BSJE JOINT EXAMINATION

-2024 -

Kenya Certificate of Secondary Education

121/1 Mathematics Alt. A Paper 1

July, 2024 TIME: 2½ Hrs

Name: …… Index No: ……

School: …….. Signature: ……..

121/1 - Mathematics
Friday, 12TH July, 2024
Morning
8.00am-10.30am

Instructions to candidates.

(a) Write your name and index number in the spaces provided above.
(b) Sign and write the date of the examination in spaces provided above.
(c) This paper consists of two sections: Section **I** and **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 answer at each stage in the space provided.
(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) ***Candidates should check the question paper to ascertain that no questions are missing.***
(i) ***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 (50MARKS):<u>Answerall the questions in this section in the spaces provided.</u>

1. Evaluate without using tables or calculators (3marks)

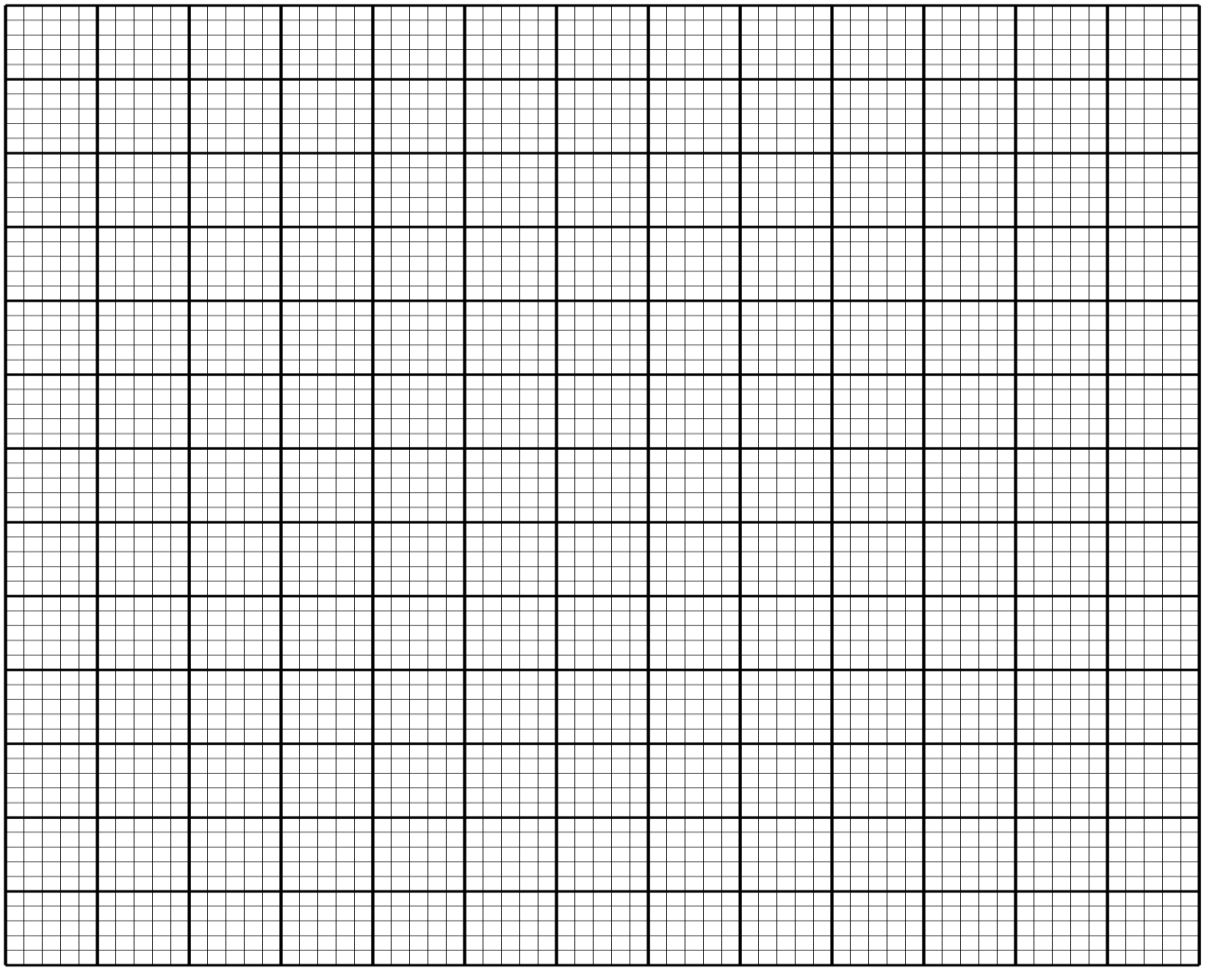
$$\frac{{}^{6}/_{7} \text{ of } {}^{14}/_{3} \div 80 \times {}^{-20}/_{3}}{-2 \times 5 \div (14 \div 7) \times 3}$$

