

KALA PRE-TRIAL EXAMINATION – 2025

Kenya Certificate of Secondary Education



121/2

Paper 2

MATHEMATICS AIt. 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.**

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

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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)

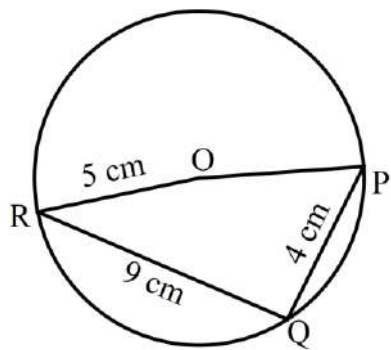
$$\frac{\sin 30^\circ - \cos 30^\circ}{\tan 45^\circ + \tan 60^\circ}$$

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 $PQ = 4\text{cm}$, $QR = 9\text{cm}$, and $OR = 5\text{cm}$. Calculate angle PQR. (2 marks)



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

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

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

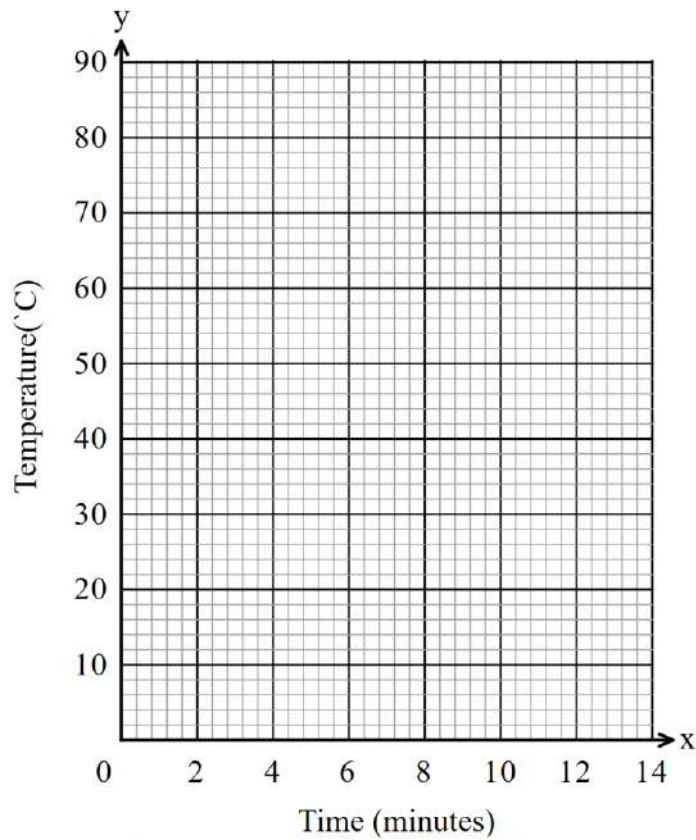
- 10.** A variable P varies directly as variable Q and inversely as the square root of R . Calculate, correct to 3 significant figures, the percentage change in R if Q is doubled and P is increased by 36%. (3 marks)
- 11.** A regular pentagonal solid has its sides marked 3, 4, 5, 6 and 7. Another regular 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 ($^{\circ}\text{C}$)	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:

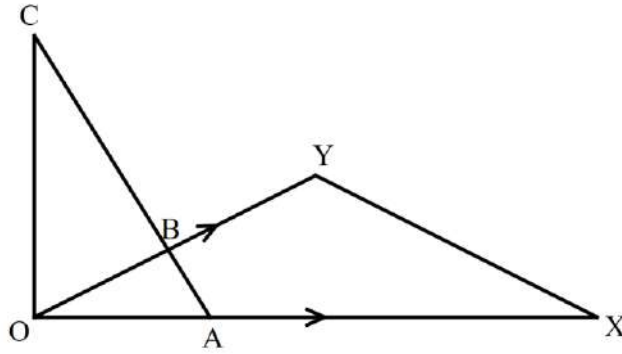
- Taxable allowances amount to Ksh 18 700.05
- Non-taxable allowances amount to Ksh 10 000

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)

