MASENO SCHOOL

2025 MOCK EXAMINATION

Kenya Certificate of Secondary Education

121 / 2 - Mathematics Paper 2 (Alt. A)	
Thursday 19th July, 2025	**Unique Identifier No.........................**
8.00 a.m. - 10.30 a.m.	**Signature..**

Instructions to candidates

a) *Write your **Unique Identifier Number** and **sign** in the spaces provided above.*

b) *This paper consists of **two** sections; **Section I** and **Section II**.*

c) *Answer all the questions in **Section I** and only **five** questions from **Section II**.*

d) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.***

e) *Marks may be given for correct working even if the answer is wrong.*

f) ***Non – programmable** silent electronic calculators **and** KNEC Mathematical tables may be used, except where stated otherwise.*

g) ***This paper consists of 15 printed pages.***

h) ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***

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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 in the spaces provided.*

1 The dimensions of a rectangular floor are given to the nearest 10 cm as 12.5 m and 9.6 m. Calculate the percentage error of the area of the floor. (3 marks)

2 Given that $\frac{5}{\sqrt{3}-\sqrt{2}} - \frac{2}{\sqrt{3}+\sqrt{2}} = a\sqrt{2} + b\sqrt{3}$, find the values of a and b. (3 marks)

3 A hot water tap can fill a bath in 6 minutes while a cold water tap can fill the same bath in 4 minutes. The drain pipe can empty the bath in 8 minutes. The two taps and the drain pipe are fully opened for $1\frac{1}{2}$ minutes after which the drain pipe is closed. Calculate the total time taken to fill the bath. (3 marks)

4 Solve the following logarithmic equation. (3 marks)

$$2\log_4(x+2)-\log_4(3x-2)=1$$

5 (a) Expand $\left(2-\frac{1}{3}x\right)^5$ in ascending powers of *x* leaving the coefficients as fraction in their simplest form. (1 mark)

(b) Use the first four terms of the expansion in (a) to estimate the value of $(1.9)^5$ (2 marks)

6 Solve the equation $6\cos^2 x+\sin x=4$ for $0^\circ \le x \le 360^\circ$. (3 marks)

7 Make d the subject of the formula $k=\dfrac{m}{n+\frac{2}{d}}$ (3 marks)

8 Point $Q(-1,5,-6)$ divides line AB externally in the ratio 3:5 where A is the point $(2,-4,3)$. Calculate the coordinates of B. (3 marks)

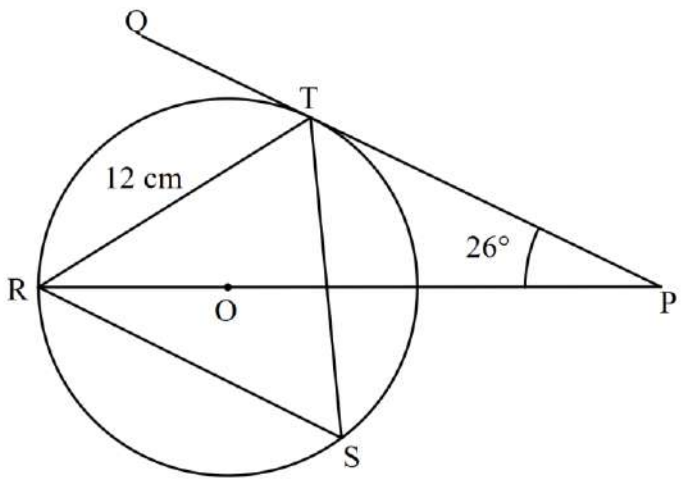
9 A quantity P varies partly as the square of y and partly as the inverse of y. Given that P = 6 when y = 2 and P = 10 when y = 4, find P when y = 8. (3 marks)

10 Using a ruler and a pair of compasses only, construct on the upper side of line AB = 6 cm, the locus P such that $\angle APB = 60^\circ$ and the area of triangle APB = 12 cm^2. (4 marks)

11 Sam bought a piece of land valued at Ksh 1 800 000 and a car valued at Ksh 4 500 000. The land appreciated at the rate of 12% per annum while the car depreciated at the rate of 5% every 4 months. Find the number of years it will take for the value of the land to be equal to the value of the car. Give your answer correct to 1 decimal place. (3 marks)

12 Under a transformation $\mathbf{T} = \begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix}$, triangle ABC is mapped onto triangle $A'B'C'$ whose vertices are $A'(4,2)$, $B'(10,2)$ and $C'(9,7)$. Calculate the area of triangle ABC. (3 marks)

13 In the figure below, R, T and S are points on the circle centre O. PQ is a tangent to the circle at T. POR is a straight line. Angle QPR = 26^o and RT = 12 cm.



