KALA PRE-TRIAL EXAMINATION – 2025

Kenya Certificate of Secondary Education

121/2 **Paper 2**

MATHEMATICS Alt. A

March 2025 – 2½ hours

Name: ……..……**Adm Number:** ……**Class:** …….

Student's Signature: ……**Date:** …… **School:** ……..…….....

Instructions to candidates

(a) Write your name, Adm number, school and class in the spaces provided above.

(b) Sign and write the date of examination 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. **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 the spaces provided*

1. Simplify leaving your answer in the form $a+b\sqrt{c}$ (3 marks)

$$\frac{\sin 30° - \cos 30°}{\tan 45° + \tan 60°}$$

2. The base and height of a triangle were measured as 12.8cm and 7.5cm respectively. Calculate, correct to four significant figures, the percentage error in the area of the triangle. (3 marks)

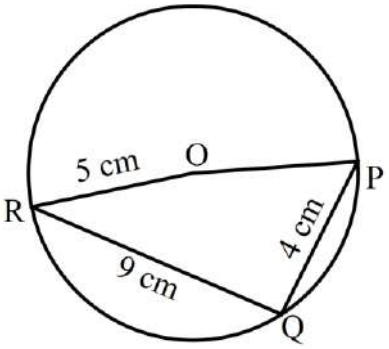
3. Make k the subject of the formula and simplify. (3 marks)

$$t = \frac{2y+4}{\sqrt{2ky+k}}$$

4. A buyer pays for a car on hire purchase in 15 equal monthly instalments. The cash price was Ksh 300 000 and the interest rate was 15% p.a. A deposit of Ksh 75 000 was paid. Calculate her monthly repayments to the nearest shilling. (3 marks)

5. Five men working for 8 hours a day take 2 days to cultivate an acre of land. How many days would four men working 10 hours a day at double the rate take to cultivate 3 acres of land? (3 marks)

6. In the figure below, PQ and QR are chords of a circle, centre O. If PQ = 4cm, QR = 9cm, and OR = 5cm. Calculate angle PQR. (2 marks)



7. Find the absolute value of y in the equation, $1+\log_y(y+1)=\dfrac{\log 6}{\log y}$ (3 marks)

8. Given that the coefficient of x^3 in the expansion of $\left(a+\dfrac{x}{2}\right)^4$ is 1, find the value of a.

(2 marks)

9. Solve the equation $\dfrac{5}{\sin x}=7-\dfrac{2\cos^2 x}{\sin x}$ for $-90°\le x\le 90°$ (4 marks)

10. A variable P varies directly as variable Q and inversely as the square root of R. Calculate, correct to 3 significant figures, the percentage change in R if Q is doubled and P is increased by 36%. (3 marks)

11. A regular pentagonal solid has its sides marked 3, 4, 5, 6 and 7. Another regular one has its sides marked 6, 7, 8, 9 and 10. Both are tossed and sum of the numbers appearing on the bottom face recorded.

(i) Draw a probability space to show the possible sums. (2 marks)

(ii) Find the probability of getting a sum greater or equal to 14. (1 marks)

12. A soccer ball of diameter 30 cm is placed right at a corner of a rectangular room. Find the shortest distance of the ball from the corner of the room, correct to 2 significant figures. (3 marks)

13. The tangent to the circle $x^2 + y^2 - 2x - 6y = -5$ at the point (3, 4) meets the $x - axis$ at P. Find the coordinates of P. (4 marks)

14. Given that $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$, $\mathbf{b} = -\mathbf{i} - 2\mathbf{j}$ and $\mathbf{c} = -2\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}$, evaluate $|2\mathbf{a} - 3\mathbf{b} - 2\mathbf{c}|$ to 2 decimal places. (3 marks)

15. The production of milk, in litres, of 10 cows on a certain week were:
90, 94, 96, 98, 99, 102, 105, 91, 102 and 99.
Using a working mean of 96 litres, Calculate correct to 3 significant figures;

