

NAME..... SCHOOL.....

CLASS..... ADM NO..... INDEX NO.....

121/2 MATHEMATICS

FORM 4

Time: 2 ½ Hours

AUG 2022

LAIKIPIA EAST TERM 2 2022 FORM 4 EVALUATION EXAM

Kenya Certificate of Secondary Education – K.C.S.E

INSTRUCTIONS TO CANDIDATES.

1. Write your name and admission number in the space provided at the top of this page.
2. This paper consists of two sections; **section I** and **section II**
3. Answer **ALL** questions in sections I and only **FIVE** sections in section II
4. Show all the steps in your calculations; giving your answers at each stage in the spaces provided below each question.
5. Marks may be given for correct working even if the answer is wrong
6. Non-programmable silent electronic calculators and KNEC mathematical tables may be used.

For examiners 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: Answer all questions from this section 50mks

1. Use logarithm tables to evaluate

(4 Marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. Solve for x in the equation $2\sin^2 x - 1 = \cos^2 x + \sin x$ for $0^\circ \leq x \leq 360^\circ$

(3 Marks)

3. (a) Expand $\left(1 + \frac{3}{x}\right)^5$ up to the fifth term

(2 Marks)

(b) Hence use your expansion to evaluate the value of $(2.5)^5$ to 3 d.p .

(2 Marks)

4. Make Q the subject of the formula

$$T = P \sqrt{\frac{Q^2}{Q^2 - 1}}$$

(3mks)

5. The position vectors of A and B are $\underline{a} = 4\mathbf{i} + 4\mathbf{j} - 6\mathbf{k}$ and $\underline{b} = 10\mathbf{i} + 4\mathbf{j} + 12\mathbf{k}$. D is a point on AB such that AD:DB is 2:1. Find the co-ordinates of D (3 Marks)

6. A dealer has two types of grades of tea, A and B. Grade A costs Sh. 140 per kg. Grade B costs Sh. 160 per kg. If the dealer mixes A and B in the ratio 3:5 to make a brand of tea which he sells at Sh. 180 per kg, calculate the percentage profit that he makes (3 marks)

7. A variable Z varies directly as the square of X and inversely as the square root of Y . Find the percentage change in Z if X increased by 20% and Y decreased by 19% (3 Marks)

8. Find the centre and radius of the circle whose equation is $2x^2 + 2y^2 - 8x + 12y - 2 = 0$
(3 Marks)

9. Pipe A can fill a tank in 2 hours; pipes B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take:

(a) To fill the tank if A and B are left open and C closed (2 Marks)

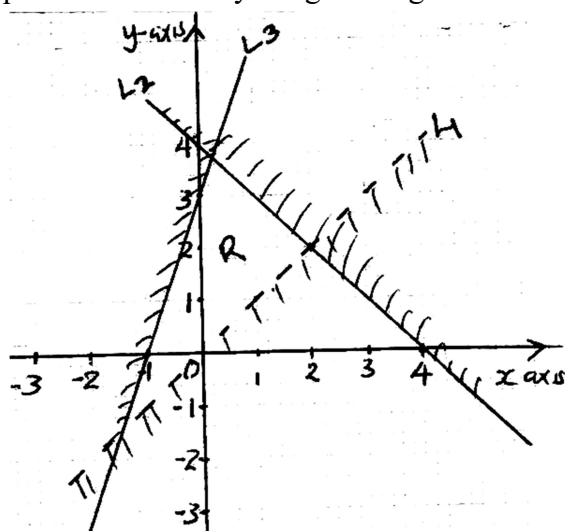
(b) To fill the tank with all the pipes open (2 Marks)

10. Evaluate by rationalizing the denominator and leaving your answer in surd form.(3 Marks)

$$\frac{\sqrt{8}}{1 + \cos 45^\circ}$$

11. Form the three inequalities that satisfy the given region R

(3 Marks)



