RCEA JOINT EXAMINATION

Kenya Certificate of Secondary Education

FORM FOUR

Form 4 **MATHEMATICS alt A** **Term 2**

PAPER 2 **JULY 2026 – 2½ Hours** **121/2**

Name: ……Index no……Adm No: ……

Stream: …. School ……Candidate's Signature: ……Date: …..

Instructions to Candidates

(a) Write your name, admission number 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 any **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.
(i) 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	

SECTION (50 Marks)

*Answer **all** the questions in this section in the spaces provided*

1. Premium tea leaves cost sh 89 per kg while normal tea leaves cost sh 74 per kg. A tea seller mixes premium tea leaves with normal tea leaves in the ratio 2 : 3 respectively. At what price, must he sell a mixture of 5kg to make a profit of 20%. (3 marks)

2. Given that $m = \sqrt{\frac{2m+1+k}{4k}}$, express k in term of m, in its simplest form. (3 marks)

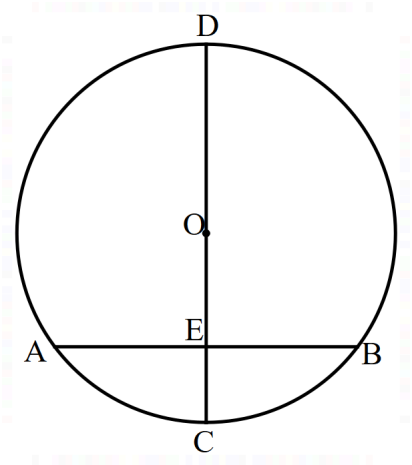
3. A quantity B is directly proportional to the square of quantity C and inversely proportional to the square root of quantity D. Find the percentage decrease in B if C is decreased by 36% and D is increased by 21%. (3 marks)

4. Solve the simultaneous equations (3 marks)

$x^2 + y^2 = 13$

$x + y = 1$

5. In the figure below, CD is the diameter of a circle centre O. CD is perpendicular to the chord AB. Given that AB = 12cm and CE = 3cm, calculate the radius of the circle. (3 marks)



6. Two places A and B are on the earth's surface. Given that B is due east of A and that when the local time at A is 2.00pm, the local time at B is 7.00pm. If A is on longitude 20°E, on what longitude is B?

(3 marks)

7. Solve the equation $2\cos^2 x + 3\sin x = 0$ for $0^o \le x \le 360^o$. (3 marks)

8. a) Draw a circle of radius 4cm with centre O and mark a point P, 7cm from O. (1 marks)
   b) Draw a tangent to the circle to pass through the point P. (2 marks)

9. The position vectors of the points **X**, **Y** and **Z** are $-2\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$, $2\mathbf{i} + 4\mathbf{j} - 5\mathbf{k}$ and $-4\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ respectively.
   a) Find:
      (i) **XY** (1 mark)

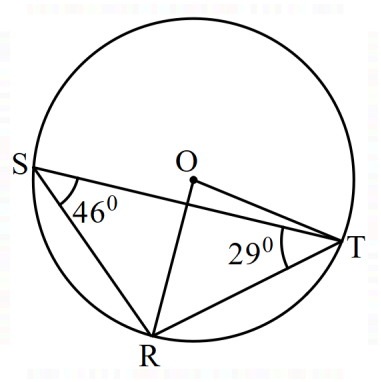
      (ii) **XZ** (1 mark)

   b) Hence show that points X, Y and Z are collinear. (2 marks)

10. Three pumps working 8 hours a day can empty a tank in 2 days. How many hours must 4 pumps work to empty the tank in a day. (3 marks)

11. Determine the centre and radius of a circle whose equation is $x^2 + y^2 - 8x + 2y + 16 = 0$ (3 marks)

12. The diagram below shows a circle centre O. Given that angle STR = 29° and angle RST = 46°, determine the size of angle STO. (2 marks)



13. A triangle PQR whose vertices are the points with coordinates P(5, 5), Q(10, 10), R(10, 15) is mapped onto triangle P'Q'R' with vertices as P'(–1, 7), Q'(–2,14) and R'(–6, 7) by a matrix **M**. Determine the matrix **M**. (3 marks)

14. The velocity v m/s of a particle moving along a straight lie after time t seconds is given by $v = t^2 - 3t + 5$. Its distance x (m) at the time t = 1 is 6 metres. Determine its distance when t = 3 (3 marks)

