KEJE EXAMINATION COUNCIL - 2025

Kenya Certificate of Secondary Education

121/2 **Paper 2**

MATHEMATICS

- Alt A –

July 2025 – 2 Hours 30 minutes

121 / 1 - Mathematics Paper 1

Monday 21ST July 2025

Time: 8.00 a.m – 10.30 a.m

Name: ……..…….. Index Number: ……

Student's Signature: ……..…… School: ……..……. 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 15 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 II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50 marks)

*Answer **all** questions in the spaces provided below each question.*

1. In a geometric progression , the sum of the first and the fourth terms is −1575 while the sum of the third and the sixth terms is −25200, find the possible value of the common difference. (3 marks)

2. The length of a rectangular room is 4 m more than its width and the area of the room is 96 m^2. The room is to be carpeted leaving a uniform margin of 20 cm all around. Calculate the area of the margin. (4 marks)

3. If A = 2.3, B = 8.7 and C = 2.2 find the percentage error in evaluating $\frac{B-A}{C}$ (3 marks)

4. Given that $\tan 65^\circ = 2+\sqrt{3}$ without using tables or calculators determine $5\tan 25^\circ$ leaving your answer in the form $p+q\sqrt{r}$ where *p*, *q* and *r* are integers. (3 marks)

5. Expand and simplify $\left(3+\frac{1}{\sqrt{3}}\right)^5+\left(3-\frac{1}{\sqrt{3}}\right)^5$ (3 marks)

6. Solve for *x* in the equation; $\log_2(x+6)+\log_2(x+4)=3$ (3 marks)

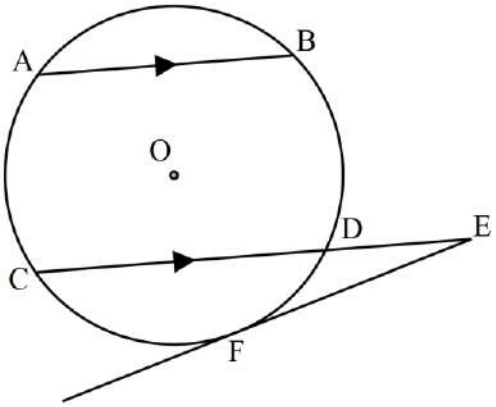
7. The cash price of a laundry machine at General Suppliers is KSh.56 000. One can buy it through hire purchase by paying a deposit of KSh.8 000 followed by 15 equal monthly instalments of KSh.4 700 each. Find the percentage rate of compound interest charged per month when buying the laundry machine on hire purchase. (3 marks)

8. Make x the subject of the formula in $A=\left(\frac{PT-x^2}{x^2}\right)^{-\frac{1}{2}}$ (3marks)

9. Given that O is the origin, $\mathbf{OA}=8\underset{\sim}{i}+9\underset{\sim}{j}-4\underset{\sim}{k}$ and $\mathbf{OB}=6\underset{\sim}{i}+11\underset{\sim}{j}+2\underset{\sim}{k}$. If **R** divides **AB** externally in the ratio 3:1, find $|\mathbf{OR}|$. (3 marks)

10. A flour company has two types of flour for making porridge, maize flour and millet flour. Maize flour costs ksh. 60 per kilogram and millet flour costs sh.90 per kilogram. The milling company makes a new brand of flour by mixing maize flour and millet flour. If the new brand cost ksh. 85 per kilogram, determine the percentage of maize flour in the mixture. (3 marks)

11. The figure below shows a circle centre O, with two parallel chords AB and CD. Chord CD is extended to E and EF is tangential to the circle at F. The radius of the circle is 5 cm, $AB = 8$ cm and chords AB and CD are 5 cm apart.



Calculate correct to 1 decimal place:

(a) The length of the chord CD. (2 marks)

(b) The length FE if $DE = \frac{3}{2}CD$. (2 marks)

