Name..... F2 M·S ..... ADM. Number: .....

School: ..... Candidate's Signature .....

121
Mathematics Alt. A
FORM TWO.
22ND MARCH 2023.
2 ½ Hours.

URANGA MATHEMATICS ASSOCIATION-2023.

Kenya Certificate of Secondary Education

MATHEMATICS
121
FORM TWO
TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your name, school, admission number and sign in the spaces provided above.
- This paper contains **TWO** sections: Section **I** and Section **II**.
- Answer **ALL** the questions in Section **I** and **FIVE** questions from section **II**.
- All answers and working **MUST** be written on the question paper in the spaces provided below each question.
- Marks may be given for correct working even if the answer is wrong.
- Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.

FOR EXAMINERS 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

This paper consists of 14 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A: 50 MARKS

Answer ALL the questions in the spaces provided

1. Add one thousand and fourty four to the product of one thousand and six and one hundred And eighty. (3 marks)

$1006 \times 180 = 181080$ ——— M_1

$1044 + 181080$ ——— M_1

$182,124$ ——— A_1

2. Find the value of x, which satisfies the equation.

$16^{x^2} = 8^{4x-3}$ (3 marks)

$2^{4(2x)} = 2^{3(4x-3)}$ ——— M_1

$8x = 12x - 9$ ——— M_1

$-4x = -9$

$x = 9/4$ OR $2\frac{1}{4}$ ——— A_1

3. Evaluate; (3 marks)

$14 \div \frac{1}{3} of\ 5\frac{1}{4} - 3\frac{3}{4} \times 1\frac{1}{3}$

$\left(14 \div \left(\frac{1}{3} of \frac{21}{4}\right)\right) - \left(\frac{15}{4} \times \frac{4}{3}\right)$

$8 - \left(\frac{15}{4} \times \frac{4}{3}\right)$ ——— M_1

$8 - 5$ ——— M_1

3 ——— A_1

4. Find the length of a square whose diagonal is 8cm to one decimal place (3 marks)

$L^2 + L^2 = 8^2$

$2L^2 = 64$ —— M_1

$L^2 = 32$

$L = 5.6568$ —— A_1

$L = 5.7$ —— B_1

5. A four digit number is formed from the first four prime numbers.

(a) Write down the number formed (1 mark)

2357 —— B_1

(b) Divide the number by 3 and leave your answer to two decimal places

$2357 \div 3 = 785.666^{\cdot}$ —— M_1 (2marks)

$= 785.67$ —— A_1

6. Express the following recurring decimal as a fraction $0.\dot{1}45\dot{3}$ (3 marks)

$n = 0.1453$

$10000n = 1453.1453$ —— M_1

$\frac{9999}{9999} n = \frac{1453}{9999}$ —— M_1

$n = \frac{1453}{9999}$ —— A_1

7. A church service lasted 2 hours 35 minutes. What time did it start if it ended at 12.15 p.m? Express your answer in 24 – clock system. (3 marks)

12:15
− 2:35 } ——— M_1

9:40 a.m ——— A_1

0940 HRS ——— B_1

8. Use tables of squares and square roots to evaluate; (3 marks)

$11.98^2 + \sqrt{231.5}$

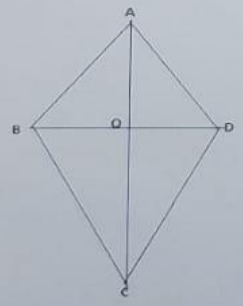
$(1.198 \times 10^1)^2 \rightarrow 1.434 \times 10^2 = 143.4$

$\sqrt{231.5} \rightarrow \sqrt{2.315 \times 10^2} \rightarrow 1.5215 \times 10^1 = 15.215$ } B_1

$143.4 + 15.215$ ——— M_1

$= 158.615$ ——— A_1 C.A.O

9. The figure below represents a kite ABCD, AB = AD = 15cm. The diagonals BD and AC intersect at O, AC = 30cm and AO = 12cm.