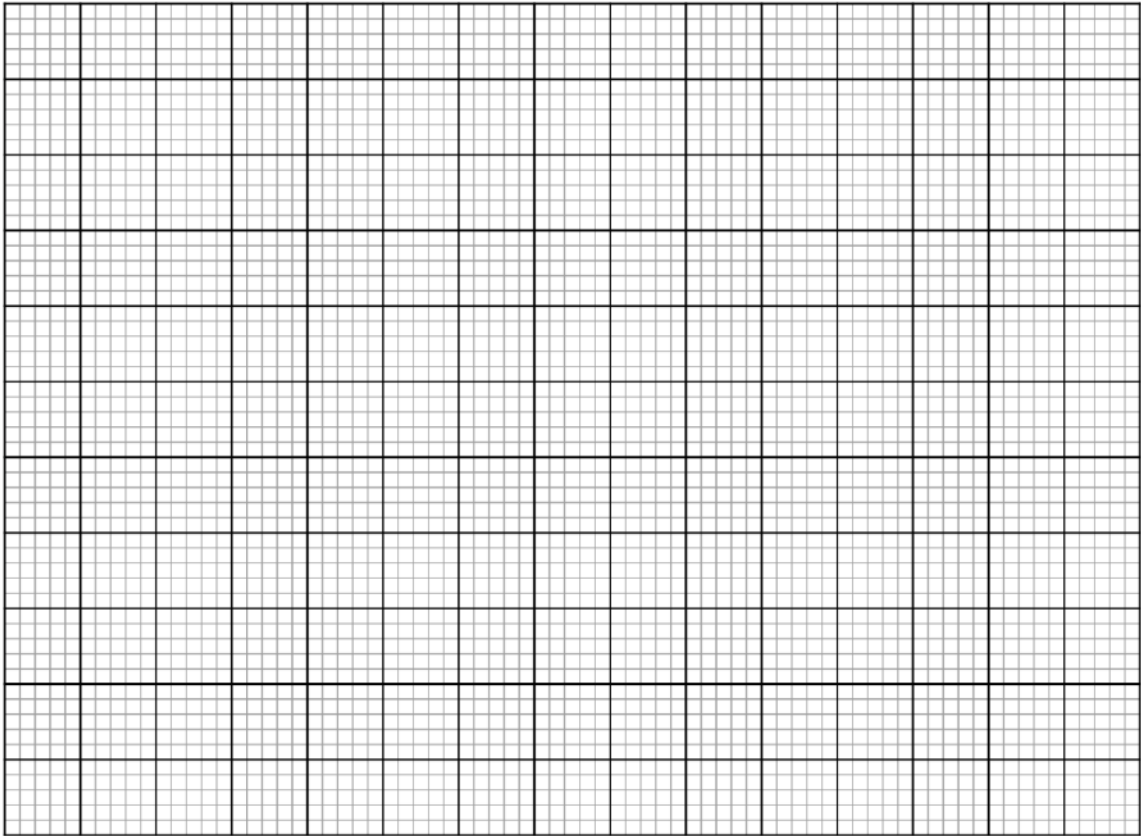
(d) Locate by shading, the locus of point P within $\triangle BXC$ such that $\angle BPC \geq \angle BXC$ and $BP \leq PC$ and area of $\triangle BQC \geq \frac{1}{2} \triangle BYC$ (2 marks)

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.

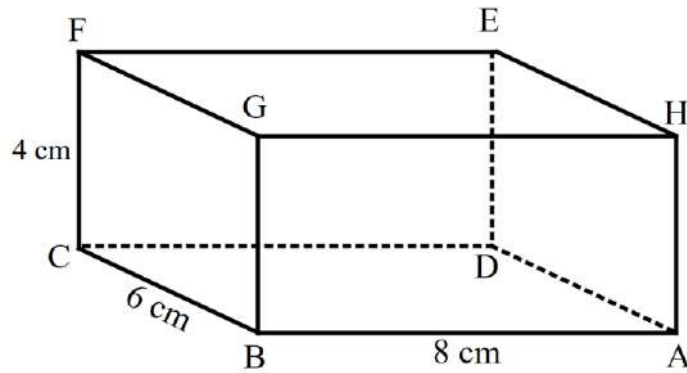
(1 mark)

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

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

(v) The 6th 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° N, 29° W) and Q (60° N, 31° 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)