MASENO SCHOOL MOCK – 2022

Kenya Certificate of Secondary Education

121/2   **Paper 2**

MATHEMATICS
- Alt. A -
Sept. 2022 – 2½ hours

Name ……………………………………………… Admission Number …………………..

Class …………………… Date ……………………Candidate's Signature………………...

Instructions to candidates

a) Write your name and admission number in the spaces provided above.
b) Write your class, the 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 16 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.**
j) **Candidates should answer the questions in English.**

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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. Without using mathematical tables or a calculator, simplify $\dfrac{2\log 7 - \log 343}{\log 49 + \log 7}$.   (3 marks)

2. The top of a table is a regular pentagon of sides measuring 25.0 cm each. Find the percentage error in calculating the perimeter of the table.   (3 marks)

3. Mary and Esther working together can do a piece of work in 6 days. Mary working alone takes 5 days longer than Esther. Calculate the number of days it would take Esther to do the work alone.

                                                                                (3 marks)

4. Simplify the following expression leaving your answer in surd form. (3 marks)

$$\frac{\sin 150°}{1+\sin(-240)°}$$

5. The first and the fourth terms of a geometric progression (G.P) are 2 and 54 respectively. Find the greatest number of terms of the G.P for which the sum of the terms is less than 1 500. (3 marks)

6. The length of a rectangular room is 3 m more than its width and the area of the room is 40 m^2. The room is to be carpeted leaving a uniform margin of 20 cm all around. Calculate the area of the margin. (4 marks)

7. The data below represents shoe sizes in a shop.

$$10, \ 7, \ 7, \ 6, \ 7, \ 9, \ 5, \ 3, \ 5, \ 4, \ 6, \ 5 \text{ and } 4$$

Calculate the mean absolute deviation of the data. (3 marks)

8. In the figure below, AB and CD are chords of a circle that intersect externally at point T. Using a ruler and a pair of compasses only, construct the circle hence draw a tangent from point T to the circle at E. Measure ET. (3 marks)
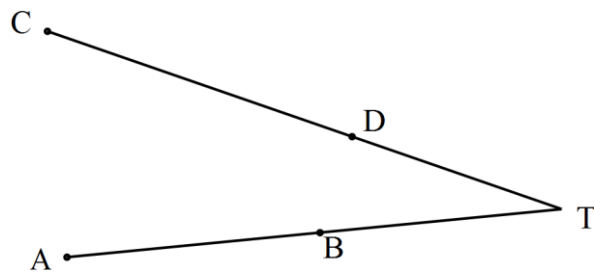
9. A boat leaves a port $P\left(5^\circ N, 45^\circ E\right)$ and sails due east for 120 hours to another port Q. The average speed of the boat is 27 knots. Find the position of port Q. (3 marks)

10. The equation of a wave is given as $ay = b\sin cx$ where a, b and c are integers. Given that the amplitude of the wave is $2\dfrac{1}{3}$ and the period is $90°$, find the values of a, b and c. (3 marks)

11. In an experiment involving two variables, time (t) in hours and height (h) in centimetres, the following results were obtained.

