

ACK DIOCESE OF MUMIAS SECONDARY SCHOOLS
Kenya Certificate of Secondary Education

121/1

Paper 1

MATHEMATICS
ALT. A
SEPTEMBER. 2022 – 2¹/₂ hours

Name: **Index Number:**

Student's Signature: **Date:** **Class:**.....

Instructions to candidates

- (i) Write your name, Index number and class in the spaces provided above.
- (ii) Sign and write the date of examination in the spaces provided above.
- (iii) This paper consists of **two** sections: **Section I** and **Section II**.
- (iv) Answer **all** the questions in **Section I** and only **five** questions from **Section II**.
- (v) **Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.**
- (vi) Marks may be given for correct working even if the answer is wrong.
- (vii) **Non – programmable** silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
- (viii) This paper consists of 16 printed pages. **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (ix) **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 2

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 calculator evaluate: $7\frac{3}{5} - \frac{1}{3}\left(1\frac{1}{4} + 3\frac{1}{3}\right) \times 2\frac{2}{5}$. (3 marks)

2. Lessons in Nyamasaria and Kasagam Secondary schools take 30 minutes and 40 minutes respectively. The two bells ring simultaneously at 7.50 a.m. How many times will they ring together again between 7.50 a.m. and 3.00 p.m. (3 marks)

3. Use table of squares and square roots to find the value of $x = \sqrt{0.0472^2 + 0.1236^2}$ (3 marks)

4. A straight line L_1 whose equation is $3y - 2x = -2$ meets the x - axis at R. Determine the

5. Given that $\tan\alpha=0.75$, without using mathematical tables or calculator find $\cos(90-\alpha)$.

(2 marks)

6. A Kenyan company received M Us dollars. The money was converted into Kenya Shillings in a bank which buys and sells foreign currencies as shown below.

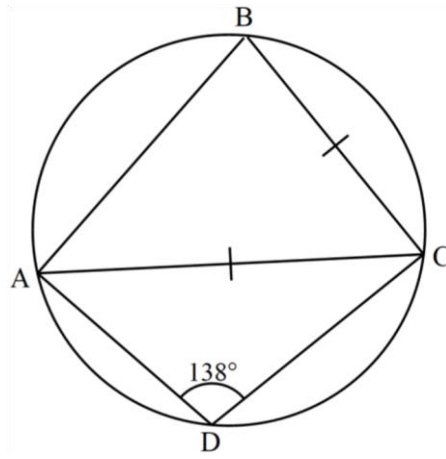
	Buying (Kshs)	Selling (Kshs)
1 Sterling Pound	125.78	126.64
1 US Dollars	75.66	75.86

- (a) If the company received Kshs.15, 132, 000, calculate the amount, M Us Dollars.

(2 marks)

- (b) The company exchanged the above Kenyan shillings into Sterling pounds to buy a car in Britain. Calculate the cost of the car to the nearest Sterling Pound. (2 marks)

7. In the figure below, A, B, C and D are points on the circumference. Chord BC = AC and angle ADC = 138° .



Giving reasons, calculate the size of angle ACB. (3 marks)

8. (a) Using a ruler and a pair of compasses only, construct a quadrilateral PQRS in which $PQ = 5$ cm, $PS = 3$ cm, $QR = 4$ cm, $\angle PQR = 135^\circ$ and Angle SPQ is a right angle. (2 marks)

- (b) The quadrilateral PQRS represents a plot of land drawn to a scale 1:4000. Determine the actual length of RS in meters. (2 marks)