12. Solve the quadratic equation by completing the square method.

(3 marks)

$$2x^2 - 5x = -3$$

13. The gradient of a curve is given by $\frac{dy}{dx} = x^2 - 4x + 3$. The curve passes through the point (1, 0). Find the equation of the curve. (3mks)

14. The base and height of a right angled triangle were measured as 6.4cm and 3.5cm respectively. Calculate the maximum absolute error in the area of the triangle. (3mks)

15. Solve for x in the equation

(2 marks)

$$\log (5x - 15) - \log(2x - 3) = 1$$

16. Calculate the exact value of compound interest earned on Sh. 20 000 for $1\frac{1}{2}$ years at the rate of 12% p.a, compounded half yearly.

(3 marks)

SECTION II – 50 MARKS

Answer any FIVE questions from this section

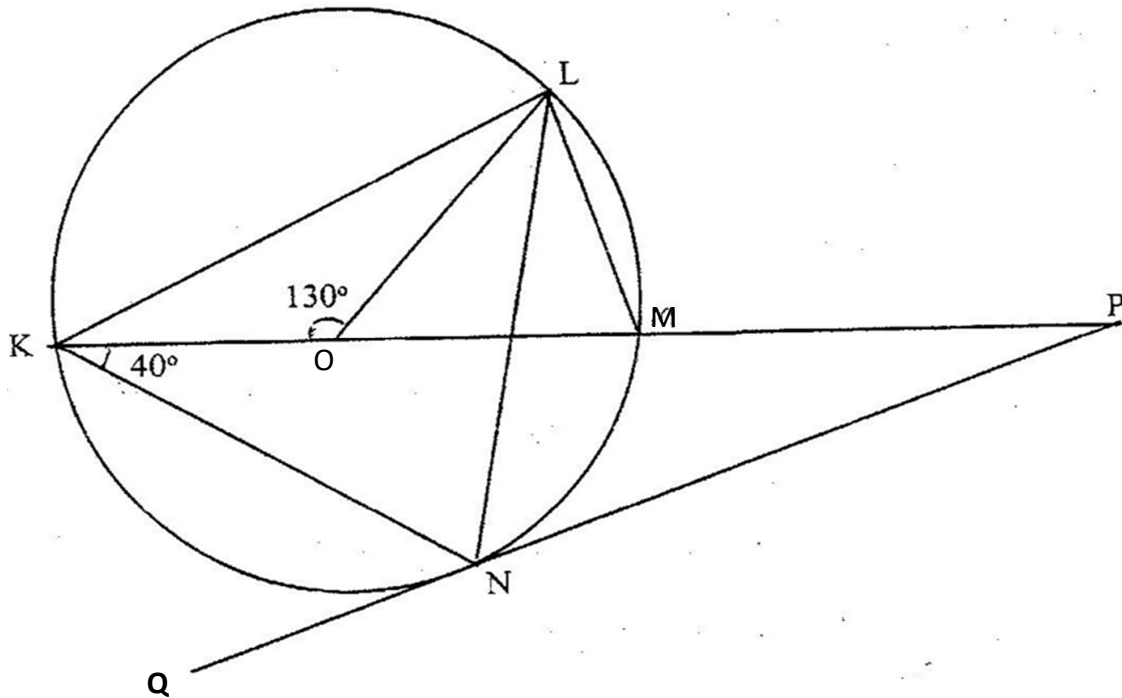
17. An arithmetic progression of 41 terms is such that the sum of the first five terms is 560 and the sum of the last five terms is -250. Find:

a) The first term and the common difference (5 marks)

b) The last term (2 marks)

c) The sum of the progression (3 marks)

18. In the figure below, K L M and N are points on the circumference of a circle centre O. The points K, O, M and P are on a straight line. PQ is a tangent to the circle at N. Angle $KOL = 130^\circ$ and angle $MKN = 40^\circ$



- a. $\angle MLN$ (2mks)
- b. $\angle OLN$ (2mks)
- c. $\angle LNP$ (2mks)
- d. $\angle MPQ$ (2mks)
- e. $\angle KNQ$ (2mks)

