



MARANDA HIGH SCHOOL PRE-MOCK

121/2 — MATHEMATICS — Paper 2

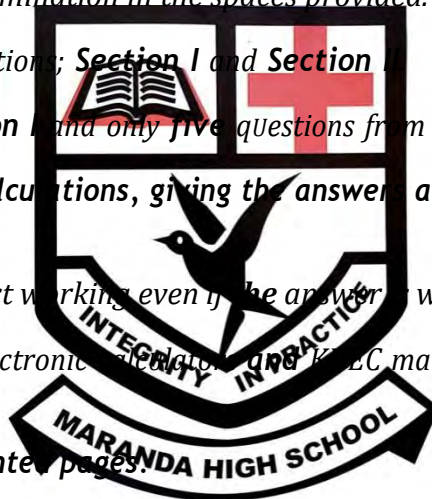
ALT A
Apr. 2023 – 2½ hours

Name: Admission Number:

Candidate's Signature: Stream: Date:

Instructions to Candidates

- (a) Write your name and admission number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided.
- (c) This paper consists of **two** sections; **Section I** and **Section II**.
- (d) Answer **all** questions in **Section I** and **only five** questions from **Section II**.
- (e) Show **all the steps** in your calculations, giving the answer 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 KLEC mathematical tables may be used, except where stated otherwise.
- (h) This paper consists of **17** 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**.



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 in the spaces provided.

1. State the Amplitude, the Period and the Phase angle of the function :

$$y = \frac{4}{3} \sin \left(\frac{1}{2}x + 15 \right)^0$$

(3 marks)

2. Three quantities P, Q and r are such that P varies directly as Q and Inversely as the fifth root of r. When P = 1.5, Q= 9 and r= 32. Determine the equation connecting P, Q and r. (3 marks)

3. Omollo intends to buy a plot of land which cost Ksh.1450000. He borrows the money from a financial institution that charges an interest rate of r% per annum compounded quarterly. Calculate the compound interest r% p.a if he payed back a sum os Ksh. 1836817 (3 marks)

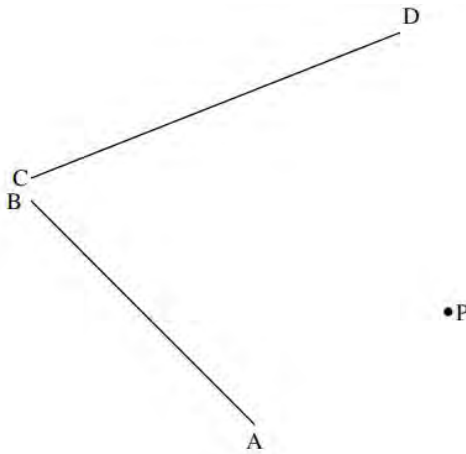
4. Given that O is the origin , $OA = 3i - 2j - 4k$ and $OB = 4i + 5j - 2k$. If a point X divides AB externally in the ratio 3 : -2. find AX (3 marks)

5. Without using calculators or mathematical tables, express in surd form and simplify.

$$\frac{\sqrt{52}}{2 - \cos 750^\circ}$$

(3 marks)

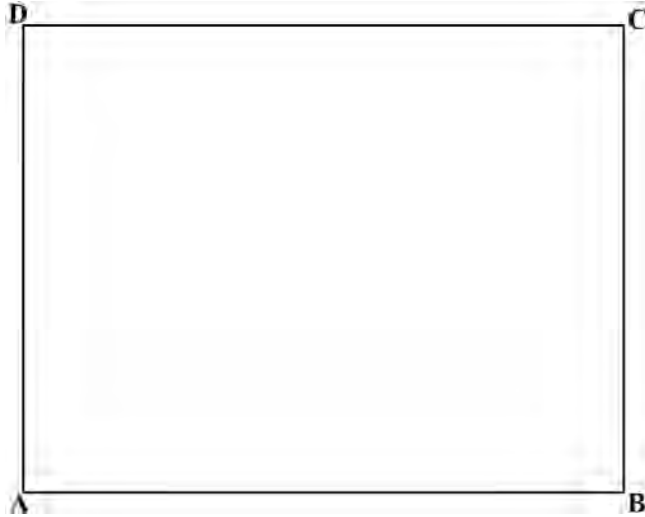
6. In the diagram below, AB and CD are chords of a circle. A point P is on the circumference of the circle.