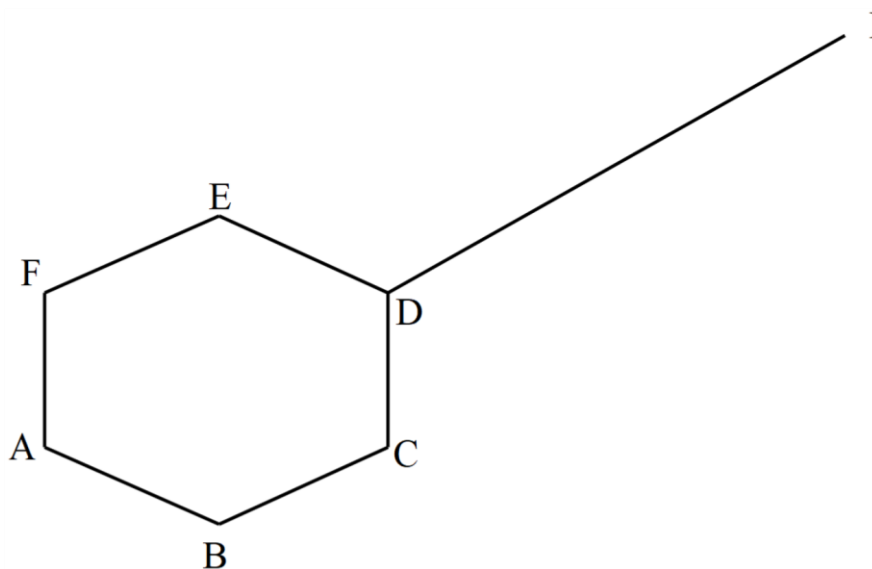
9. Find the ratio a:c if $a:b = 2:5$ and $b:c = 2:3$. (2 marks)

10. Simplify the expression: $\frac{2p^2 - 3p - 5}{4p^2 - 25}$

(3 marks)

11. In the figure below ABCDEF is a uniform cross – section of a solid. Given that DI is one of the visible edges of the solid, complete the sketch showing the hidden edges with broken lines.

(3 marks)



12. Given the inequalities $2x - 3 \leq 4x + 7 < x + 13$, solve the inequalities and represent the solution on a number line.

(3 marks)

13. The position vector of points A and B are $-10\mathbf{i} - 6\mathbf{j} + 9\mathbf{k}$ and $-5\mathbf{i} + \mathbf{k}$ respectively.
Calculate $|\mathbf{AB}|$ leaving your answer in surd form. (3 marks)

14. Two numbers p and q are such that $p^3 \times q = 135$, find p and q . (3 marks)

15. A circle centre O has the equation $x^2 + y^2 = 4$. The area of the circle in the first quadrant is divided into five vertical strips each of width 0.4 cm.

- (a) Use the equation of the circle to complete the table below for values of y correct to two decimal places. (1 mark)

x	0	0.4	0.8	1.2	1.6	2.0
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y	2.00			1.60		0.00
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(b) Use trapezium rule to estimate the area of the circle.

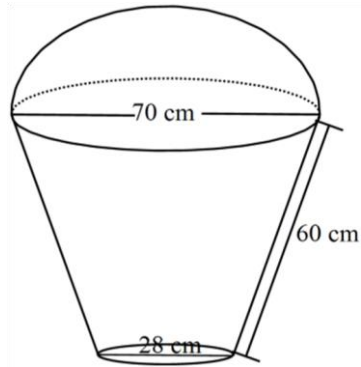
(3 marks)

16. Four interior angles of an irregular polygon are each 155° , while the rest are each 160° . Find the number of sides of the polygon. (3 marks)

SECTION II (50 Marks)

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

17. The figure below represent a model of a solid structure in the shape of a frustum of a cone with hemispherical top. The diameter of hemispherical part is 70 cm and is equal to the diameter of the frustum. The frustum has a base diameter of 28 cm and a slant height of 60 cm.



Calculate:

- (a) The area of the hemispherical surface. (2 marks)

- (b) The slant height of the cone from which the frustum was cut. (3 marks)

- (c) The total surface area of the model. (5 marks)

18. A matatu and Nissan left town A for town B 240 km away at 8:00 a.m. travelling at 90 km/hr and 120 km/hr respectively. After 20 minutes the Nissan had a puncture which took 30 minutes to mend.

- (a) At what time did the Nissan catch up with the matatu? (5 marks)

(b) How far from town A did the Nissan catch up with the matatu? (2 marks)

(c) At what time did the matatu reach town B? (3 marks)

19. A number of people are asked to cut 20 cm length of string without measuring. Later 100 cm pieces are collected and measured correct the nearest 0.1 cm. The data below was obtained.