12. State the amplitude and the period of the wave $y = \frac{2}{5}\sin(4x - 30)$. (2 marks)

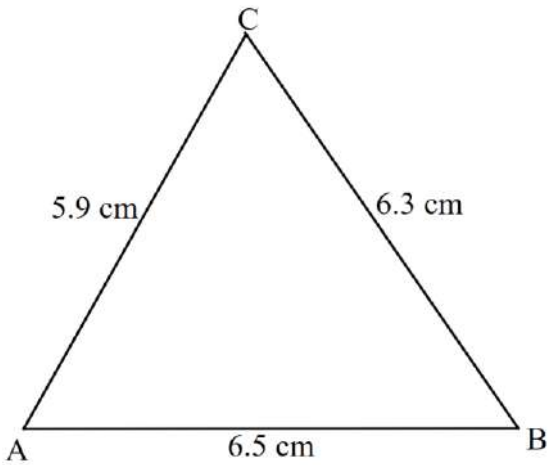
13. A workshop makes cupboards and tables using two artisans A and B. Every cupboard made requires 3 days of work by artisan A and 2 days of work by artisan B. Every table requires 2 days of work by artisan A and two days of work by artisan B. In one month artisan A worked for less than 24 days while artisan B worked for not more than 18 days. The workshop made x cupboards and y tables in that month. Write all inequalities which must be satisfied by x and y. (3 marks)

14. The data below represent the number of animals owned by 7 neighbors;

9, 5, 6, 8, 12 and 14

Calculate the exact value of mean absolute deviation of the number of animals. (3 marks)

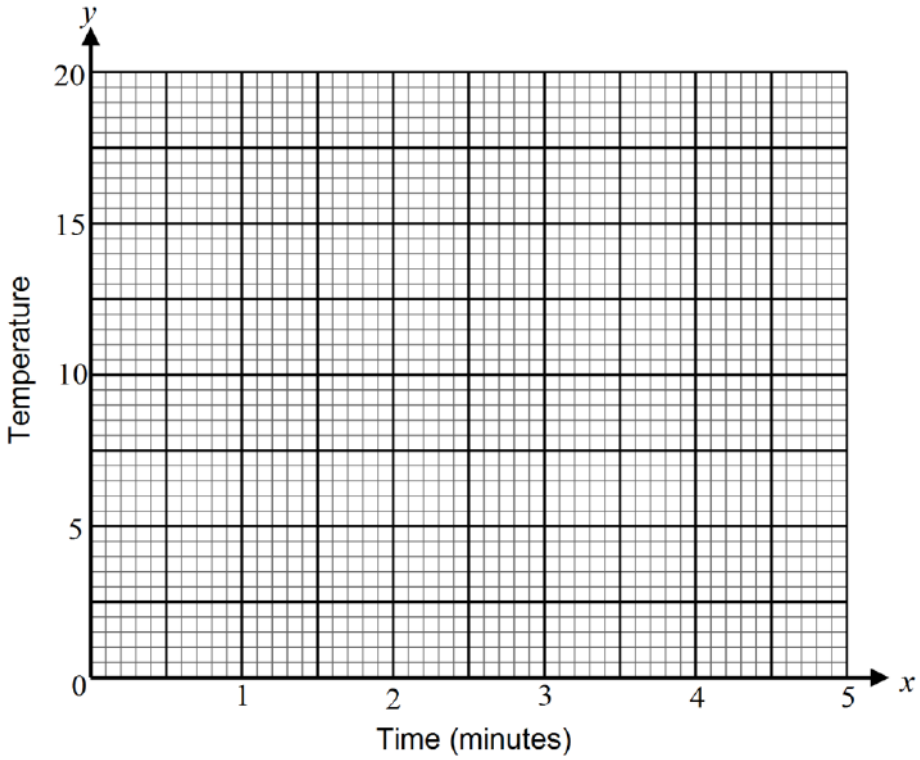
15. The figure below shows a triangle ABC in which AB = 6.5 cm, BC = 6.3 cm and AC = 5.9 cm. Using a ruler and compass only, construct a circle opposite angle A touching lines BC , AB and AC produced. Measure the radius of the circle. (3 marks)



16. A solution was gently heated and the temperature recorded as shown below at an interval of 1 minute.

Time (minutes)	0	1	2	3	4	5
Temperature ($^{\circ}$C)	4	6.8	8.4	12.0	15.5	17.5

(a) On the grid provided, draw a graph of temperature ($^{\circ}$C) against time (minutes). (2 marks)



(b) Use your graph to find the relationship between temperature (T) and time (t). (2 marks)

SECTION II (50 Marks)

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

17. The table below shows the rate at which tax is charged for all income earned in a certain month.

Taxable income in Ksh per month	Percentage tax rate
0 – 9860	10
9861 – 18700	15
18701 – 27820	20
27821 – 37140	25
Above 37140	30

A total of Ksh 17 000 was deducted from Mr. Okumu's monthly salary. He is entitled to a house allowance of Ksh 12 000 and a commuter allowance of Ksh 6 000. He claims a personal relief of Ksh 1 056. In addition, he pays insurance premium of Ksh 3 200 for which he is entitled to a further relief of 15% of premium paid. Apart from PAYE, the following is also deducted from his salary: NSSF Ksh 1 500, SHIF Ksh 1 600 and Co – Operative Loan Repayment Ksh 6 000.