- (a) Construct the circle. (3 marks)
- (b) Construct the tangent to the circle passing through point P. (1 mark)

7. Given the rectangle ABCD below, locate and shade a region within the rectangle in which a variable point P must lie given that P satisfies the following conditions:
- (i) $AP \geq BP$
 - (ii) $\angle APB \leq 90^\circ$
 - (iii) P is closer to DC than BC
 - (iv) $AP > 7 \text{ cm}$

(4 marks)



8. Use binomial expansion to simplify

(3 marks)

$$[\sqrt{3} + 5]^4 + [\sqrt{3} - 5]^4$$

9. The table below represents a relationship between two variables P and T, connected by the equation, $P = aT + b$ where a and b are constants.

T	0.1	0.2	0.3	0.4	0.5	0.6
P	6.2	5.6	4.8	4.0	3.4	2.7

On the grid provided draw the line of best fit for the data.

(3 marks)

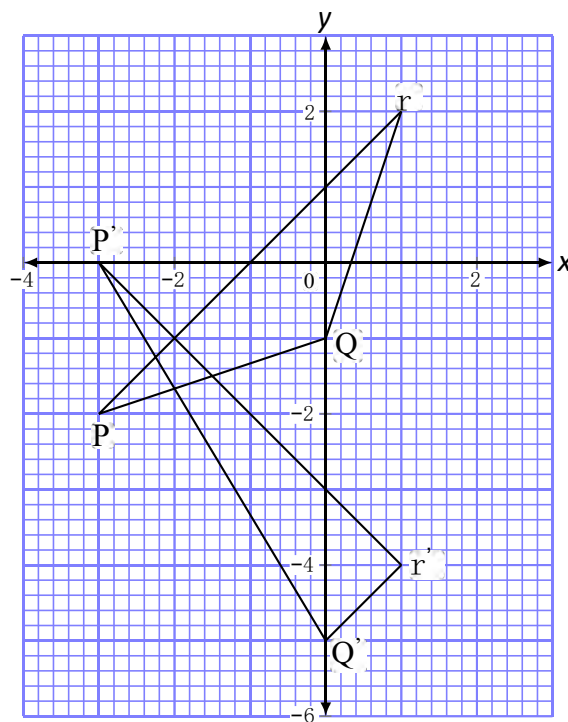


Use your graph to find the value of P when $T = 0$

(1 mark)

10. Solve without using mathematical tables or calculator
 $4 \sin^2(2x + 10^\circ) = 3$ for $0^\circ \leq x \leq 180^\circ$ (3 marks)
11. Nine students scored some marks in a random assessment test whose deviations from the mean were. $5, -2, 2, 1, z, -3, -2, -4, 0$. Given that, the mean of the scores is 13. Find z and the quartile deviation. (4 marks)
12. At Maranda High School, Magwa House can accommodate only 144 students, both junior and senior students. The number of junior students must be at least 90 while the number of seniors must be less than a third of the total capacity. Taking x to represent number of the junior students and y to represent the number of seniors, write down all the inequalities representing this information. (3 marks)

13. A coffee blender mixes two types of coffee, X which costs Ksh. 125 and Y which costs Ksh. 160. She sells the mixture at Ksh. 182.5 thereby making a profit of 25%. Find the ratio X:Y at which she mixed the two types of coffee. (3 marks)
14. Truncate 3645986 correct to 3 significant figures. Hence calculate the percentage error arising from the truncation. (2 marks)
15. On the grid below, triangle P'Q'R' is the image of triangle PQR under a certain transformation. Describe the transformation. (2 marks)



16. Find the radius and the co-ordinates of the centre of the circle whose equation is $\frac{1}{2}x^2 + \frac{1}{2}y^2 = 3x - 5y - 9$ (3 marks)

SECTION II(50 marks)

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

17. (a) A fair tetrahedron with faces marked 1,2,3 and 4 and a fair die are tossed together and the difference of the faces showing up recorded. By taking x and y to represent faces on the tetrahedron and die respectively,
- (i) Draw a possibility space to show the possible outcomes. (2 marks)
- (ii) Find the probability that $|x - y| \geq 3$ (1 mark)
- (b) The probabilities of three football teams A,B and C winning their first match in CECAFA championships are $\frac{3}{5}$, $\frac{7}{10}$ and $\frac{2}{5}$ respectively. Using a tree diagram, find the probability that:
- (i) None of the teams win their first match; (2 marks)
- (ii) At least two teams win their first match; (3 marks)
- (iii) At most one team wins its first match. (2 marks)