Find the area of the kite. (3 marks)

BO OR OD $= \sqrt{15^2 - 12^2} = 9$ } ——— M_1

$\therefore$ BD = 18 cm

$(\frac{1}{2} \times 18 \times 12) + (\frac{1}{2} \times 18 \times 18)$ ——— M_1

270 cm^2 ——— A_1

10. Using logarithm tables evaluate; (4 marks)

$$\sqrt[2]{\frac{4.684 \times 2.497}{0.3465}}$$

NO	LOG
4.684	0.6706
2.497	0.3975 +
	1.0681
3.465	0.5397 −
	0.5284 ÷ 2
	0.2642
1.838 ←	Antilog

B_1 All logs
B_1 + −
B_1 ÷2
B_1 Antilog to obtain 1.838

11. A straight line L passes through the point (3, -2) and is parallel to a line whose equation is $2y - 4x = 1$. Find the equation of line L in the form $y = mx + c$. (3 marks)

$y = 2x + \frac{1}{2}$

$M_1 = 2$

$\therefore M_2 = 2$ ——— M_1

$\frac{y+2}{x-3} = 2$ ——— M_1

$y = 2x - 8$ ——— A_1

12. A square room is covered by a number of whole rectangular slabs of sides 60cm and 42cm. Calculate the least possible area of the room in square metres. (4 marks)

2	60	42
2	30	21
3	15	21
5	5	7
7	1	7
	1	1

M_1

$2^2 \times 3 \times 5 \times 7 = 420$

A_1

$420 \times 420 = 176400$

M_1

$= 17.64\ m^2$

A_1

13. Write the following as a single fraction (3 marks)

$\frac{(2x+1)}{4} - \frac{2x-1}{3}$

$\frac{6x+3-8x+4}{12}$ ——— $M_1 M_1$

$\frac{7-2x}{12}$ ——— A_1

14. An American tourist arrived in Kenya with 1000 US $ and converted the whole amount in Kenya shillings. He spent sh 40,000 and changed the balance to sterling pound before leaving for United Kingdom. A Kenyan bank buys and sells foreign currencies as shown.

	Buying (in Kshs)	**Selling (in Kshs)**
1 US dollar	84.2083	84.3806
1 Sterling Pound	134.7941	135.1294

Calculate the amount he received to the nearest sterling pound. (3 marks)

$(84.2083 \times 1000) - 40000$ ——— M_1

$44208.3 \div 135.1294$ ——— M_1

327.1553045

327 sterling Pounds ——— A_1

15. By how much is the product of $^{9}/_{5}$ and $8^{1}/_{4}$ greater than 5? (3 marks)

$\frac{9}{5} \times \frac{33}{4} = \frac{297}{20} = 14\frac{17}{20}$ ——— M_1

$\frac{297}{20} - \frac{5}{1}$ ——— M_1

$= 9\frac{17}{20}$ ——— A_1

16. A square based brass plate is 2mm high and has a mass of 1.05kg. The density of the brass is 8.4g/cm^3. Calculate the length of the plate in centimeters. (3 marks)

