciprocals to the nearest 4 s.f. (3 marks)

$$\frac{38.21}{\sqrt{0.02548}}$$

5. Simplify the expression; $\dfrac{49x^2 - y^2}{21x^2 + 35ax - 3yx - 5ya}$ (3 marks)

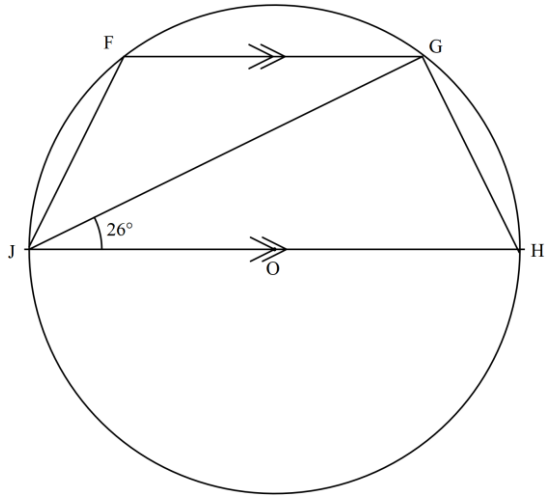
6. A two digit number is such that, the sum of its digits is 11. When the digits are interchanged,the original number exceeds the new number by 9. Find the original number. (3 marks)

7. A Kenyan company received 103 800 sterling pounds. The money was converted in a bank which buys and sells foreign currencies as follows;

	Buying (in Ksh.)	Selling (in Ksh.)
1 Sterling Pound	145.78	146.64
US Dollar	110.66	110.86

Calculate the amount of money received to the nearest US dollar. (3 marks)

8. In the figure below, O is the centre of the circle. FG is parallel to JH and angle GJH = 26º. Calculate the size of angle FJG. (2 marks)



9. Three towns A, B and C are such that B is 50 km on a bearing of N70°W from A and C is 70 km east of B.

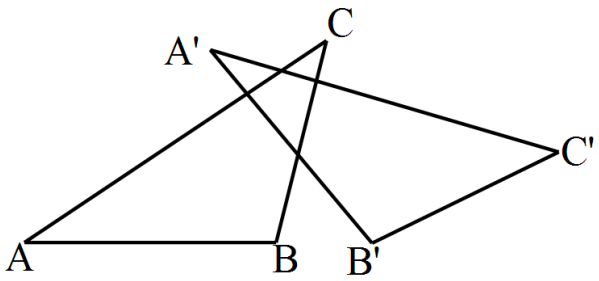
(a) Using a scale of 1 cm to represent 10 km, draw a diagram to show the relative position of towns A, B and C. (2 marks)

(b) Determine the distance, in km, of C from. (1 mark)

10. Solve for x in the equation.

$9\left(2^{(2x+2)}\right) - 41(2^{x}) + 8 = 0.$ (4 marks)

11. In the figure below, triangle A′B′C′ is the image of triangle ABC under a rotation. By construction, determine the angle and centre of rotation. (3 marks)



12. Points $A(-1,-6)$ and $B(-4,-5)$ are mapped onto $A^1(5,-5)$ and $B^1(-1,-3)$ respectively by an enlargement. Find the coordinates of the centre of enlargement.
(3 marks)

13. Solve the inequality $x + 2 \leq 2x + 6 < -x + 8$, and hence list all the integral values of x.
(3 marks)

14. The equation of a straight line, L_1 is given as; $\frac{4}{5}y - \frac{3}{10}x = 7$

i. Find gradient of line L_1. (1 mark)

ii. Find equation of line L_2 which passes through $(2, -3)$ and perpendicular to L_1 in the form $ax + by + c = 0$ where a, b and c are positive integers. (3 marks)

15. The displacement, s metres of a moving particle after t seconds are given by $s = t^3 - 9t^2 + 40t + 8$. Find the maximum velocity of the particle. (3 marks)