19. An aircraft leaves town P (30°S , 17°E) and moves directly towards Q (60°N , 17°E). It then moved at an average speed of 300 knots for 8 hours Westwards to town R. Determine

a) The distance PQ in nautical miles. (2 marks)

b) The position of town R. (4 marks)

c) The local time at R if local time at Q is 3.12p.m (2 marks)

d) The total distance moved from P to R in kilometers. (Take $1\text{nm} = 1.853\text{km}$) (2 marks)

20. A cupboard has 7 white cups and 5 brown ones all identical in size and shape. There was a blackout in the town and Mrs. Kamau had to select three cups, one after the other without replacing the previous one.

(a) Draw a tree diagram for the information. (2mks)

(b) Calculate the probability that she chooses.

(i) Two white cups and one brown cup. (2mks)

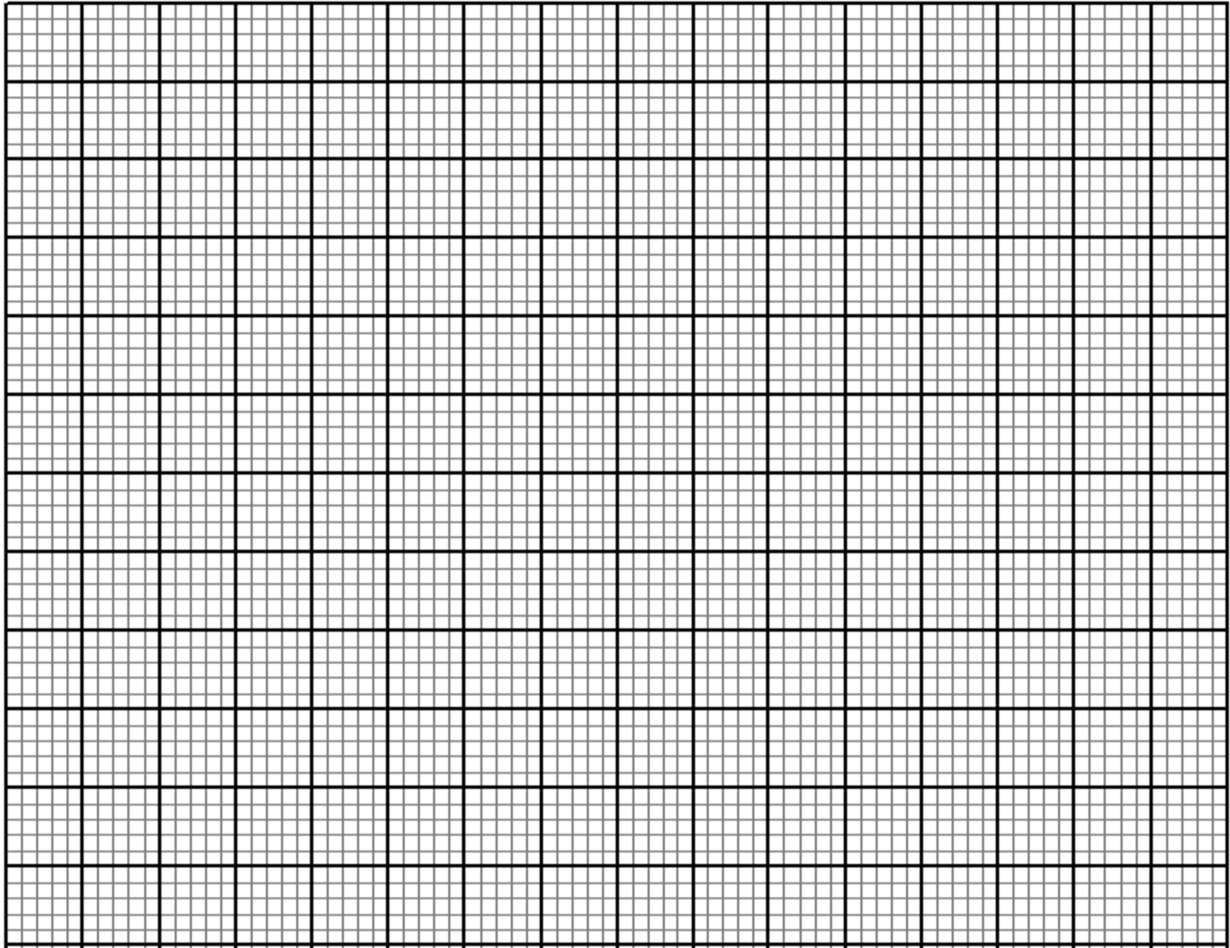
(ii) Two brown cups and one white cup. (2mks)