$V = \frac{1050}{8.4} = 125\ cm^3$ ——— M_1

$l^2 \times 0.2\ cm = 125\ cm^3$

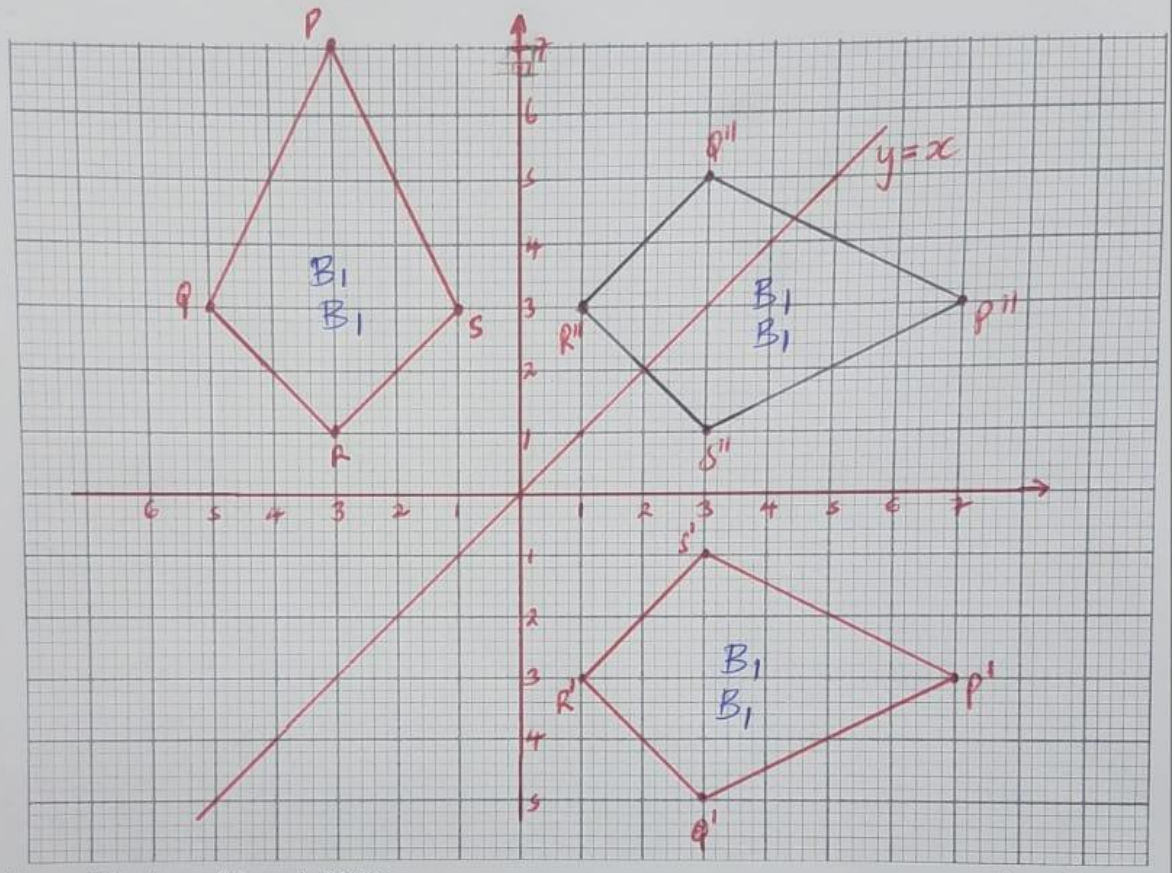
$l^2 = 625$ ——— M_1

$l = 25\ cm$ ——— A_1

SECTION B: 50 MARKS

Answer ANY FIVE questions only in this section

17. Plot points P(-3,7), Q (-5,3),R (-3,1) and S (-1,3) (2 marks)



i) What type of figure is PQRS (1 mark)

Kite B_1

ii) Reflect figure PQRS in the line y = x and find the co-ordinates. (3 marks)

P'(7,-3) Q'(3,-5) R'(1,-3) S'(3,-1) B_1

iii) Reflect figure P'Q'R'S' on the x axis and find the co-ordinates of the second image (3 marks)

P''(7,3) Q''(3,5) R''(1,3) S''(3,1) B_1

iv) State the congruency of figure PQRS and P''Q''R''S'' (1 mark)

direct congruency B_1

18. Jane is a sales executive earning a salary of Ksh. 20,000 and a commission of 8% for the sales in excess of Ksh 100,000. If in January 2010 she earned a total of Ksh.48, 000 in salaries and commissions.

a) Determine the amount of sales she made in that month (4 marks)

$48000 - 20,000 = 28000$ ——— M_1

$\frac{100}{8} \times 28000 = 350000$ ——— M_1

$350000 + 100,000$ ——— M_1

Ksh. 450,000 ——— A_1

=

b) If the total sales in the month of February and March increased by 18% and then dropped by 25% respectively. Calculate

i. Jane's commission in the month of February (3 marks)

$\frac{118}{100} \times 450000 = 531000$ ——— M_1

$(531000 - 100,000) \times \frac{8}{100}$ ——— M_1

$=$ Ksh. 34,480 ——— A_1

ii. Her total earning in the month of March (3 marks)

$\frac{75}{100} \times 531000 = 398250$ ——— M_1

$(398250 - 100,000) \times \frac{8}{100} + 20000$ ——— M_1

Ksh. 43,860 ——— A_1

19 A line L passes through point (-2,3) and (-1, 6) (3marks)

a) Find the equation of L.