16. Given the position vector $\overrightarrow{OA}$ = 4i – 2j – 3k and $\overrightarrow{OB}$ = -3i + 4j + 2k, express $\overrightarrow{AB}$ in terms of i, j, k and hence find the magnitude of $\overrightarrow{AB}$ to the nearest 1decimal place. (3 marks)

SECTION II (50 marks)

*Answer **only five** questions in this section in the spaces provided.*

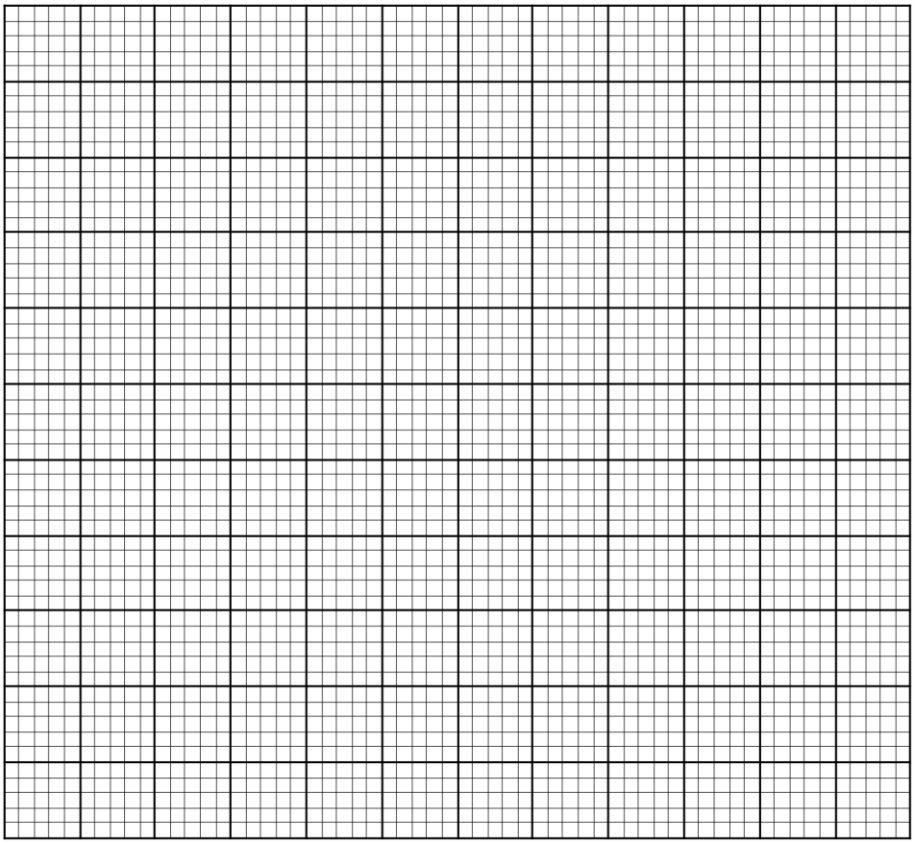
17. (a) Complete the table below for the function $y = 2x^2 + 5x - 18$ in the range $-5 \leq x \leq 3$.

(2 marks)

x	–5	–4	–3	–2	–1	0	1	2	3
y	7		–15			–18			15

(b) On the grid provided draw a graph of $y = 2x^2 + 5x - 18$ in the range $-5 \leq x \leq 3$. Use a scale of 1 cm to represent 5 units on y – axis and 1 cm to represent 1 unit on x – axis.