2. Solve the following inequalities and represent the solution on a number line.
   $4 - 3 \leq 6x - 1 < 3x + 8$ (3marks)

3. Use tables of squares, cubes roots and reciprocals to evaluate; (4marks)

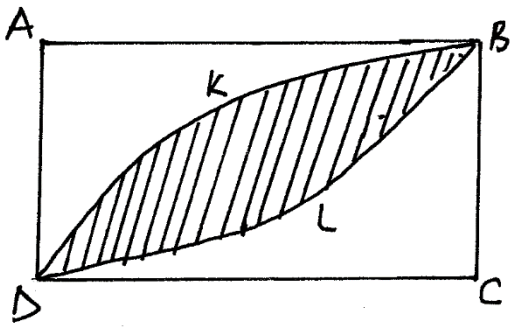
$$23.5^3 - \sqrt[3]{(4411)} + \frac{1}{0.0071}$$

4. Triangle ABC has its vertices at A(3, 0), B(2,3) and C(5,1) if A′(5, 0), B′(3,6) and C′(9,2) is the image of ABC under enlargement. On the same axes and grid provided below, determine the Centre of enlargement and linear scale factor. (3marks)



5. Phenny is a saleslady. She is paid Ksh 15,375 per month. She is also paid a commission of 4 ½ % on the amount of money she makes from her sales. In a certain month, she earned a total of Ksh. 28,875. Calculate the value of her sales that month. (3marks)

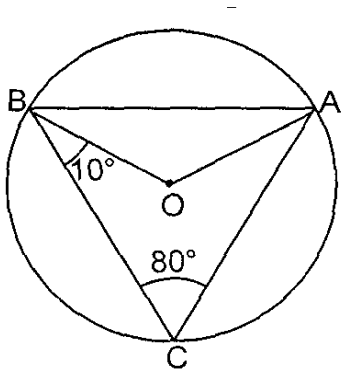
6. The figure drawn below is a square ABCD of sides 36.75cm. The shaded area is formed out of two segments. DCB and DKB. Find the area of the shaded region. (3marks)



7. Solve for x in the equation: $3^{2x+1} + 4 \times 3^{2x+1} - 45 = 0$ (3 marks)

8. Simplify the expression to its simplest form $\frac{24x^2 + 2ax - 12a^2}{18x^2 - 8a^2}$ (3marks)

9. In the figure below, O is the centre of circle. Angle BCA=80^0 and angle CBO = 10^0. Determine the size of angle CAB. (3marks)



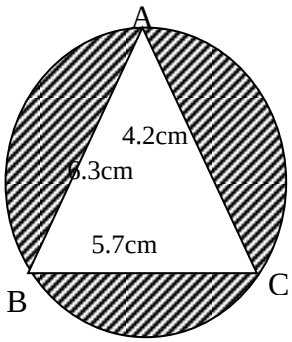
10. A foreign exchange bureau in Mombasa buys and sells selected foreign currencies at the rates shown in the table below.