$M = \frac{6-3}{-1+2} = 3$ ——— M_1

$\frac{y-3}{x+2} = 3$ ——— M_1

$y = 3x + 9$ ——— A_1

b) Find the equation of line P which is perpendicular to line L and meets P at (-1, 6). (3marks)

$M_1 = 3$

$M_2 = -\frac{1}{3}$ ——— B_1

$\frac{y-6}{x+1} = -\frac{1}{3}$ ——— M_1

$y = -\frac{1}{3}x + \frac{17}{3}$ ——— A_1

c) Given that another line Q is parallel L and passes through point (1, 2), find the x and the y intercepts of line Q. (2marks)

$M_1 = M_2 = 3$

$\frac{y-2}{x-1} = 3$

$y = 3x - 1$

x intercept is $\frac{1}{3}$ ——— B_1

y intercept is -1 ——— B_1

d) Find the point of intersection of lines P and Q. (2marks)

Line P: $3y + x = 17$

Line Q: $y - 3x = -1$

By elimination

$3y + x = 17$

$3y - 9x = -3$ } ——— M_1

$10x = 20$

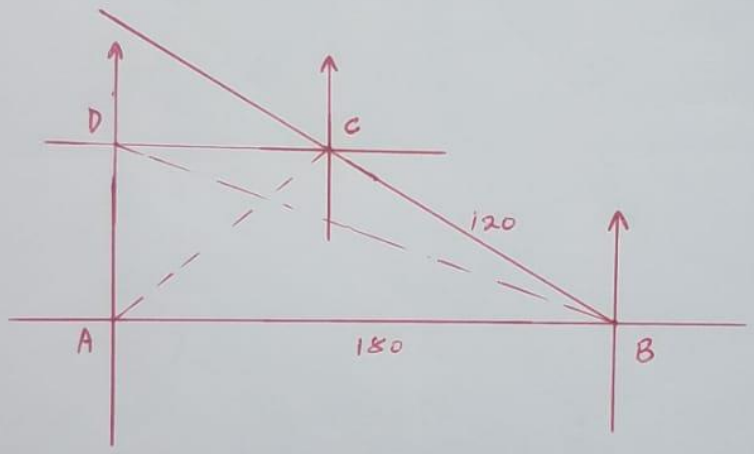
$x = 2$.

$y = 5$

$(2, 5)$ ——— A_1

20. Four towns A, B, C and D are such that town B is 180 km East of A. Town C is at a distance of 120km on a bearing of 300^0 from B. Town D is due West of C and North Of A.

(a) Using a scale of 1cm to represent 20km, make an accurate scale drawing to show the relative positions of the towns. (4 marks)



S_1

B_1 for B

B_1 for C

B_1 for D

(b) Find:

(i) Determine the bearing of C from A (1mark)

$051^\circ \pm 2^\circ$ B_1

(ii) Determine the distance of C from D (2 marks)

(3.8×20)

$76km \pm 2km$ $B_1 B_1$

(iii) Determine the bearing of B from D (1 mark)

$108^\circ \pm 2^\circ$ B_1

(iv) Determine the distance of A from D (2 marks)

(3.1×20)