Calculate:

(a) Mr. Okumu's net tax per month. (2 marks)

(b) Mr. Okumu's taxable income. (6 marks)

(c) Mr. Okumu's basic salary. (2 marks)

18. The probability that it rains on any given Sunday is 0.4. If it rains, the probability that Jane goes to church is 0.3 and if it does not rain the probability that she goes to church is 0.9. If she goes to church on a rainy Sunday the probability that she wears a rain coat is 0.2

(a) Draw a tree diagram to represent the above information (2 marks)

(b) Find the probability that on any given Sunday

(i) She goes to church and carries a rain coat (2 marks)

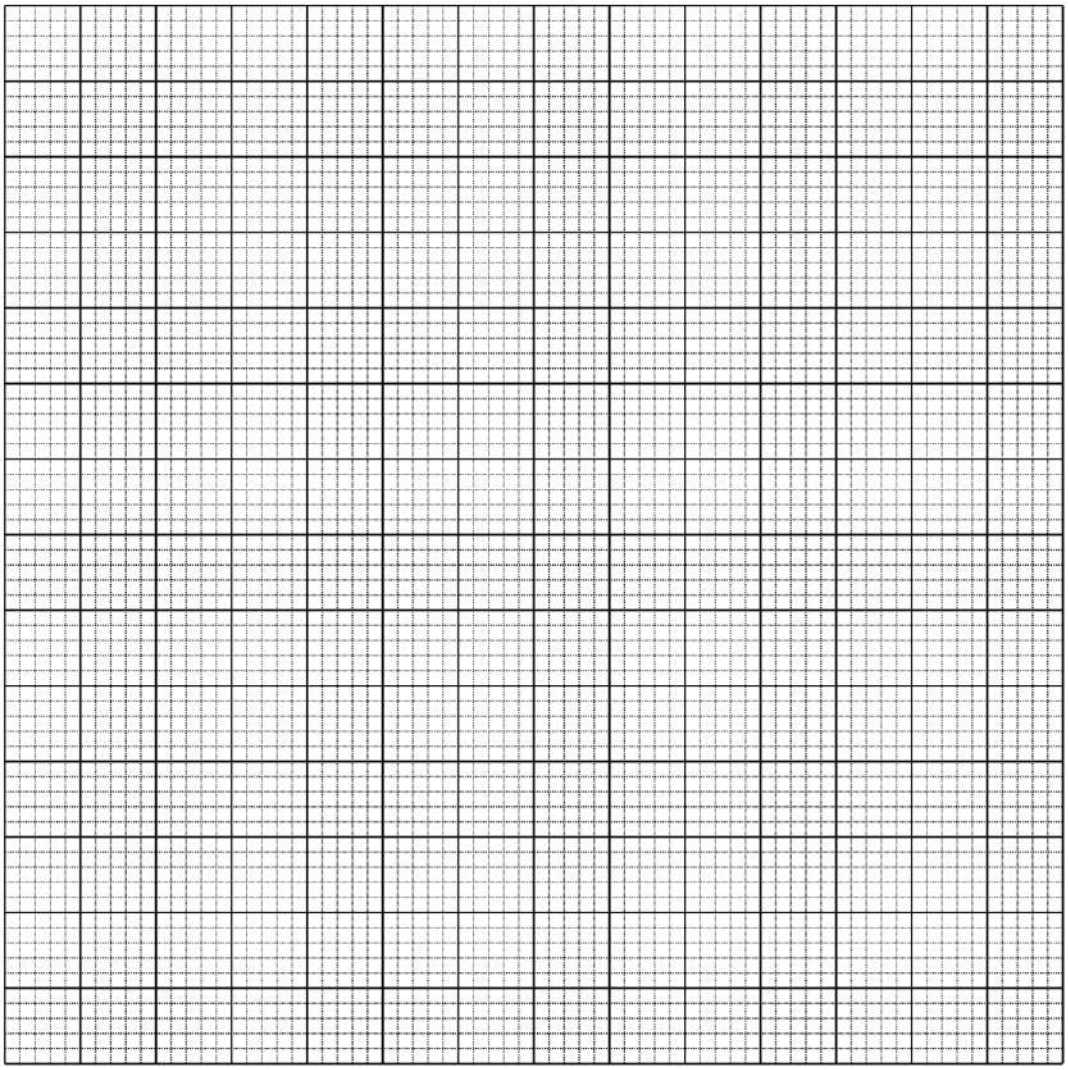
(ii) She does not carries a rain coat (2 marks)

(iii) It does not rain and she goes to church (2 marks)

(iv) She does not go to church (2marks)

19. Triangle PQR has vertices $P(2,2)$, $Q(2,-2)$ and $R(-1,-4)$. Point Q is mapped $Q'(5,-2)$ by shear with x – axis invariant.