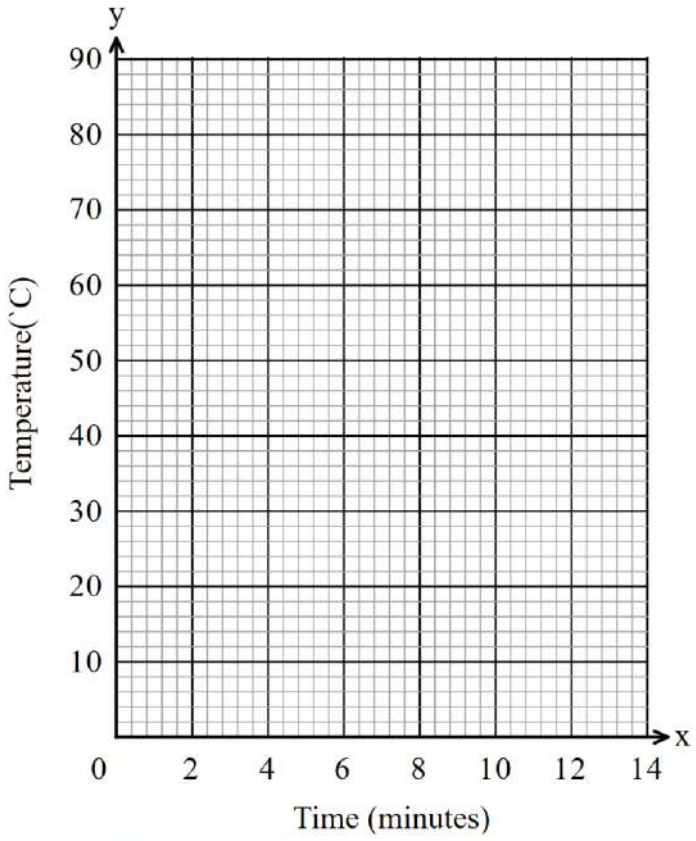
(a) The actual mean. (2 marks)

(b) The standard deviation. (2 marks)

16. The temperature of a cooling water was measured at intervals of two minutes and recorded as shown in the table below.

Time (minutes)	0	2	4	6	8	10	12
Temperature (°C)	80	60	46	35	26	20	15

(a) On the grid provided, draw the graph of the temperature against time. (2 marks)



(b) Determine the average rate of cooling of water between the third and eleventh minutes. (2 marks)

SECTION II (50 marks)

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

17. The table below shows monthly income tax rates in a certain year.

Monthly income in Ksh	% tax rate in Ksh
Up to 9 680	10
9 681 – 18 800	15
18 801 – 27 920	20
27 921 – 37 040	25
Over 37 041	30

In the month of May of that year, Yvonne paid a net tax of Ksh 9 000. She was entitled to the following monthly allowances:

- Taxable allowances amount to Ksh 18 700.05
- Non-taxable allowances amount to Ksh 10 000

Yvonne contributes 5% of her basic salary towards Pension scheme. This contribution is exempted from the taxation. She has a life insurance policy for which she pays a monthly premium of Ksh 5 000 and claims tax relief at 7.5% on premium. She is entitled to monthly personal relief of Ksh 1 202.

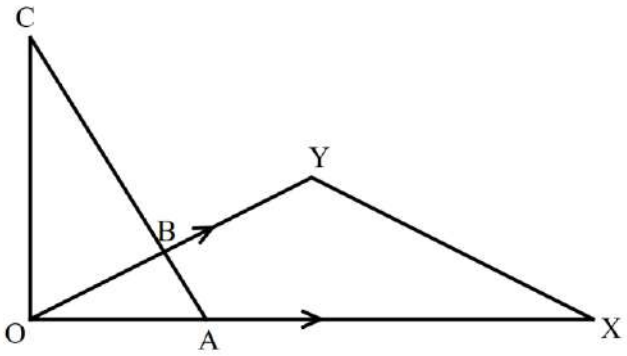
Calculate:

(a) Yvonne's monthly taxable income. (5 marks)

(b) Yvonne's monthly basic salary. (2 marks)

(c) The following deduction is also made from Yvonne's gross salary. Sacco loan repayment of Ksh 12 000. Determine Yvonne's net pay in the month of May. (3 marks)

18. In the figure below, $\mathbf{AC} = 6\mathbf{AB}$, $\mathbf{OY} = 2\mathbf{OB}$, $\mathbf{OX} = \frac{5}{2}\mathbf{OA}$, $\mathbf{OA} = \mathbf{a}$ and $\mathbf{OB} = \mathbf{b}$.