(iii) At least one white cup. (2mks)

(iv) Three cups of the same colour. (2mks)

21. a) Draw $\triangle PQR$ whose vertices are $P(1,1)$, $Q(-3,2)$ and $R(0,3)$ on the grid provided (1 Mark)

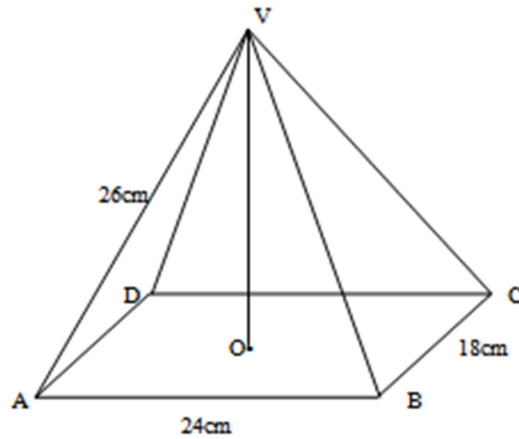
a) Find and draw the image $P'Q'R'$, image of $\triangle PQR$ under the transformation whose matrix is $\begin{pmatrix} 3 & 0 \\ 1 & 1 \end{pmatrix}$ (3 Marks)



c) $P'Q'R'$ is then transformed into $P''Q''R''$ by the transformation of matrix $\begin{pmatrix} -1 & 0 \\ 1 & 3 \end{pmatrix}$ Find the co-ordinates of $P''Q''R''$ and draw the image (3 Marks)

d) Describe fully the single transformation which maps PQR onto $P''Q''R''$. Find the matrix of this transformation (3 Marks)

22. The diagram below represents a pyramid standing on rectangular base ABCD. V is the vertex of the pyramid and $VA = VB = VC = VD = 26$ cm. M is the midpoints of BC and AC respectively. $AB = 24$ cm and $BC = 18$ cm.



Calculate:-

- The length of the projection of line VA on plane ABCD (2marks)
- The angle between line VA and the plane ABCD. (2marks)
- The size of the angle between the planes VBC and ABCD. (2marks)
- The vertical height of the pyramid. (2marks)
- The volume of the pyramid (2marks)

23. (a) Using a ruler and a pair of compasses only, construct a parallelogram ABCD such that $AB=9$ cm, $AD=7$ cm and angle $BAD=60^\circ$. (3mks)

(b) On the same diagram, construct:

- (i) The locus of a point P such that P is equidistant from AB and AD; (1mk)
- (ii) The locus of a point Q such that Q is equidistant from B and C; (1mk)
- (iii) The locus of a point T such that T is equidistant from AB and DC; (1mk).

(a) (i) Shade the region R bounded by the locus of P, the locus of Q and the locus of T. (1mk)

(ii) Find the area of the region shaded in (d)(i) above. (3mks)

24. The table below shows the marks scored by eighty Form 4 students in a mathematics test.

Marks	$10 \leq x < 20$	$20 \leq x < 30$	$30 \leq x < 40$	$40 \leq x < 50$	$50 \leq x < 60$	$60 \leq x < 70$	$70 \leq x < 80$	$80 \leq x < 90$
Frequency	2	5	9	17	22	15	8	2

a) Calculate

i) Mean mark.