(a) Draw triangle PQR and its image $P'Q'R'$ under the shear on the same axes on the grid provided below. (3 marks)



(b) Find the matrix that represents the shear. (2 marks)

(c) Transformation **S** is a rotation of 180^{o} about the origin. It maps triangle $P'Q'R'$ onto $P''Q''R''$.

(i) Draw triangle $P''Q''R''$ on the same axes. (2 marks)

(ii) Find a single transformation matrix that maps $P''Q''R''$ back onto triangle PQR. (3 marks)

20. Three points A, B and C on the surface of the earth are located at $A(4^{o}S, 23^{o}W)$, $B(4^{o}S, 37^{o}E)$ and $C(26^{o}N, 37^{o}E)$.

(a) Calculate the distance in nautical miles between:

(i) A and B along the latitude correct to the nearest nautical mile. (3 marks)

(ii) B and C. (2 marks)

(b) An aeroplane left A for C via B on Tuesday 2130 hours at an average speed of 270 knots.

(i) Find the local time at C when the aeroplane left A. (2 marks)

(ii) Find the local time at C when the aeroplane arrived. (3 marks)

21. Using a ruler and a pair of compasses only:

(a) Draw a triangle ABC such that AB = 8 cm, angle CAB = angle CBA = 37.5^{o}. (3 marks)

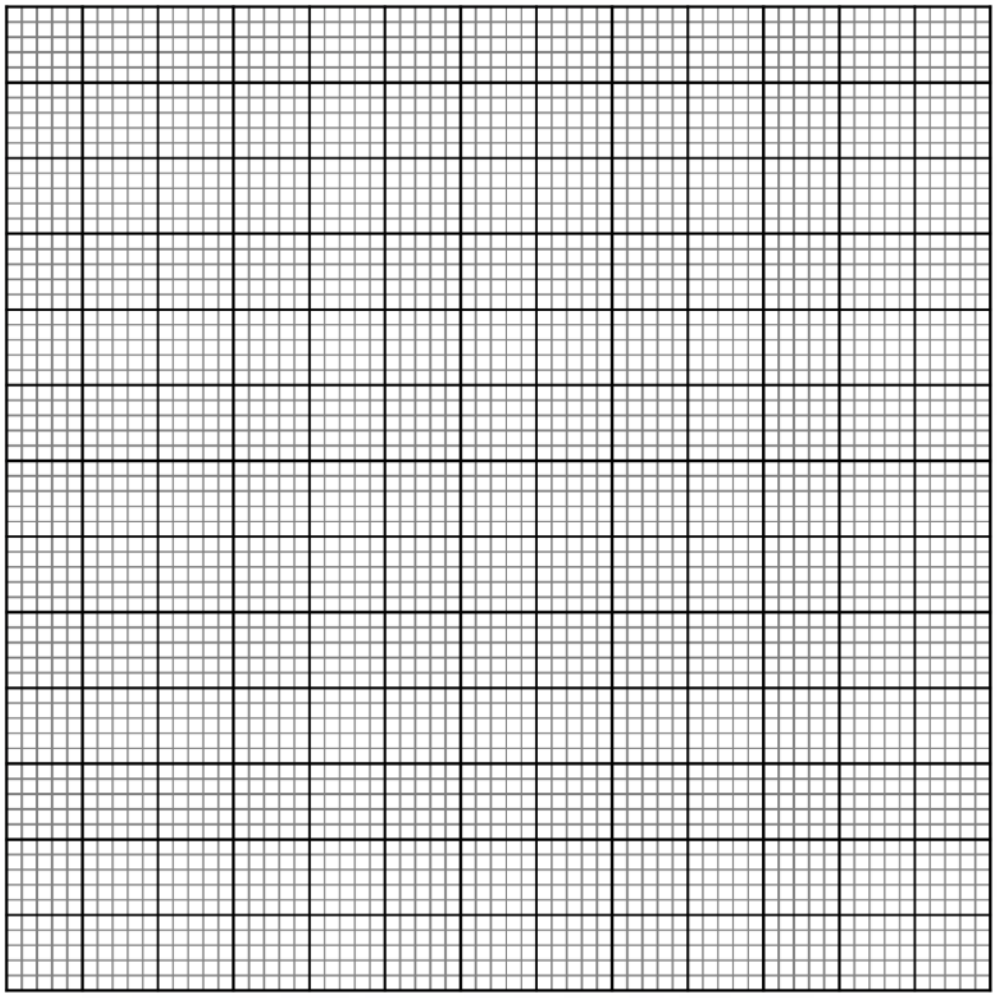
(b) Draw the locus of P such that angle ACB is twice angle APB and is on the same side of AB as C. (2 marks)