Currency	**Buying (Ksh)**	**Selling (Ksh)**
1 South African Rand	7.48	7.95
1 Chinese Yuan	20.03	20.20

A tourist arrived in Kenya from South Africa with 7,435,000 South African Rands. She converted the whole amount to Kenya shillings through an agent at a commission of 2%. While in Kenya, she spent 25% of this money and converted the balance to Chinese Yuan. Calculate the amount of Chinese Yuan that she received. (3 marks)

11. Two matrices A and B are such that A=$\begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$and B= $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$,given that the determinant of AB = 4, find the value of K. (3mks)

12. The circle below whose area is 18.05cm^2 circumscribes triangle ABC where AB = 6.3cm, BC = 5.7cm and AC = 4.2cm. Find the area of the shaded part. (4Marks)



13. A boat is at point P, a distance of 100km from the bottom of a hill. The angle of elevation of the top of the hill is 30^o from P. The boat sails straight towards the hill to a point Q from where the angle of elevation to the top of the hill is now 60^o. Calculate the distance PQ (3 marks)

14. The interior angle of a regular polygon is 108^0 larger than the exterior angle. Determine the number of sides of the polygon. (3 Marks)

15. A piece of wire 18 cm long is to be bent to form a rectangle. If its length is x cm, obtain an expression for its area. Hence calculate the dimensions of the rectangle with maximum area from the expression (3marks)

16. A solid comprises of a cube **ABCDEFGH** of each side **2cm** and a square based pyramid **EFGHV**. The slant edges of the pyramid **EV=FV=GV=HV=2cm**. Draw the net of the solid. (3marks)

SECTION II(50 Marks)

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

17. A bus left Kisumu at 6.00a.m and travelled towards Usenge Boys at an average speed of 100km/hr. At 6.30 am, a van left Usenge Boys and travelled towards Kisumu to receive the bus with a number of students moving at an average speed of 125km/h.Given that the distance between Kisumu and Usenge Boys is 500km Calculate:

    a. The time the two vehicles met. (4marks)

    b. On meeting, the bus proceeded with its journey but the van had a break of 30 minutes before proceeding for Usenge Boys. Calculate:

    i. The time the bus arrived at Usenge Boys. (3marks)

    ii. The time the van arrived at Usenge Boys (3marks)

18. Complete the table below for the function $y= x^2– 3x + 6$ in the range $-2 \leq x \leq 8$. (2mks)

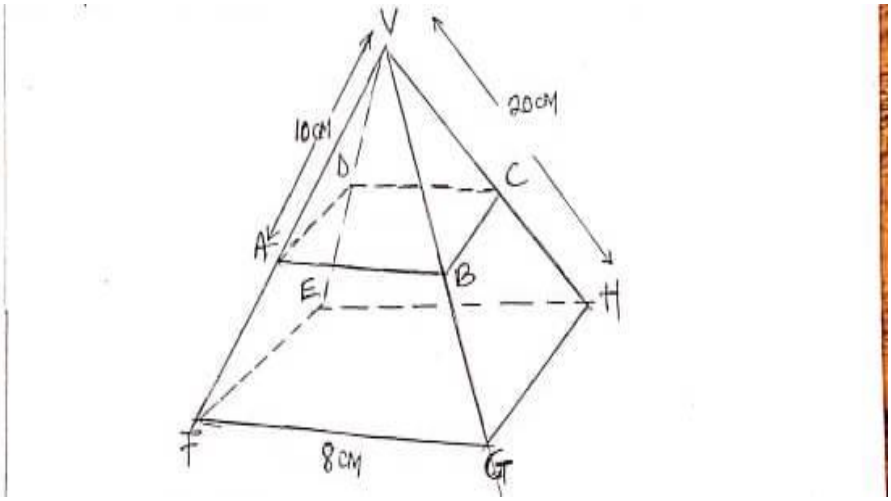
X	-2	-1	0	1	2	3	4	5	6	7	8
Y											

a. Use the trapezium rule with 10 strips to estimate the area bounded by the curve, $y=x^2- 3x + 6$, the lines $x = -2$, $x =8$ and the x – axis. (3mks)

b. Use the mid – ordinate rule with 5 strips to estimate the area bounded by the curve, $y = x^2 – 3x + 6$, the lines $x = -2$, $x = 8$ and the x- axis. (3mks)

c. By integration, determine the actual area bounded by the curve $y = x^2 – 3x + 6$, the lines $x = -2$, $x = 8$, and the x – axis. (2mks)

19. The figure below is a right pyramid VEFGH with a square base of 8cm and a slant edge of 20cm. points A,B,C and D lie and plane ABCD is parallel to the base EFGH.