Length	18.0 – 18.4	18.5 – 18.9	19.0 – 19.4	19.5 – 19.9	20.0 – 20.4	20.5 – 20.9	21.0 – 21.4	21.5 – 21.9
Frequency	5	8	30	x	10	20	10	4

(a) Find :

(i) The value of x . (1 mark)

(ii) The modal class. (1 mark)

(b) Calculate:

(i) The mean. (4 marks)

(ii) The median. (4 marks)

20. Four cities A, B, C and D are such that town B is 1500 km due East of town A. Town C is 1800 km due North of town B. Town D is on a bearing of 330° from town A and on a bearing of 300° from C.

(a) Use a ruler and compasses only to show the position of town A, B, C and D. (Take a scale of 1 cm = 300 km). (5 marks)

(b) Determine:

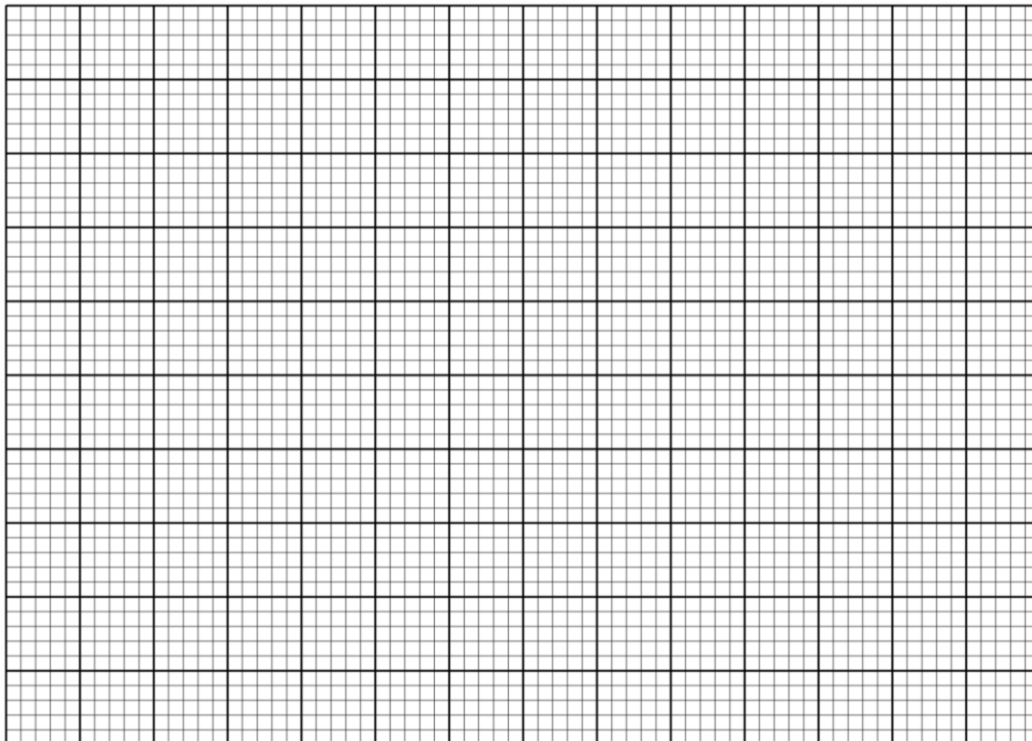
(i) The distance AD. (2 marks)

(ii) The distance CD. (2 marks)

(iii) The bearing of town D from town B. (1 mark)

21. The vertices of triangle PQR are P(0,0), Q(6,0) and R(2,4) .

(a) Draw triangle PQR on the grid provided. (1 mark)



(b) Triangle P'Q'R' is the image of a triangle PQR under an enlargement scale factor $\frac{1}{2}$ and centre (2,2). Write down the coordinates of triangle P'Q'R' and plot on the same grid.

(3marks)

(c) Draw triangle P''Q''R'' the image of triangle P'Q'R' under a positive quarter turn about point (1,1). (2 marks)

(d) Draw a triangle P'''Q'''R''' the image of triangle P''Q''R'' under reflection in the line $y = 1$. (2 marks)

(e) Describe fully a single transformation that maps triangle P'''Q'''R''' onto triangle P'Q'R'. (2 marks)

22. (a) Find the inverse A^{-1} of the matrix: $A = \begin{pmatrix} 4 & 3 \\ 3 & 2 \end{pmatrix}$ (2 marks)