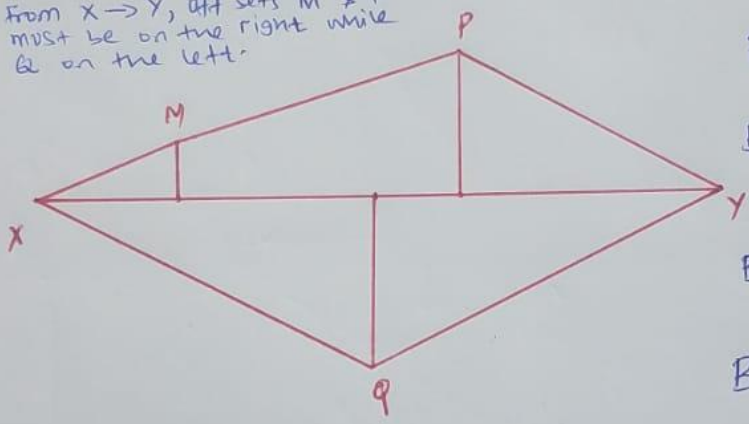
$62km \pm 2km.$ $B_1 B_1$

21. The measurements (in metres) of a field were given in a field note book as follows:
Base line XY = 240m

	Y	
	150	50 to P
To Q 60	120	
	50	20 to M
	X	

(a) Using a scale of 1 cm to represent 20 m, draw an accurate map of the farm. (4marks)

NOTE: From X → Y, off sets M & P must be on the right while Q on the left.



B_1 Line XY=12cm

B_1 Off-sets M & P to the ~~Right~~ of XY

B_1 Off set Q to the left of XY

B_1 Map XMPYQ

(4marks)

(b) **Find** the area of the field in hectares.

$\frac{1}{2} \times 20 \times 50 = 500\ m^2$
$\frac{1}{2}(20+50) \times 100 = 3500\ m^2$ } M_1

$\frac{1}{2} \times 50 \times 90 = 2250\ m^2$
$\frac{1}{2} \times 120 \times 60 = 3600\ m^2$
$\frac{1}{2} \times 60 \times 120 = 3600\ m^2$ } M_1

$13450\ m^2$ —— M_1
$10,000$

1·345 Hectares —— A_1

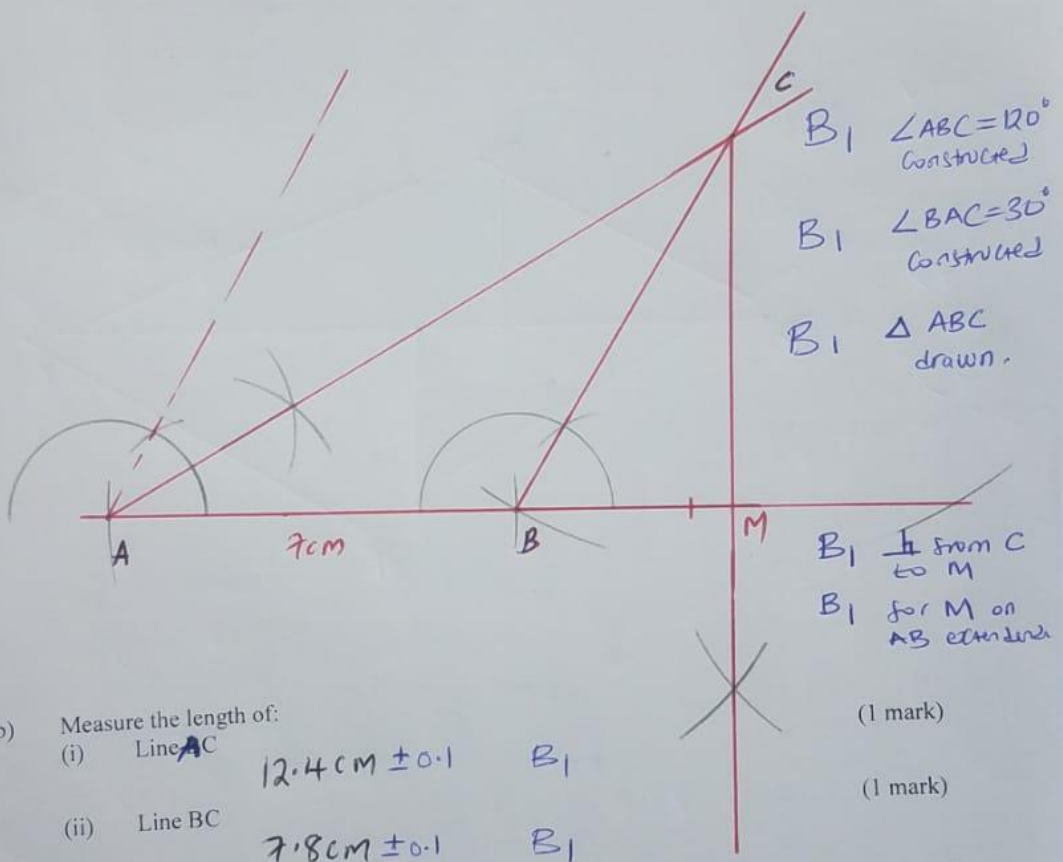
(c) If the farm is on sale at sh. 900 000 per hectare, find how much the farm costs. (2 marks)