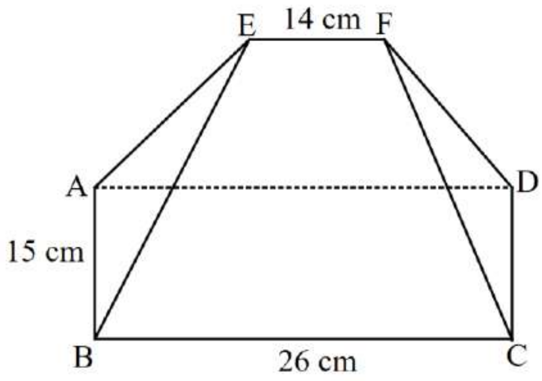
Calculate the:

(a) Size of angle RST. (2 marks)

(b) Radius of the circle correct to 1 decimal place. (2 marks)

14 The equation of a circle is $x^2 + y^2 + 4x + \mathrm{k}y = 12$. The radius of the circle is 5 units. Find the coordinates of the two possible centres of the circle. (3 marks)

15 The figure below is a model of a roof with a rectangular base ABCD. AB = 15 cm, BC = 26 cm. The ridge EF = 14 cm and is centrally placed. The faces ABE and CDF are equilateral triangles.



Calculate the angle between lines CF and CE. (3 marks)

16 The gradient function of a curve is given by $\frac{dy}{dx} = 3x^2 + 4x - 5$. The curve passes through the point $(1, -4)$. Find the equation of the curve. (3 marks)

SECTION II (50 marks)

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

17 A trader deals in two types of rice; type A and type B. Type A costs Ksh 600 per bag and type B costs Ksh 420 per bag.

(a) The trader mixes 50 bags of type A rice with 30 bags of type B rice and sells the mixture at a profit of 20%. Calculate the selling price of 1 bag of the mixture. (4 marks)

(b) The trader now mixes type A rice with type B rice in the ratio $x : y$ respectively. The cost of the mixture is Ksh 528 per bag. Determine the ratio $x : y$. (3 marks)

(c) One bag of the mixture in (a) is mixed with 1 bag of the mixture in (b) above. Calculate the percentage of type A rice in this new mixture. (3 marks)

18 The marks scored by 50 students in a mathematics test were as shown in the table below.

Marks	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74	75 – 79
No. of students	5	8	15	10	8	4

(a) Using an assumed mean of 62, calculate the:

(i) Mean mark. (3 marks)

(ii) Standard deviation. (3 marks)

(b) Calculate the number of students who scored more than 68 marks. (4 marks)

19 The 5^{th} and 10^{th} terms of an arithmetic progression (A.P) are 60 and 45 respectively.

(a) Find the common difference and the first term. (3 marks)

(b) Determine the least number of terms of the A.P which must be added together so that the sum of the progression is negative. Hence find the sum. (5 marks)