18. The income tax rates in a certain year are as shown below.

Monthly Income (in Ksh.)	Tax rate in each shilling (%)
0 – 10164	10
10165 – 19740	15
19741 – 29316	20
29317 – 38892	25
38893 and above	30

Mwenda pays Ksh. 8234 as P.A.Y.E per month. He has a monthly house allowance of Ksh. 10500 and is entitled to a personal relief of Ksh. 1162 per month. Determine:

- a). (i) his gross tax per month; (2 marks)

- (ii) his monthly taxable income; (4 marks)

- (iii) his basic salary per month (2 marks)

- b). If the second tax bracket was expanded by 25% Calculate his new P.A.Y.E (2 marks)

19. The table below shows distribution of marks scored by 82 students in a Mathematics test.

Marks	1 – 10	11 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 – 80	81 – 90	91 – 100
Frequency(f)	3	5	5	9	11	15	14	8	6	4

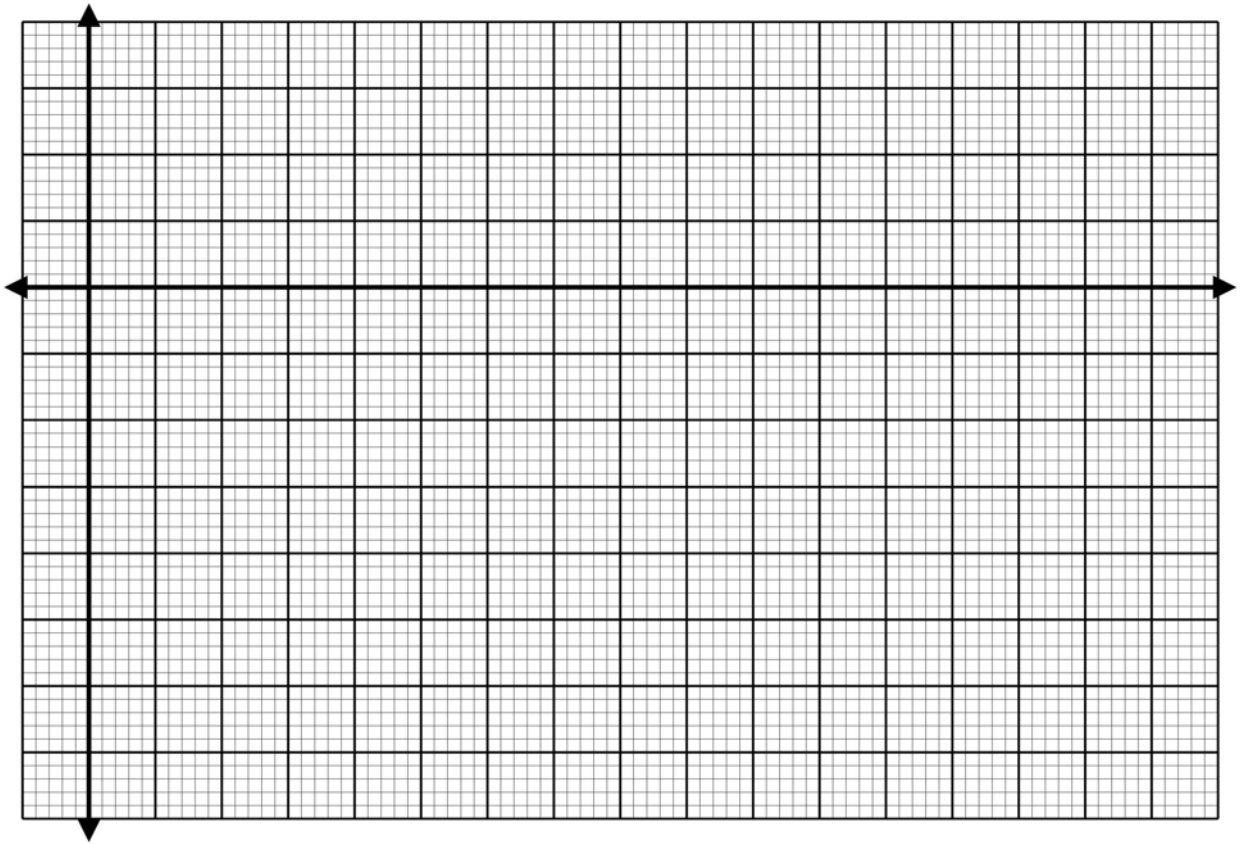
- a). Using an assumed mean of 55.5 calculate
- i). mean mark (3 marks)
- ii) the standard deviation; (3 marks)
- b). Find the number of students who scored 73% and above (2 mark)
- c) if each students was added 5 marks determine the new mean and the standard deviation (2marks)

20. (a) Complete the table below for the equation $y = \sin x$ and $y = \cos x - \sin x$ correct to 2 decimal places.