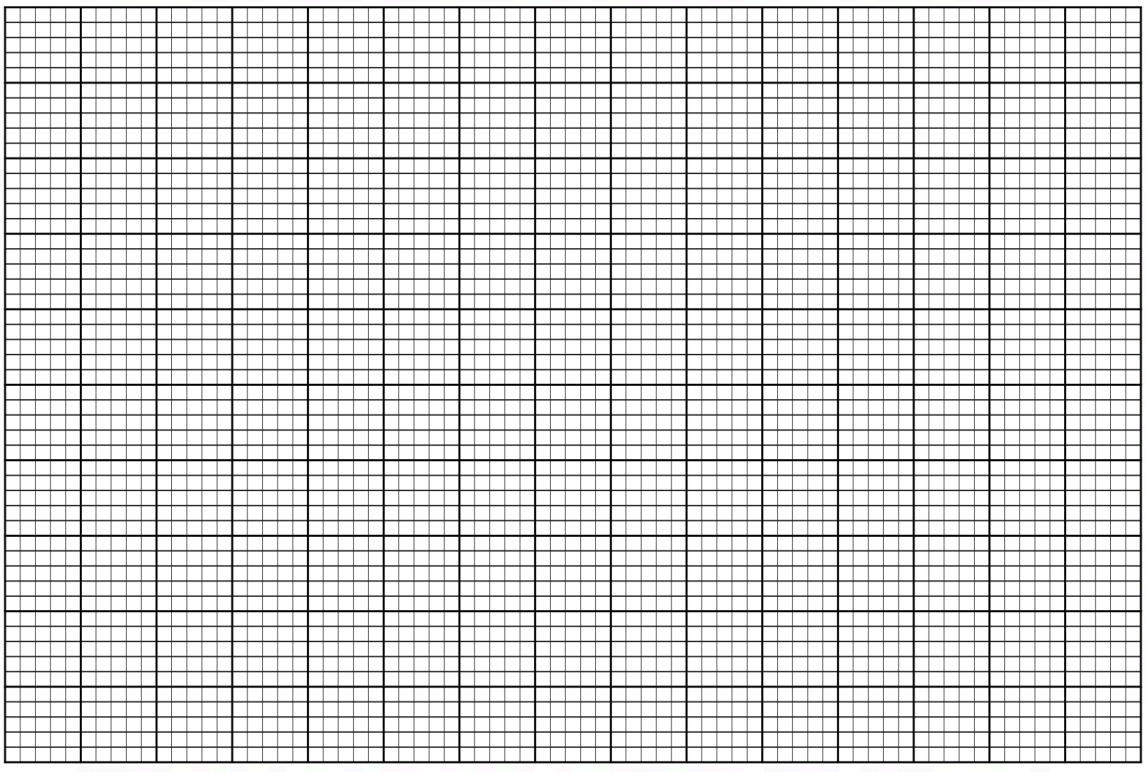
15. The cash price of a new car is Ksh 1 080 500. Ben buys the car on hire purchase. He pays a deposit of 20% of the cash price followed by 60 monthly instalments of Ksh 16 492. Calculate
    a) The total amount that he will pay for the car. (2 marks)

b) The rate of simple interest per year that had been charged, leaving your answer correct to 1 decimal place. (2 marks)

16. During a science practical lesson, a hot test tube is left to cool. The temperature y^{o}C of the test tube after x minutes is then recorded. The table below gives the recordings by the students.

x(minutes)	1	3	4	5	8	10	14
y (^{o}C)	132	114	108	102	76	58	28

a) On the grid provided, plot (x, y), where x is the minutes and y is corresponding temperature reading. Use a scale of 1 cm represents 1 unit on the x-axis and 1 cm represents 20 units on the y-axis. (2 mark)



b) Use the plotted points to draw the line of best fit. (1 mark)

c) Use the line of best fit to determine the temperature of the test tube at the start of the experiment. (1 mark)

SECTION II (50 Marks)

Answer only ***five*** questions in this section

17.

a) A piece of string 10 metres long is to be cut into pieces, so that the length of the pieces form an arithmetic sequence.

i) The length of the longest and the shortest pieces are 1m and 25cm respectively, how many pieces are there. (2 marks)