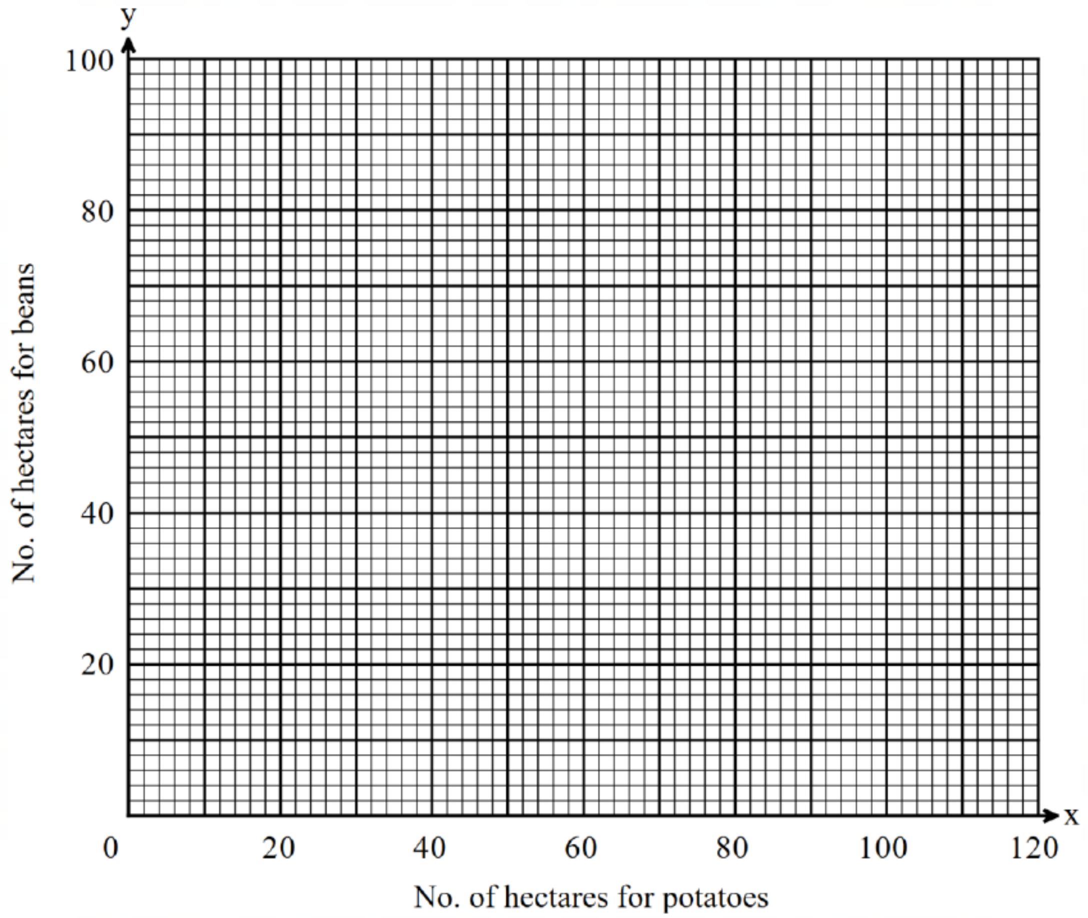
(c) The 5^{th} and the 10^{th} terms of the A.P above form the first two consecutive terms of a geometric progression (G.P). Determine the 6^{th} term of the G.P. (2 marks)

20 A farmer wishes to grow two crops; potatoes and beans. He has 70 hectares of land available for this purpose. He has 240 man – days of labour available to work the land and he can spend up to Ksh 180 000 shillings. The requirements for the crops are as follows:

	Potatoes	Beans
Minimum number of hectares to be sown	10	20
Man - days per hectare	2	4
Cost per hectare in Ksh	3000	2000
Profit per hectare in Ksh	15000	10000

(a) Taking x to be the number of hectares for potatoes and y to be the number of hectares for beans, form all the inequalities in x and y to represent this information. (4 marks)

(b) On the grid provided below, draw all the inequalities and shade the unwanted region. (4 marks)



(c) Determine the maximum profit. (2 marks)

21 A bag contains 6 red, 4 white and 5 blue balls. Two balls are drawn at random from the bag, one at a time and without replacement.

(a) Represent this information in a tree diagram. (2 marks)

(b) Use the tree diagram to find the probability that:

(i) The second ball drawn is red. (2 marks)

(ii) The two balls are of the same colour. (2 marks)

(iii) No white ball is drawn. (2 marks)

(iv) At least one ball is blue. (2 marks)