(2 marks)

x°	0°	$\frac{1\pi^\circ}{6}$	$\frac{1\pi^\circ}{3}$	$\frac{1\pi^\circ}{2}$	$\frac{2\pi^\circ}{3}$	$\frac{5\pi^\circ}{6}$	π°	$\frac{7\pi^\circ}{6}$	$\frac{8\pi^\circ}{6}$
$y = \sin x$	0.00		0.87			0.50		-0.50	
$y = \cos x - \sin x$		0.37		-1		-1.37			0.37

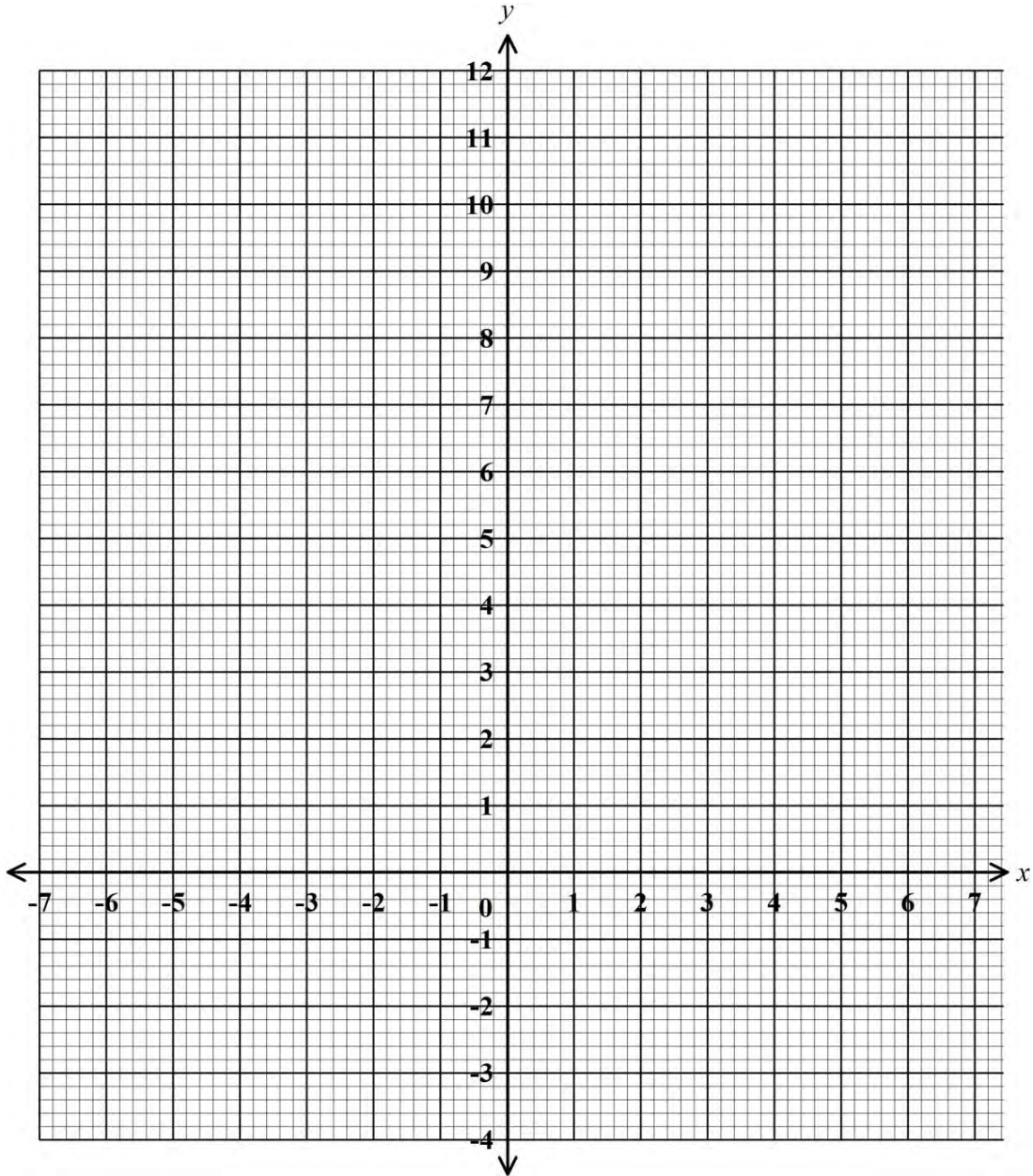
- (b) On the graph provided, draw a graph of $y = \sin x$ and $y = \cos x - \sin x$ for $0^\circ \leq x \leq \frac{8\pi^\circ}{6}$. Use 2 cm to represent $\frac{1\pi^\circ}{6}$ on the x-axis and 4 cm to represent 1 unit on the y-axis (4 marks)