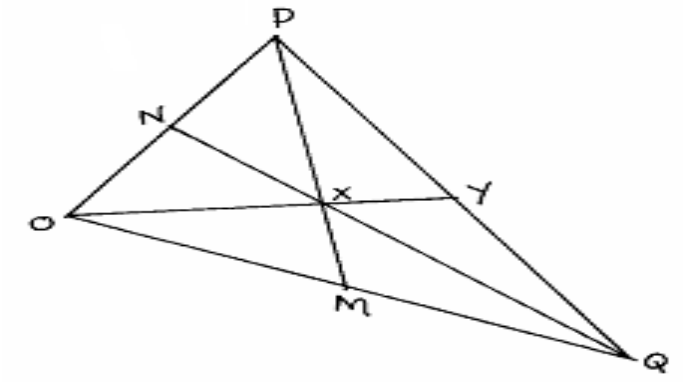
a. Find the length of AB. (2marks)

b. Calculate to 2 decimal places.
i. The length of AC. (2marks)

ii. The perpendicular height of the pyramid VABCD. (2marks)

c. The pyramid VABCD was cut off. Find the volume of the frustrum ABCDEFGH correct to 2 decimal places. (4marks)

20. The figure below is triangle OPQ in which **OP = p** and **OQ = q** . M and N are points on **OQ** and **OP** respectively such that **ON = NP** = 1:2 and **OM: MQ** = 3: 2.



(a) Express the following vectors in terms of p and q.

(i) PM. (2marks)

(ii) QN. (1marks)

(iii) PQ. (1marks)

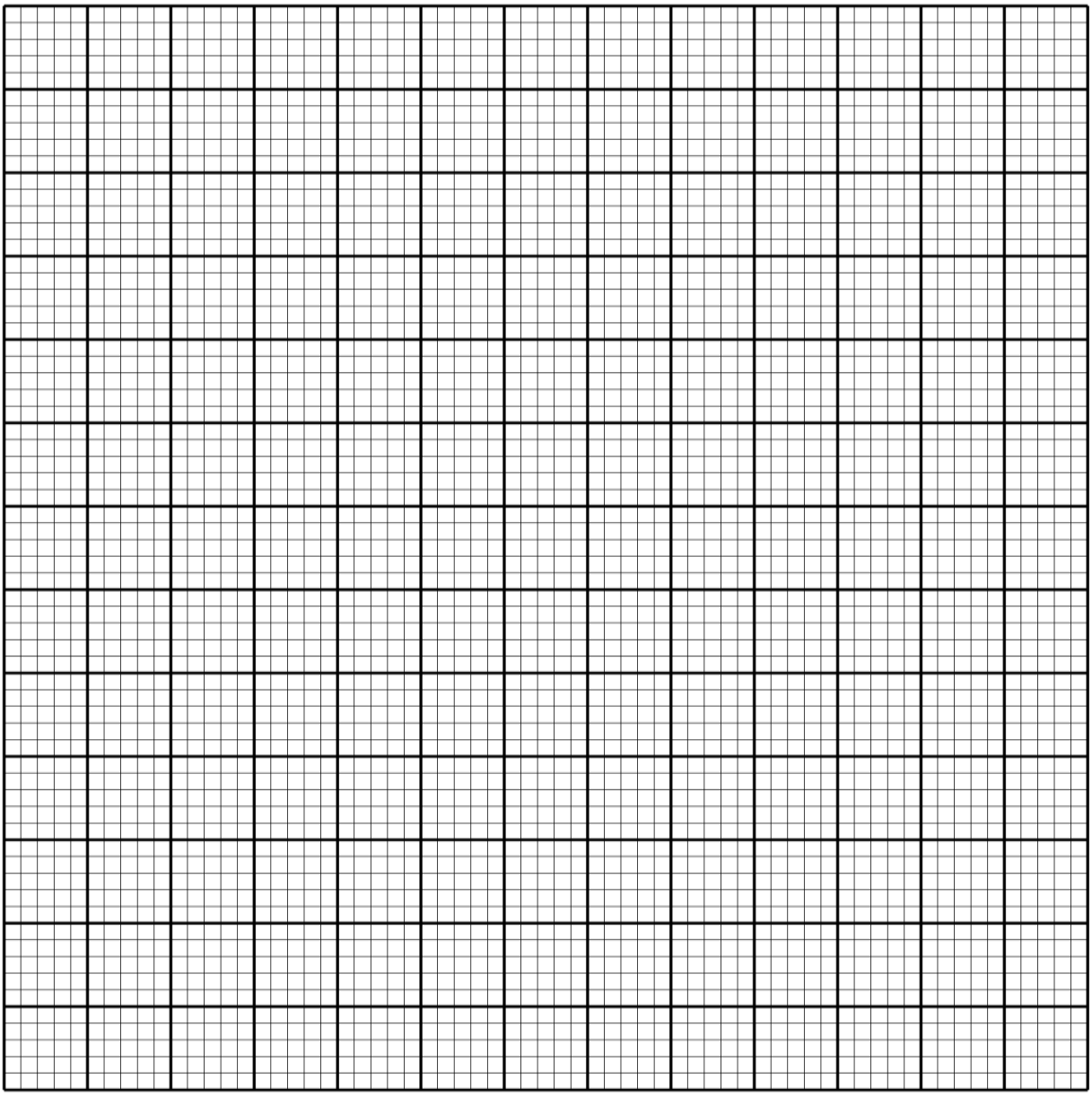
(b) Lines PN and QN intersect at X such that **PX = rPM** and **QX = tQN**. Express **OX** in two different ways and find the value of **r** and **t.** (4 marks)