$900,000 \times 1{\cdot}345$ —— M_1

$= Sh.\ 1,210,500.$ —— A_1

22. Triangle ABC is such that AB = 7cm, angle ABC = 120^0 and angle BAC = 30^0. (3marks)

(a) Using a ruler and a pair of compass only, construct triangle ABC.



B_1 $\angle ABC = 120^0$ Constructed

B_1 $\angle BAC = 30^0$ Constructed

B_1 Δ ABC drawn.

B_1 $\frac{1}{2}$ from C to M

B_1 for M on AB extended

(b) Measure the length of: (1 mark)

(i) Line AC 12.4cm ± 0.1 B_1

(1 mark)

(ii) Line BC 7.8cm ± 0.1 B_1

(c) Drop a perpendicular from C to meet line AB extended at M. (2 marks)

(d) Measure the length of line CM (1 mark)

6.3cm ± 0.1 B_1

(e) Calculate the area of triangle ABC (2 marks)

$(\frac{1}{2} \times 7 \times 12.4 \sin 30)$ or $\frac{1}{2} \times 6.3 \times 7$ M_1

21.7cm^2 A_1 22.05cm^2 ± 0.4

23. A hollow metal pipe whose internal and external and internal diameters are 6.3cm and 2.8cm respectively is 3.5m long.

(a) Calculate the volume of the metal used to make the pipe. (4 marks)

$\frac{22}{7} \times 3.15^2 \times 350 - \frac{22}{7} \times 1.4^2 \times 350$ M_1 M_1

$10914.75 - 2156$ —— M_1

$= 8758.75\ cm^3$ —— A_1

(b) The pipe is melted down and recast into a solid cylinder of height 1.75m. Calculate the radius of the cylinder to two decimal places. (4 marks)

$V_{Pipe} = V_{cylinder} = 8758.75\ cm^2$

$\frac{22}{7} \times 175 \times r^2 = 8758.75$ —— M_1

—— M_1

$r^2 = 15.925$

$r = 3.9906$ —— A_1

$= 3.99\ cm$ or $0.04m$ —— B_1

(c) Given that the density of the metal above is $4.2g/cm^3$, calculate the mass of the solid cylinder in kilograms. (2 marks)

4.2×8758.75 —— M_1

$36786.75\ g$

$36.78675\ kg$ —— A_1

24. Three business people Kamau, Gachui and Maina agreed to contribute Kshs. 1 210 000 to start a business. The ratio of Kamau's contribution to Gachui's contribution is 3 : 2 while that of Gachui to Maina is 1 : 3.

(a) Determine the ratio of Kamau's contribution to Maina's contribution. (2 marks)

K : G : M

(3 : 2
1 : 3) } —— M_1

K : G : M
3 : 2 : 6

1 : 2 —— A_1

(b) Determine the amount of money contributed by Kamau (2 marks)

$\frac{3}{11} \times 1210000$ —— M_1

= KSh. 330,000 —— A_1

(c) They agreed to share their profits as follows;
50% to be shared in the ratio of their contributions
40% to be retained for the running of the business
10% to be set aside for emergencies

If their total profit for the year 2014 was sh.704 000, determine the

(i) Amount of money retained for running the business. (2 marks)

$\frac{40}{100} \times 704000$ —— M_1

Sh. 281600 —— A_1

(ii) The amount of money set aside for emergencies. (2 marks)

$\frac{10}{100} \times 704000$ —— M_1

Sh. 70,400 —— A_1

(iii) The amount of received by Gachui (2 marks)

$\frac{50}{100} \times 704000 = 352,000$

$\frac{2}{11} \times 352000$ —— M_1

= Sh. 64,000 —— A_1