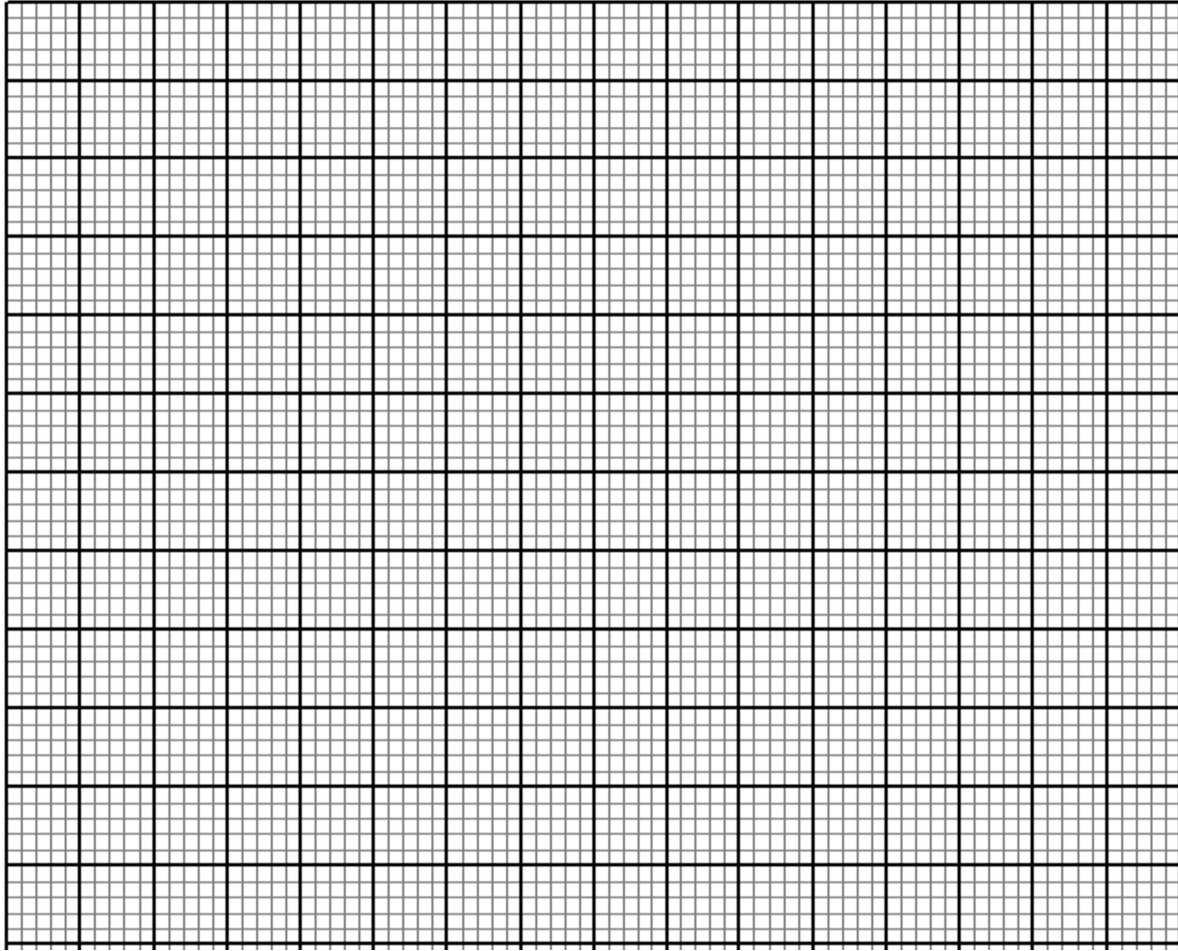
(3mks)

ii) Lower quartile

(2mks)

b) On the grid provided draw the cumulative frequency curve to represent the above distribution.

(3mks)



c) From the graph estimate the

i) 4th decile

(1mk)

ii) Range of marks of the middle 70% of the students.

(1mk)