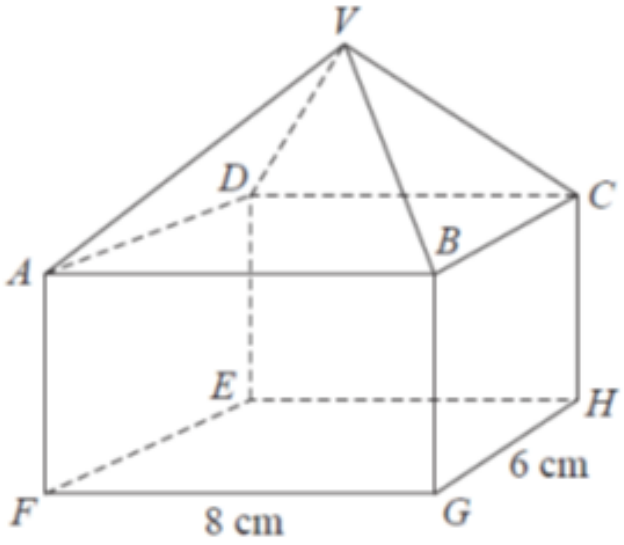
ii) If the same string had been cut into 20 pieces with lengths that formed an arithmetic sequence, and if the length of the second longest had been 92.5cm, how long would the shortest piece have been. (3 marks)

b) A geometric sequence has the following terms: 8, 16, …., 2048, Find;

i) The number of terms in the sequence. (3 marks)

ii) the sum of the terms in the sequence (2 marks)

18. The figure below shows a solid VABCDEFGH which is formed by joining a cuboid ABCDE to a right pyramid VABCD. The height of the cuboid and the height of the pyramid are both 4 cm and FG = 8cm and GH = 6cm.



Determine:

a) The length VA correct to 2 decimal places. (3 marks)

b) The size of the angle between the line VA and the plane ABCD (3 marks)

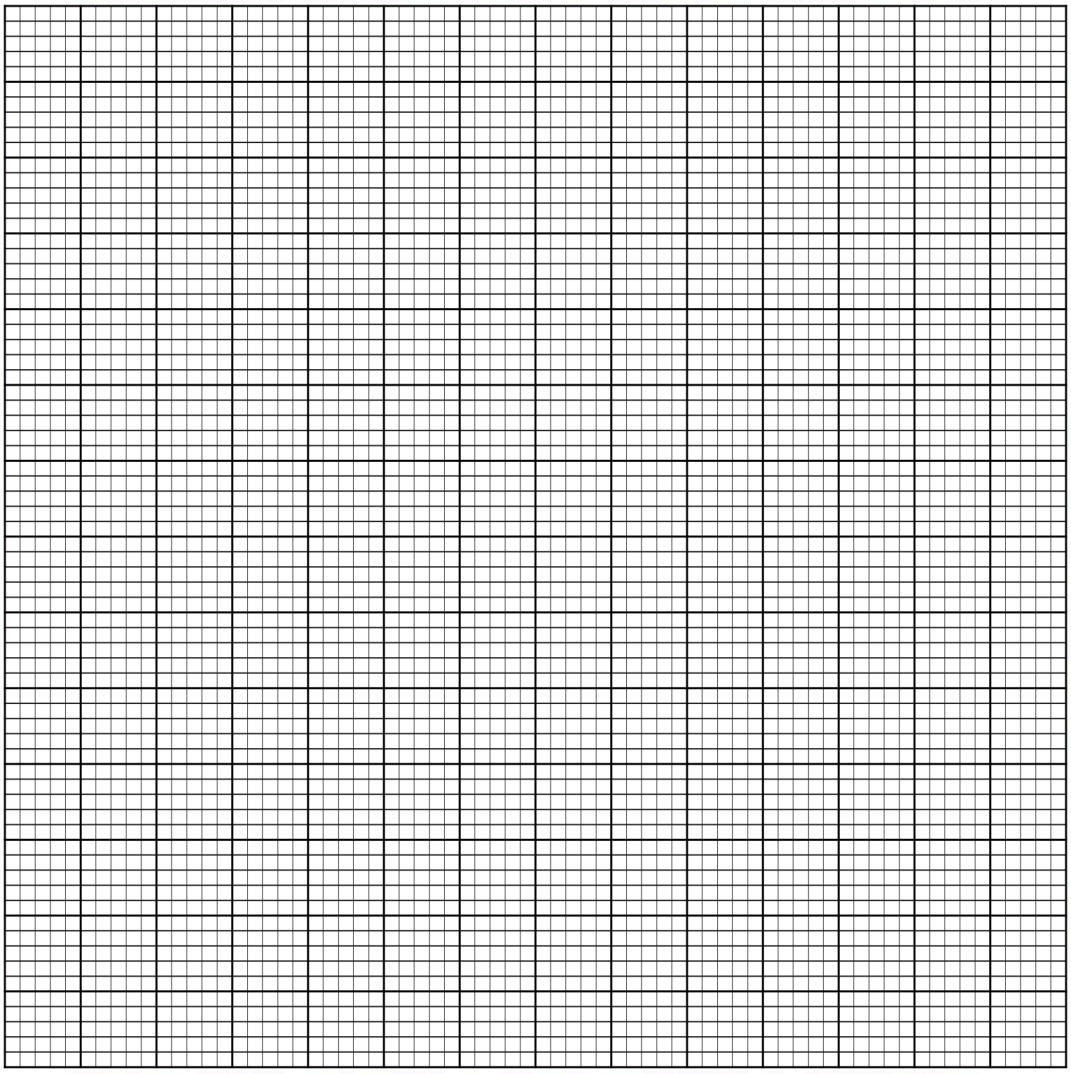
c) The size of the angle between the planes VAB and ABHE (4 marks)