(3 marks)



(c) Use your graph to solve the equations; (2 marks)

i) $2x^2 + 5x - 18 = 0$

ii) $x^2 + 3x - 10 = 0$ (3 marks)

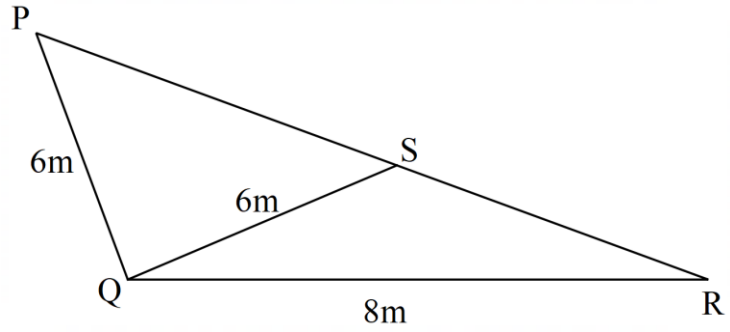
18. (a) Given the matrix M=$\begin{pmatrix} 3 & 5 \\ 1 & 2 \end{pmatrix}$, find M^{-1} the inverse of M. (2 marks)

(b)John bought 15 textbooks and 25 exercise books for a total of ksh. 10 000. If John had bought 10 textbooks and 20 exercise books, he would have spent ksh. 3000 less. Take x to represent the price of a textbook and y to represent the price of an exercise book.
(i) Form two equations to represent the information above. (1 mark)

(ii) Use the inverse M^{-1} of matrix M in (a) above to find the price of one textbook and one exercise book. (3 marks)

(c) John later sold a textbook at a profit of 20 %. If John received a total of Ksh. 11 875 from the sale of all the books, find the percentage profit of an exercise book. (4 marks)

19. The figure below (not drawn to scale) represents flower garden PQR in which PQ = 6m, QR = 8m and angle QRP = 35^0. Point S lies on PR such that QS = 6m and <QSR is obtuse.



Find correct to do 2 decimal places;

(a) the size of angle QSR (3 marks)

(b) The length of PS. (3 marks)

(c) The length of SR. (2 marks)

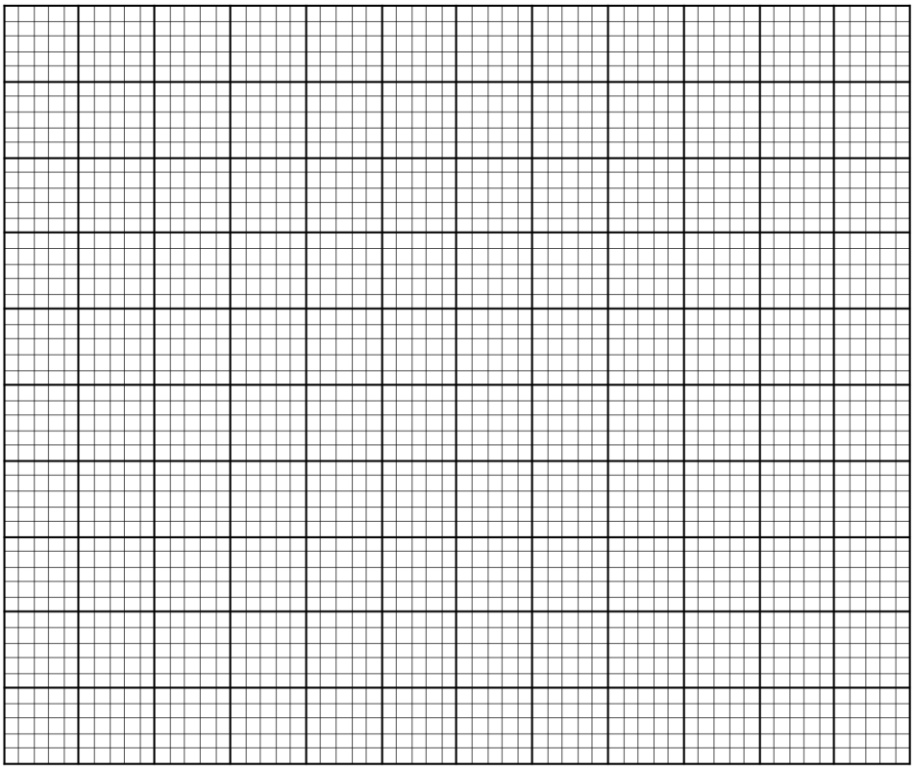
(d) The area of the flower garden PQR in Hectares. (2 marks)