(a) Express the following in terms of **a** and **b**.

(i) **AB** (1 mark)

(ii) **OC** (1 mark)

(b) Express **XY** and **XC** in terms of **a** and **b**. (3 marks)

(c) Show that X, Y and C are collinear. (3 marks)

(d) State the ratio in which C divides XY. (2 marks)

19. The second, third and ninth terms of an arithmetic progression (AP) form the first three terms of a geometric progression (GP)

(a) The common ratio of the GP. (4 marks)

(b) Given that the sum of the first ten terms of the AP is 1110, find:

(i) The first term and the common difference of the AP. (3 marks)

(ii) The number of terms of the AP that will give a sum of at least 2400. (3 marks)

20. (a) Construct triangle ABC with AB = 7.5 cm, BC = 5.5 cm and AC = 6 cm. (2 marks)

(b) Draw a circle through points B and C which cuts AB at X and AC at Y such that BX = 5.5 cm. (3 marks)

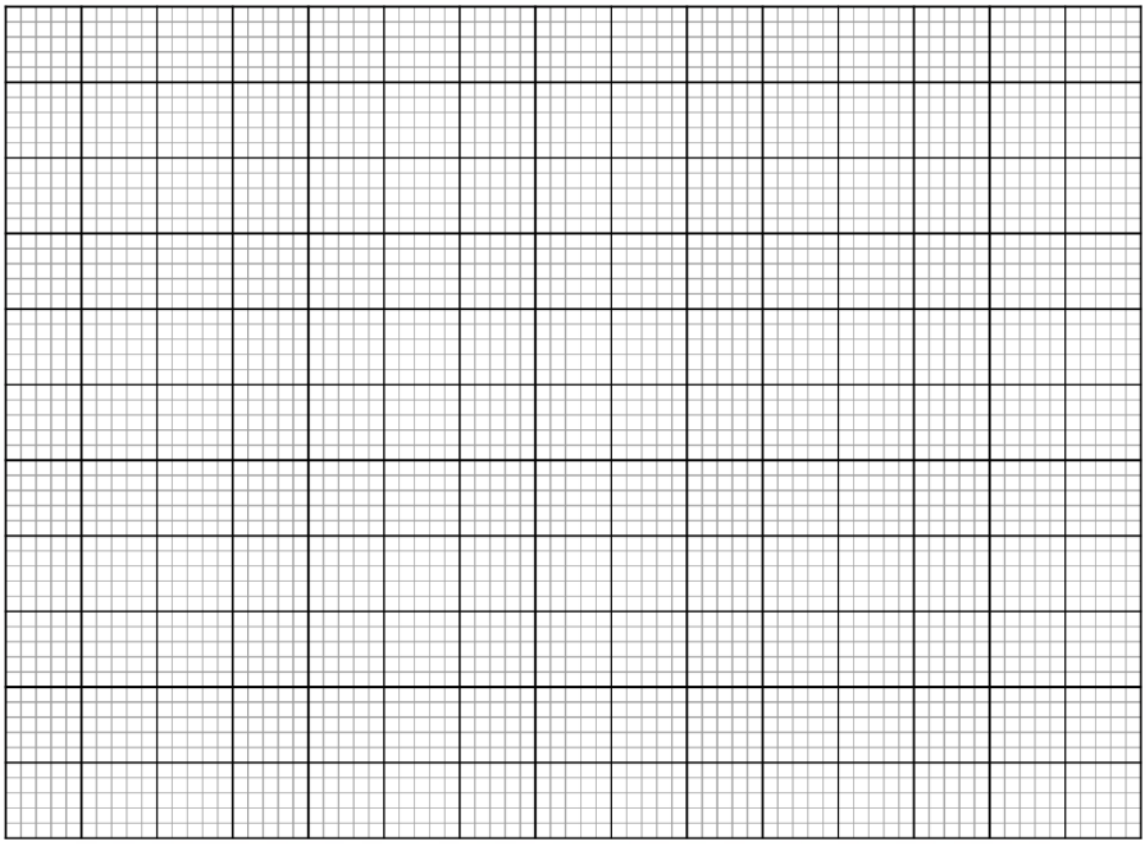
(c) Locate the locus of Q within the circle such that the area of triangle BQC is half the area of triangle BYC. (3 marks)