(c) Indicating by shading, inside the triangle, the locus of Q such that $BQ > AQ$, Q is closer to BC than AB and angle $AQB \leq 150^{o}$. (5 marks)

22. The table below shows marks obtained by 40 students in a mathematics test.

Marks	31 – 35	36 – 40	41 – 45	46 – 50	51 – 55	56 – 60
Number of students	3	4	10	12	8	3

(a) On the grid provided draw a cumulative frequency curve to represent the data (4 marks)



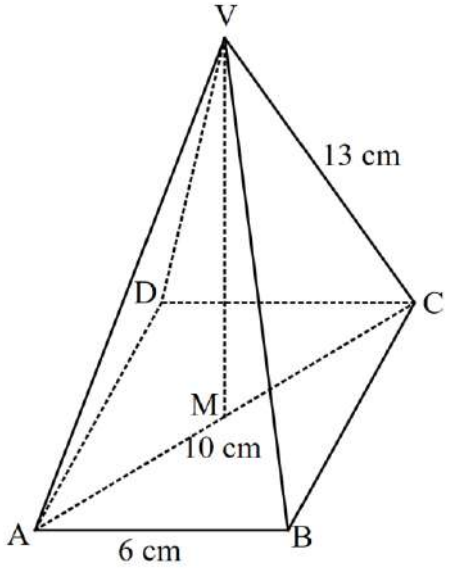
(b) Use the graph above to estimate

(i) The range of marks scored by the middle 80% of the students. (2 marks)

(ii) The quartile deviation. (2 marks)

(iii) The pass mark if 40% of the students passed the test. (2 marks)

23. The figure below is a rectangular based right pyramid with vertex V. Point M is the mid – point of AC. Given that AC = 10 cm, VA = VB = VC = VD = 13 cm and AB = 6 cm.



(a) Name the projection of line VB on plane VAC. (1 mark)

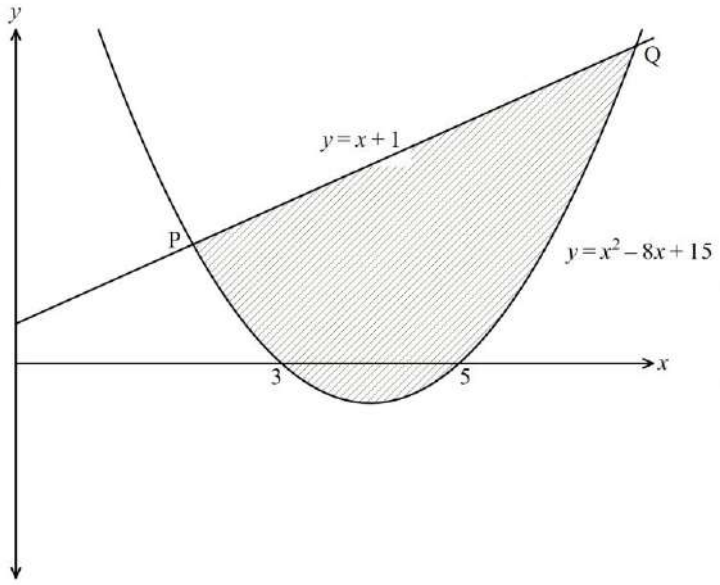
(b) Find to one decimal place:

(i) the angle between line VB and the plane VAC. (3 marks)

(ii) the angle between the plane VAB and the base ABCD. (3 marks)

(iii) the angle between the plane VAB and VDC. (3 marks)

24. The following figure is a sketch of a curve whose equation is $y = x^2 - 8x + 15$. The curve cuts x – axis at $x = 3$ and $x = 5$ and intersect the line $y = x + 1$ at point P ant Q as shown.



(a) Determine the coordinates of P and Q (4 marks)

(b) Calculate the exact area of the shaded region enclosed by the curve $y = x^2 - 8x + 15$, the line $y = x + 1$ and the x - axis. (6 marks)

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