(c) **OX** produced meets **PQ** at **Y** such that **PY: YQ = 5: 3.** Using the ratio theorem or otherwise, find **OY** in terms of **p** and **q**. (2 mark)

21. Complete the table below for the equation $y = 2x^2 + 3x - 11$ (2 Marks)

x	-4	-3	-2	-1	0	1	2	3
$2x^2$	32							
$3x$	-12							
-11	-11	-11	-11	-11	-11	-11	-11	-11
y			-9					16

(a) On the grid paper provided draw the graph of $y = 2x^2 + 3x - 11$ (3 Marks)



(b) On the same axes draw the graph of $y = 2x + 1$ (2 Marks)

(c) Use your graph to solve the quadratic

(i) $2x^2 + 3x - 11 = 0$ (1 Mark)

(ii) $2x^2 + x - 12 = 0$ (2 Marks)

22. A straight line**L**1 passes through the points (8, -2) and (4,-4).

(a) Write its equation in the form ax + by +c = 0, where a, b and c are integers. (3Marks)

(b) If the line **L**1 above cuts the x-axis at point P, determine the coordinates of P. (2Marks)

(c) Another line**L2**, which is a perpendicular bisector to the line in (a) above cuts the y axis at the point Q. Determine the coordinates of point Q. (3 Marks)

(d) Find the length of QP (2 Marks)

23. A rectangular field measures 20 metres by 16 metres. A path of uniform width x - metres is made all round it. This make the area of the field to reduce in the ratio 7 : 16.

a) Find an expression in x for the new length and the width (1mark)

b) Find the expression in x for the new area. (1mark)

c) Find the possible value of x (4 marks)

d) The remaining area of the field is divided among three siblings Abdi, Bor and Celine such that the ratio of Abdi to Bor's is 3 : 4 while that of Bor's to Celine's is 6 : 5. Find the difference between the area of Celine's share and Abdi's share.

(4marks)

24. Using a pair of compass and ruler only construct.

(a) Triangle PQR in which PQ =5cm∠QPR = 30^0 and ∠PQR=105^0. (3marks)

(b) A circle that passes through the vertices of the triangle PQR. Measure its radius. (3marks)

(c) The height of triangles PQR with PQ as the base. Measure the height. (2marks)

(d) Determine the area of the circle that lies outsides the triangle correct to 2 decimal places (2marks)