Time (t) hrs	0	2	4	6	8	10	12	14	16
Height (h) cm	80	60	46	35	26	20	16	14	13

(a) On the grid provided below, draw the graph of height against time. (2 marks)
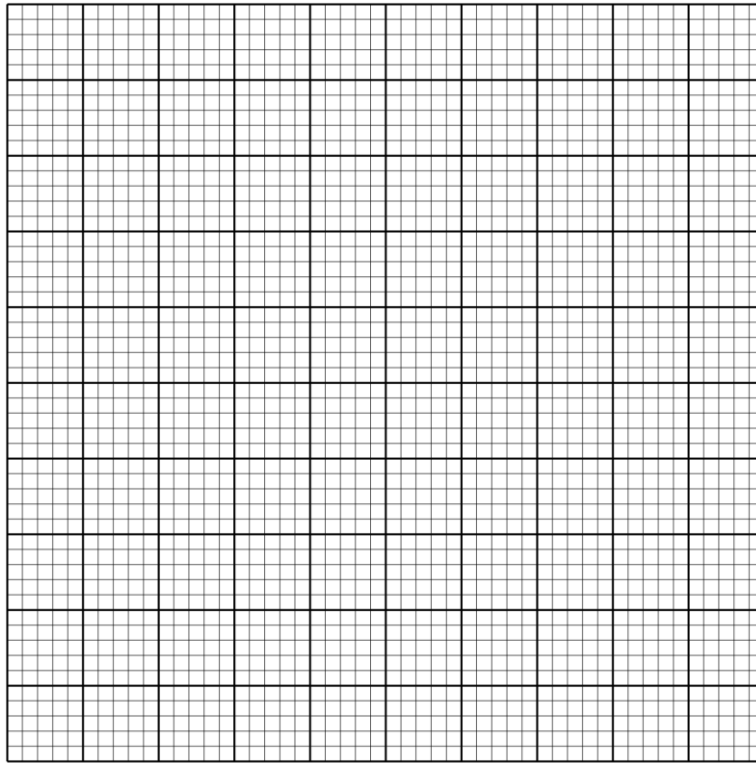
(b) Determine the rate of change between $t = 2.4$ s and $t = 13.2$ s. (2 marks)

12. (a) Expand $(2-x)^5$ up to the third term. (1 mark)

(b) Using the expansion in (a) above, find the constant k for which the coefficient of x in the expansion of $(k+x)(2-x)^5$ is -8. (2 marks)

13. The vertices of a quadrilateral MNPQ are $M(2,2)$, $N(6,2)$, $P(6,4)$ and $Q(2,8)$. A transformation matrix **K** maps quadrilateral MNPQ onto quadrilateral $M'N'P'Q'$ whose vertices are $M'(-2,2)$, $N'(-6,2)$, $P'(-6,4)$ and $Q'(-2,8)$. Find $\mathbf{K}^{-1}$, the transformation that maps $M'N'P'Q'$ onto MNPQ. (3 marks)

14. Three quantities A, B and C are such that A varies directly as B and as the square root of C. Given that A = 6 when B = 3 and C = 25, determine the value of A when B = 6 and C = 49. (3 marks)

15. A company is contracted to transport 12 000 bags of maize. The company has two types of trucks; P and Q. Type P can carry 200 bags of maize while type Q can carry 300 bags of maize per trip. The trucks are to make not more than 60 trips and type Q trucks are to make at most twice the number of trips made by type P trucks. By letting x to represent the number of trips made by type P trucks and y to represent the number of trips made by type Q trucks, write all the inequalities representing this information. (3 marks)

16. The velocity V m/s of a particle is given by the function $V = t^2 - t - 6$. Calculate the distance travelled by the particle between the times $t = 1$ and $t = 6$. (3 marks)

SECTION II (50 Marks)

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

17. A milling company imported two types of rice A and B for blending. The rice were packed in 50 kg bags. For every 3 bags of type A, the company used 5 bags of type B to blend.

(a) If a bag of type A costs Ksh 3 000 and a bag of type B costs Ksh 4 000. Determine:

    (i)   The cost of one bag of the mixture. (3 marks)

    (ii)   The selling price of a 2 kg packet of the mixture if 25% profit was to be realised.

         (2 marks)

(b) The milling company later on decided to mix the blend of type A and B rice with type C rice which costs Ksh 4 800 per 50 kg bag. Determine:

    (i)   The ratio of the mixture of the blend and type C rice that will cost Ksh 4 200 per bag.

         (2 marks)

    (ii)   The ratio of types A, B and C rice in the mixture. (3 marks)

18. A plot of land is in the shape of a parallelogram ABCD such that AB = 250 m, BC = 125 m and angle ABC $= 120^\circ$.

(a) Using a ruler and a pair of compasses only, and a scale of 1 cm to represent 25 m, construct the plot. (3 marks)

(b) A farmer intends to plant maize in the farm but is scared of monkeys. He decides to mount a giant scarecrow outside the plot such that it is equidistant from the vertices A, B and C. Locate the position of the scarecrow using letter Q. (2 marks)

(c) Locate a boundary P within the farm such that the area of APB $< 9\ 375$ m^2. (2 marks)

(d) A sprinkler is located at C such that the area within the plot that it can water is $2\ 566\frac{2}{3}$ m^2.