- (c) Use the graph in (b) above to:
- (i) solve the equation $\cos x = 2 \sin x$ (2 marks)
- (ii) find the range of x for which $\cos x - \sin x \leq -1$ (2 marks)

21. The positions of two points A and B are, A(40°N , 121°W) and B(40°N , 59°E).
- a. Calculate the distance between A and B along a circle of latitude in nautical miles. (3 marks)
- b. Another point C is on (25°N , 59°E) An aircraft leaves A at 8.30 am on Sunday and flies to C through the North Pole at a speed of 200 knots.
- i) Calculate the distance from A to C in nautical miles; (3 marks)
- ii) Determine the local time at C when the aircraft left A; (2 marks)
- iii) Determine the time and day the aircraft will arrived at C. (2 marks)

22. Triangle ABC has vertices A(3, -2) B(4, 3) and C(-3, 3). On the grid provided below, draw triangle ABC. (1 mark)



- (a) Point A is mapped on to A'(3, 4) by a shear y-axis invariant. On the grid above, draw triangle A'B'C' under the shear. (2 marks)

- (b) Determine the matrix representing the shear (2 marks)

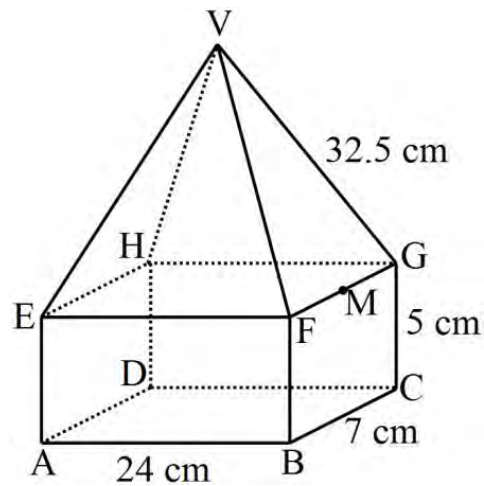
(c) Triangle $A'B'C'$ is mapped onto triangle $A''B''C''$ by the transformation matrix $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$

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

(ii) Draw triangle $A''B''C''$ (1 mark)

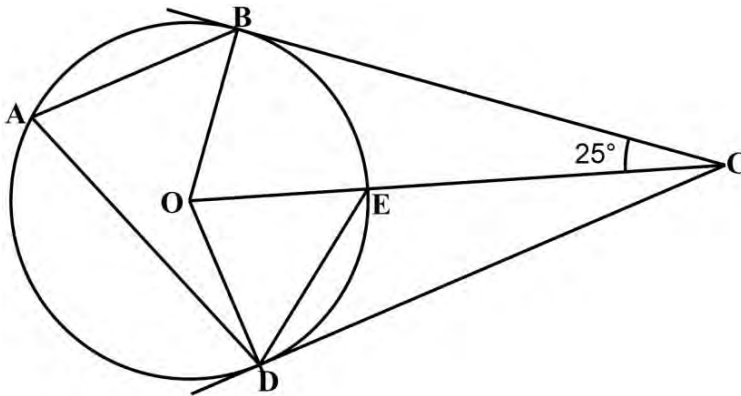
(d) Find a single matrix that maps triangle $A''B''C''$ onto triangle ABC (2 marks)

23. 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)
- (iii) The angle between line EV and AC . (2 marks)
- (iv) The angle between planes VGF and $EFGH$. (3 marks)
- (b) Calculate the volume of the model. (3 marks)

24. In the figure below, O is the centre of the circle. BC and DC are tangents to the circle. $\angle BCO = 25^\circ$. OEC is a straight line.



Find the value of the following angles, stating the reason in each case:

(i) $\angle BOC$ (2 marks)

(ii) $\angle OED$ (2 marks)

(iii) $\angle CDE$ (2 marks)

(iv) $\angle BED$ (2 marks)

(v) Reflex $\angle DAE$ (2 marks)

THIS IS THE LAST PRINTED PAGE