(b) Rose bought 20 bags of oranges and 15 bags of mangoes for a total of Kshs.9 500. Chumo bought 15 bags of oranges and 10 bags of mangoes for a total of Kshs.6 750. If the price of a bag of oranges is x and that of mangoes is y :

(i) Form two equations to represent the information above. (2 marks)

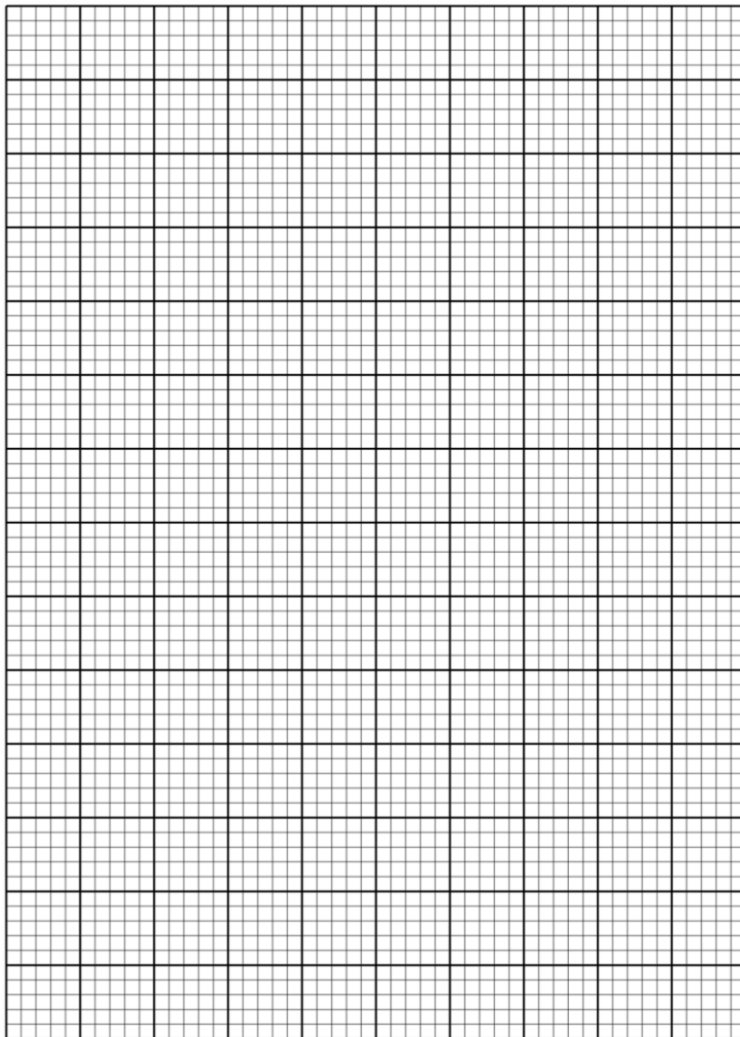
(ii) Hence use the matrix \mathbf{A}^{-1} above to find the price of one bag of each item. (3 marks)

(c) The price of each bag of oranges was increased by 10% and that of mangoes reduced by 10%. The businesswomen (Rose and Chumo) bought as many oranges and as many mangoes as they bought earlier. Find by matrix method the total cost of oranges and mangoes that the businesswomen bought after the percentage change. (3 marks)

23. (a) Fill the table below for the function $y=x^2 -4x+ 2$ for $-1 \leq x \leq 5$. (2 marks)

x	- 1	0	1	2	3	4	5
y							

(b) (i) Draw the graph of the function $y=x^2 -4x+ 2$ for $-1 \leq x \leq 5$. (3 marks)



(ii) On the same axes, draw line $y=x-1$. (1 mark)

(c) Determine the values of x at the points of intersection between the curve $y=x^2-4x+2$ and line $y=x-1$ (2 marks)

(d) Draw the line of symmetry of the curve hence state its equation. (2 marks)

24. The displacement s of a particle after t seconds is given by $s = 4t^3 - \frac{5}{2}t^2 - 3t + 3$.

Determine the:

(a) Velocity of the particle when $t = 3$ seconds. (3 marks)

(b) Value of t when the particle is instantaneously at rest. (3 marks)

(c) Displacement when the particle is instantaneously at rest. (2 marks)

(d) Acceleration of the particle when $t = 2$ seconds. (2 marks)