Locate the path R that can be traced by the sprinkler. Take π to be $\frac{22}{7}$. (3 marks)

19. Marks scored by students in a mathematics test were recorded in the table below.

Marks	$10-19$	$20-29$	$30-39$	$40-49$	$50-59$	$60-69$	$70-79$
Cummulative frequency	5	14	26	36	39	43	50

  (a) Determine the upper boundary of the modal class. (2 marks)

  (b) Using an assumed mean of 39.5, calculate the mean mark. (3 marks)

  (c) Estimate:

    (i)   Third decile. (2 marks)

    (ii)   The number of students who passed the test if pass mark was set at 43.5. (3 marks)

20. Mr Ondigo took a loan from ABC Bank amounting to Ksh 2 400 000 to buy a piece of land in Nairobi. The bank charged interest of 15% p.a. compounded after every four months.

(a) Giving your answers to the nearest Ksh 1 000, determine:

   (i)   The total interest to be repaid fully after 4 years.   (3 marks)

   (ii)   The amount owing after 3 years if Mr Ondigo made end yearly repayment of Ksh 840 000 each.   (4 marks)

(b) The land appreciated at 10% p.a. Mr Ondigo sold it through an agent who charged 8% commission on the sale value. If the land was sold at its fair value at the end of the fourth year, how much did Mr Ondigo receive from the agent?   (3 marks)

21. Two soccer teams A and B are to play at the same time.

    (a) List all the possible outcomes. (2 marks)

    (b) In a lottery game, Kevin wins when the two teams get the same outcome while Vyron wins when only one team wins. Represent this information in a tree diagram. (2 marks)

    (c) Using the tree diagram in (b) above, find the probability that:

        (i)   Both Kevin and Vyron win. (2 marks)
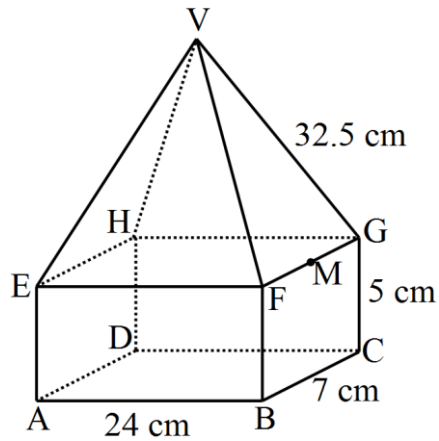
        (ii)   None of them wins. (2 marks)

   (iii)   At least one of them wins. (2 marks)

22. The figure below represents a model of a cottage with a rectangular base. $AB = 24$ cm, $BC = 7$ cm, $CG = 5$ cm and $VG = 32.5$ cm. M is the mid – point of FG.

(a) Calculate correct to **2** decimal places;

    (i)   The length AM.   (2 marks)

    (ii)   The angle between line EV and AC.   (2 marks)

    (iii)   The angle between planes VGF and EFGH.   (3 marks)

(b) Calculate the volume of the model.   (3 marks)

23. In the figure below, **OP** = **p** and **OQ** = **q**. R is the mid – point of PQ and **OM:MQ** = 2:3. **OR** and **PM** intersect at X.
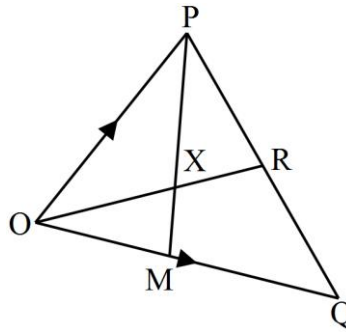
(a) Express the following vectors in terms of **p** and **q**.