(d) Locate by shading, the locus of point P within Δ BXC such that $\angle$BPC $\geq$ $\angle$BXC and BP $\leq$ PC and area of Δ BQC $\geq \frac{1}{2} \Delta$ BYC (2 marks)

21. The marks obtained by 80 students in a test that was out of 50 marks are shown in the following table:

Marks	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Frequency	3	4	6	9	11	15	14	9	5	4

(a) Plot a cumulative frequency curve. (4 marks)



(b) Use your curve to estimate;

(i) The quartile deviation (2 marks)

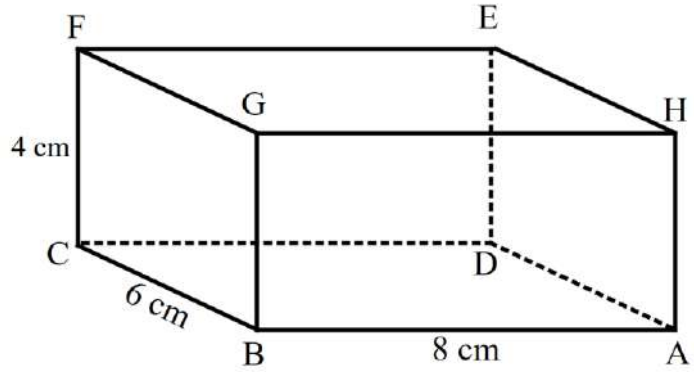
(ii) The pass mark if 80% of the students are to be successful. (1 mark)

(iii) The number of students who would pass if more than 40% is required to pass. (1 mark)

(iv) Percentage score of the 90^{th} percentile (1 mark)

(v) The 6^{th} Decile (1 mark)

22. The figure below is a cuboid ABCDEFGH such that AB = 8 cm, BC = 6 cm, and CF = 4 cm. Given that M is the midpoint of line EH.



Calculate;

(a) The angle that line AF makes with the plane ABCD (2 marks)

(b) The length of line BM (2 marks)

(c) The angle between planes BHEC and EFGH (2 marks)

(d) The angle between line MG and line BC (1 mark)

(e) The angle line MB makes with plane BDEG (3 marks)

23. (a) Two towns P and Q are located at P (60^0 N, 29^0 W) and Q (60^0 N, 31^0 E). Taking $\pi = \frac{22}{7}$ and R = 6370 km, calculate the distance between P and Q;

(i) Along the parallel of latitude in km. (2 marks)

(ii) Along the parallel of latitude in nm (2 marks)

(iii) If the local time at P is 1200hrs, determines the local time at Q. (2 marks)

(b) An airplane left town P above at 12 pm and flew due west at a speed of 500 knots. At the same time, another plane left town Q above and flew due North also at a speed of 500 knots. If the two planes met at the same latitude at town R. Determine the time they arrived at R (4 marks)

24. A triangle T whose vertices are A (2, 3), B (5, 3) and C (4, 1) is mapped onto a triangle T_1 whose vertices are A' (–4, 3), B' (–1, 3) and C' (x, y) by a transformation M.
Find;

(a) The transformation matrix represented by M (4 marks)

(b) Co-ordinates of C' (2 marks)

(c) Triangle T_2 is the image of triangle T_1 under a reflection in the line $y = x$. Use the unit square to find the matrix representing this transformation hence the coordinates A″, B″, C″ of T_2. (2 marks)

(d) Find a single matrix that maps T_2 onto T. (2 marks)