19.

a) Complete the table below for the waves $y = 2\sin 3x$ and $y = 2 - \cos 2x$, giving your values correct to 2 decimal places. (2 marks)

x	0	15	30	45	60	75	90	105	120	135	150	165	180
$y = 2\sin 3x$	0	1.41	2		0		- 2		0	1.41		1.41	0
$y = 2 - \cos 2x$		1.13	1.5	2			3	2.87		2	1.5		1

b) On the grid provided draw the graphs of $y = 2\sin 3x$ and $y = 2 - \cos 2x$ for $0^o \le x \le 180^o$. Use the scale 1 cm represents 15º horizontally and 1cm represents 0.5 units vertically. (5 marks)



c) Use the graph to solve the equation $2\sin 3x + \cos 2x = 2$ for $90^o \le x \le 180^o$. (1 mark)

d) State the;

i) period of the wave $y = 2\sin 3x$ (1 mark)

ii) amplitude of the wave $y = 2 - \cos 2x$ (1 mark)

20. Using a ruler and a pair of compasses only

a) Construct triangle ABC such that AB = 9cm, BC = 10 cm and angle BAC = 75º. (3 marks)

b) On the same side as C, construct the locus of P such that the area of triangle APB = 13.5cm^2.
(2 marks)

c) On the same side as C construct the locus of P such that angle APB = 60^o (2 marks)

d) Locate R such that AR > 5 cm and $\angle$ ACR $\geq \angle$ BCR by shading the unwanted parts.
(3 marks)

21. Bag A contains 5 red and 5 green beads while bag B contains 2 red and 3 green beads.
a) A bead is picked at random from each of the bags. Calculate the probability that:
(i) Two red beads are picked (2 marks)

(ii) Only one red bead is picked (2 marks)

b) All the beads are returned to their respective bags and then a bead is picked at random from bag A, its colour noted and placed in bag B. A bead is then picked at random from bag B. Calculate the probability:

(i) Picking two red beads. (2 marks)