(i)   **OR** (1 mark)

(ii)   **PM** (1 mark)

(b) If **PX** = t**PM** and **OX** = s**OR**, find the values of s and t. (5 marks)

(c) Show that O, X and R are collinear. (2 marks)
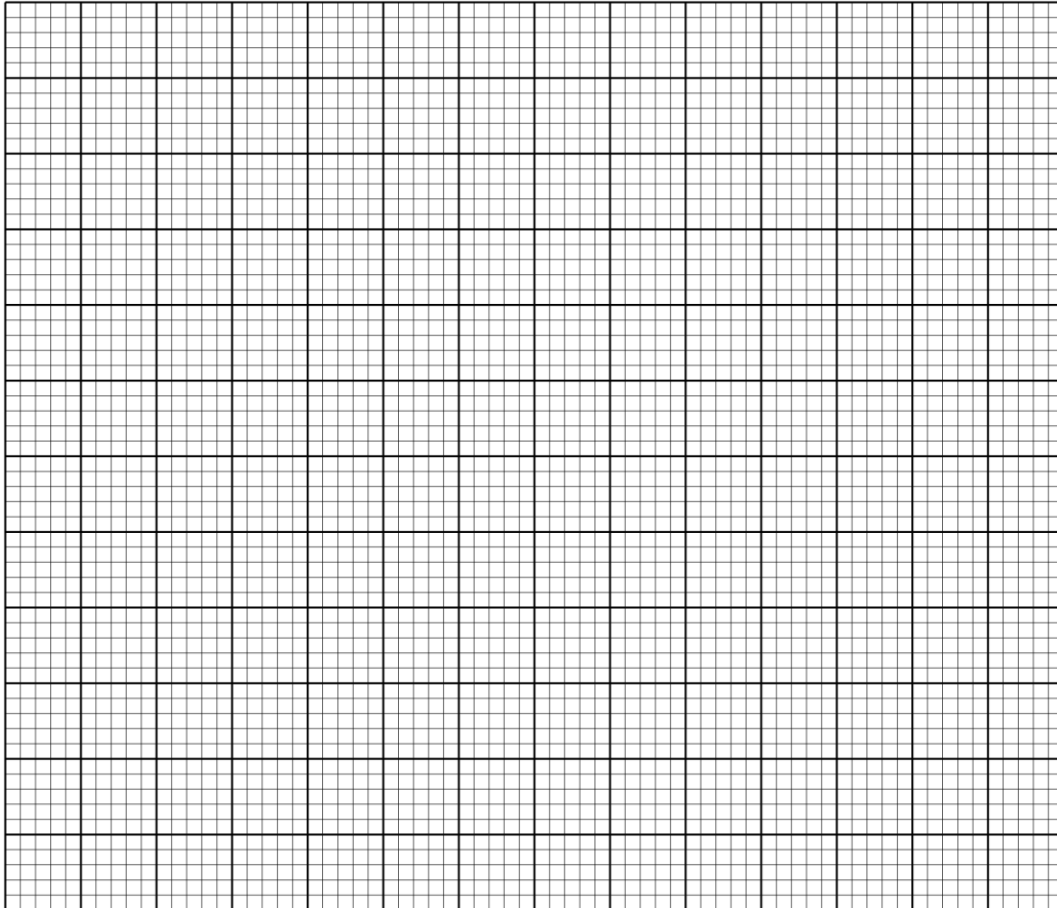
(d) State the ratio in which X divides PM. (1 mark)

24. (a) Complete the table below correct to 2 decimal places. (2 marks)

$x°$	0	15	30	45	60	75	90	105	120	135	150	165	180
$-2\cos 2x$		−1.73	−1.00				2.00		1.00			−1.73	−2.00
$3\sin\left(2x+30°\right)$	1.50					0				−2.60	−1.50		

(b) Using a scale of 1 cm for $15°$ on the x – axis and 2 cm for 1 unit on the y – axis, and on the same axes, draw the graphs of $y = 2\cos 2x$ and $y = 3\sin\left(2x+30°\right)$ for $0° \leq x \leq 180°$. (5 marks)

(c) Using the graph in (b) above, solve the equation $3\sin\left(2x+30°\right)+2\cos 2x = 0$. (2 marks)

(d) Find the range of values of x for which $3\sin\left(2x+30°\right) \leq -2\cos 2x$. (1 mark)

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