20. The frequency table below shows the daily wages paid to casual workers by a certain company.

Wages in Shillings	300 – 350	350 – 450	450 – 500	500 – 550	550 – 650
No of workers	140	120	380	240	120

(a) Calculate the mean wage. (3 marks)

(b) On the grid provided below, draw a histogram to represent the above information. (3 marks)

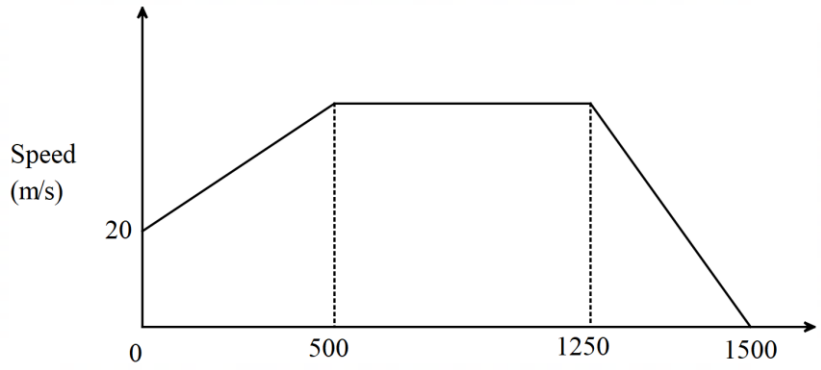


(c) (i) State the class in which the median wage lies. (1 mark)

(ii) Draw a vertical line in the histogram, showing where the median wage lies. (1 mark)

(d) Using the histogram, determine the number of workers who earn Sh. 500 or less per day. (2 marks)

21. The figure below represents a speed-time graph for a car which covered a distance of 61250metres in 1500 seconds.



(a) State the speed of the car when recording of its motion started. (1 mark)

(b) Calculate the maximum speed attained by the car in km/h r. (4 marks)

(c) Calculate the acceleration of the car in;

(i) The first 500 seconds. (2 marks)

(ii) The last 250 seconds. (1 mark)

(d) Calculate the average speed of the car in the first 1250 seconds. (2 marks)

22. A solid is in the form of a conical frustum and a hemispherical top. The base radius of the solid is 17.5cm and the top radius is 10.5cm. The height of the frustum is 30cm. (Use $\pi = \frac{22}{7}$)

(a) Calculate the vertical height of the solid. (1 mark)

(b) Calculate the total surface area of the solid to one decimal place. (4 marks)

(c) Initially the solid had water to a height of 10cm. A cube is fully immersed and the water level rose by 12. Calculate the length of the side of the cube. (5 marks)

23. (a) Complete the table below for the function $y = \frac{1}{2}x^2 - \frac{1}{2}x + 2$. (2 marks)

x	0	1	2	3	4	5	6
y							

Estimate the area bounded by the curve $y = \frac{1}{2}x^2 - \frac{1}{2}x + 2$ and the lines $y = 0$, $x = 0$ and $x = 6$ using:

(i) Trapezium rule with six strips. (3 marks)

(ii) Mid – ordinate rule with six strips. (3 marks)

(b) Find percentage change in area estimated by mid – ordinate rule given that the exact area of the above region is 39 square units. (2 marks)

24. The equation of a curve is $y = x^3 + 2x^2$.

(a) Find;

(i) The $x-$ intercepts of the curve. (2 marks)

(ii) The $y-$ intercept of the curve. (1 mark)

(b) (i) Determine the stationary points of the curve. (3 marks)

(ii) For each point in (b)(i) above, determine whether it is a maximum or minimum. (2 marks)

(c) Sketch the curve. (2 marks)

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