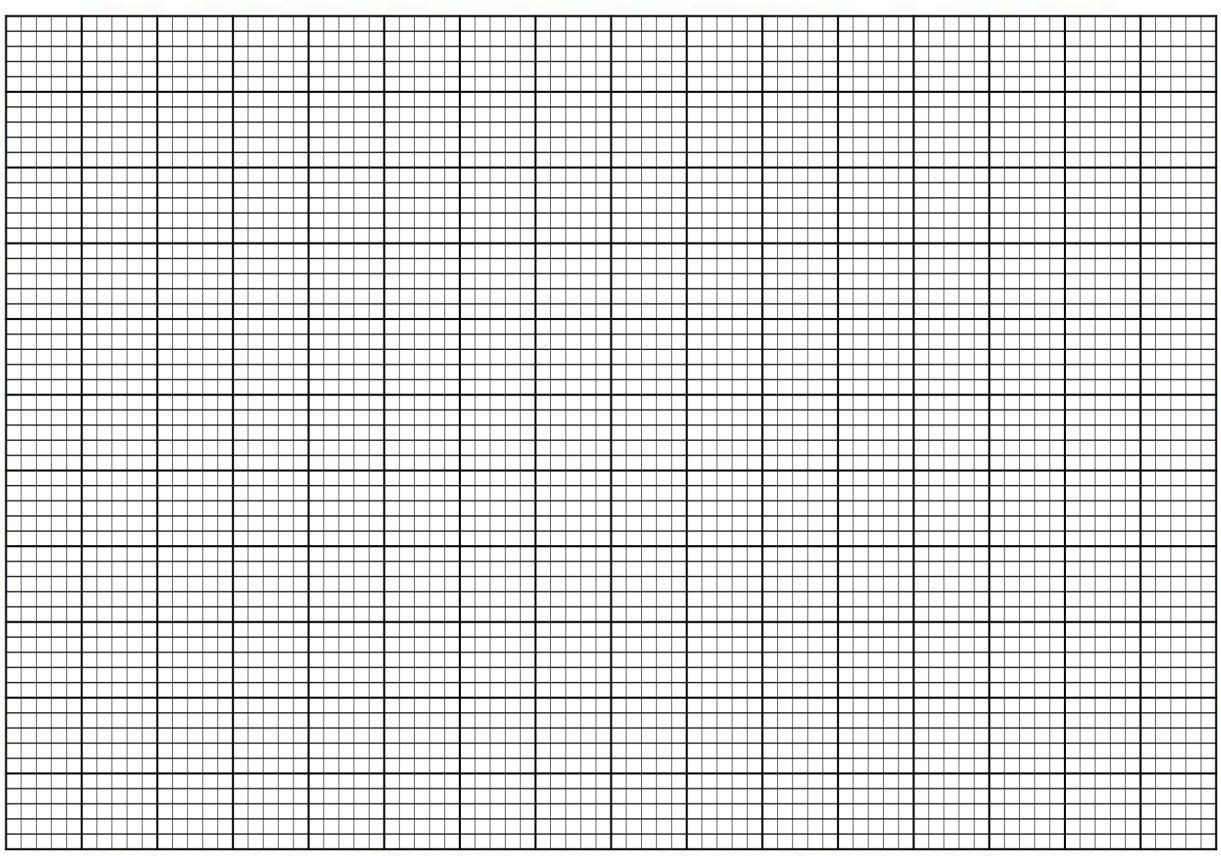
(ii) Picking at least one green bead (4 marks)

22. The table below shows the distribution of the heights in centimetres, to the nearest centimetre, of 200 students in a college.

Height (cm)	151 – 155	156 – 160	161 – 165	166 – 170	171 – 175	176 – 180	181 – 185
Number of Students	2	12	50	82	35	16	3

a) Using an assumed mean of 168cm, calculate the mean height. (4 marks)

b) On the grid provided, draw a cumulative frequency curve to represent the data. (3 marks)



c) Use the graph in part b) above to determine the semi-interquartile range of the data. (3 marks)

23. The monthly income tax rates in Kenya for a certain year were as shown in the table below.

Monthly income in Kenya Shillings (Ksh)	Tax rate percentages (%) in each shilling
0 – 24 000	10
24 001 – 32 333	25
Above 32 333	30

A tax relief of Ksh 2 400 was allowed.

An employee earned a monthly basic salary of Ksh 86 430, a house allowance of Ksh 21 000 and a commuter allowance of Ksh 12 000. The employee contributes a non-taxable 10% of basic salary towards a pension scheme.

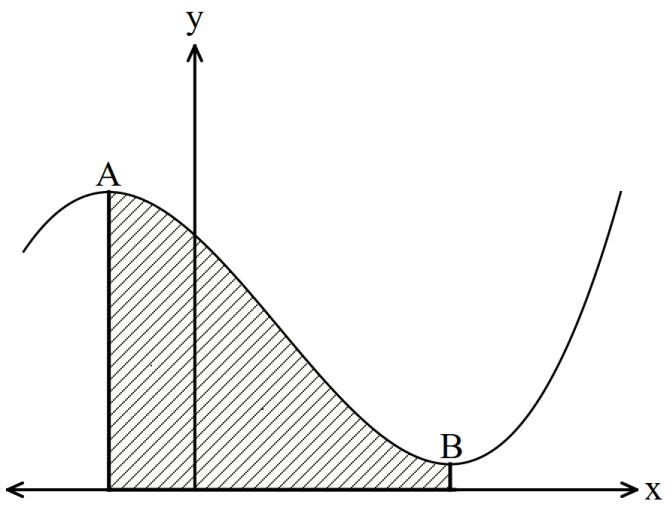
a) Calculate the employee's

i) Monthly taxable income. (2 marks)

ii) net tax per month (6 marks)

b) Calculate the employee's net salary. (2 marks)

24. The diagram below shows part of a curve whose gradient function is $\frac{dy}{dx} = 3x^2 - 6x - 9$. Points A and B are stationary points on the curve and lines from A and B are drawn perpendicular to the x-axis.



Given that the curve passes through the point (0, 30), find:

a) The equation of the curve. (3 marks)

b) The coordinates of points A and B (4 marks)

c) The area of the shaded region (4 marks)