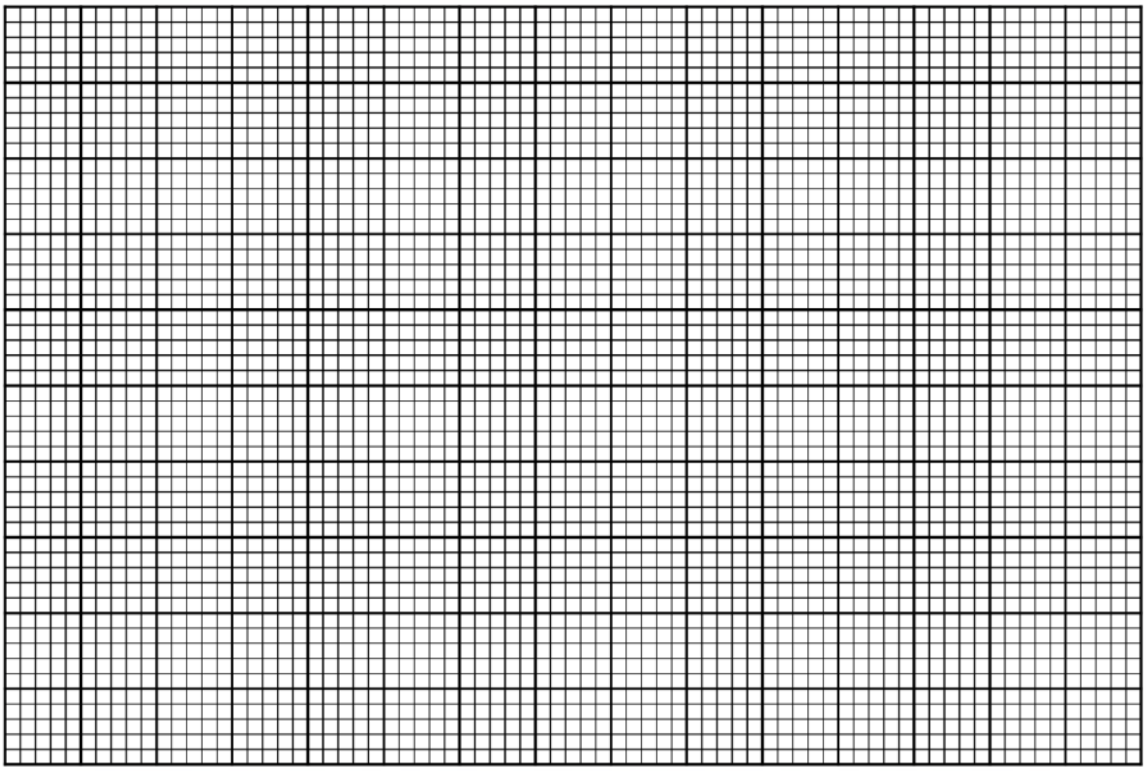
22 (a) Complete the table below giving the values correct to 2 decimal places. (2 marks)

x°	0	15	30	45	60	75	90	105	120	135	150	165	180
$\sin 2x$	0	0.50	0.87	1.00		0.50	0		–0.87		–0.87	–0.50	
$2\cos\left(x-30^\circ\right)$	1.73		2.00	1.93		1.42	1.00		0		–1.00	–1.42	–1.73

(b) On the grid provided, draw the graphs of $y=\sin 2x$ and $y=2\cos\left(x-30^\circ\right)$ for $0^\circ \le x \le 180^\circ$.

Use the scale 1 cm to represent 15° on the x – axis and 2 cm to represent 1 unit on the y – axis.

(4 marks)



(c) Using the graphs in (b) above to:

(i) Solve the equation $\sin 2x = 2\cos\left(x-30^\circ\right)$. (1 mark)

(ii) Determine the difference in the amplitude of the graphs $y=\sin 2x$ and $y=2\cos\left(x-30^\circ\right)$.

(1 mark)

(iii) Solve the equation $\cos\left(x-30^\circ\right) = -0.4$. (2 marks)

23 A point A is 8008 km south of $B(12^\circ N, 110^\circ W)$. Another point C lies on longitude $160^\circ E$ and is on the same latitude as A. Take $\pi = \frac{22}{7}$ and the radius of the earth to be 6370 km.

(a) Determine:

(i) The position of A. (3 marks)

(ii) The shorter distance in kilometres between A and C along the parallel of latitude. (3 marks)

(b) An aeroplane left point A on Monday 0730 hours local time for C along the parallel of latitude using the shorter route at an average speed of 550 km/h. Determine:

(i) The local time at C when the aeroplane left point A. (2 marks)

(ii) The local time at C when the aeroplane arrived. (2 marks)

24 Triangle ABC with vertices at $A(2,3)$, $B(5,2)$ and $C(4,-1)$ is mapped onto triangle $A'B'C'$ by a shear with x – axis invariant and A is mapped onto $A'(8,3)$.

(a) Find:

(i) The matrix representing the shear. (2 marks)

(ii) The coordinates of B' and C'. (2 marks)

(b) Triangle $A''B''C''$ is the image of triangle $A'B'C'$ under a transformation represented by the matrix $\mathbf{M} = \begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$.

(i) Find the coordinates of triangle $A''B''C''$. (2 marks)

(ii) Describe the transformation **M** fully. (2 marks)

(c) Determine a single matrix that maps triangle $A''B''C''$ onto triangle ABC. (2 marks)

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