MUSJET EXAMINATIONS 2024
Kenya Certificate of Secondary Education (KCSE)

121/2 - MATHEMATICS - Paper Form4

ALT. A

JULY. 2024 – 2½ hours

Name: ……..……...… Index No: Stream:……. **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 15 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

SECTION I-50 MARKS

(Answer all questions in this section)

1. A car bought at Kshs 80,000 depreciates at 15% p.a Determine the value of the car after 2 years. (2marks)

2. (a) Expand $(x+y)^8$ up to the term containing x^4 (2marks)

(b) Use your expansion to estimate $(1.2)^8$ (2marks)

3.Solve for x in the equation $\text{Log}(3x + 4) - \log(3-x) = 1$ (3marks)

4. Give the equation of the normal to the curve $y = 4x^3 + 2x + 1$ at (1, 4) in the form y=mx+c (3marks)

5. Using the line below, measure out Line AB of length 5cm, on the upper side of line AB draw the locus of a point P such that <APB=60^0. (3marks)

---

6. Express in surd form and simplify the expression by rationalizing the denominator. (3marks)

$$\frac{2}{1-\cos 45^\circ}$$

7. Find the percentage error in the calculation of the area of a plot whose measurement is given as: 6.0 cm × 3.5 cm (3marks)

8. Find the value of θ in the equation for $0^o \leq \theta \leq 180^o$ (3marks)

$$\frac{\sqrt{1-\cos^2\theta}}{\cos\theta} = 1$$

9. Make T the subject of the formula. (3marks)

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

10. Find the center and radius of a circle whose equation is $4x^2 + 4y^2 - 144 = 0$ (3marks)

11.Three grades A, B, and C of rice were mixed in the ratio 3:4:5. The cost per kg of each of the grades A, B and C were Ksh 120, Ksh 90 and Ksh 60 respectively. Calculate:

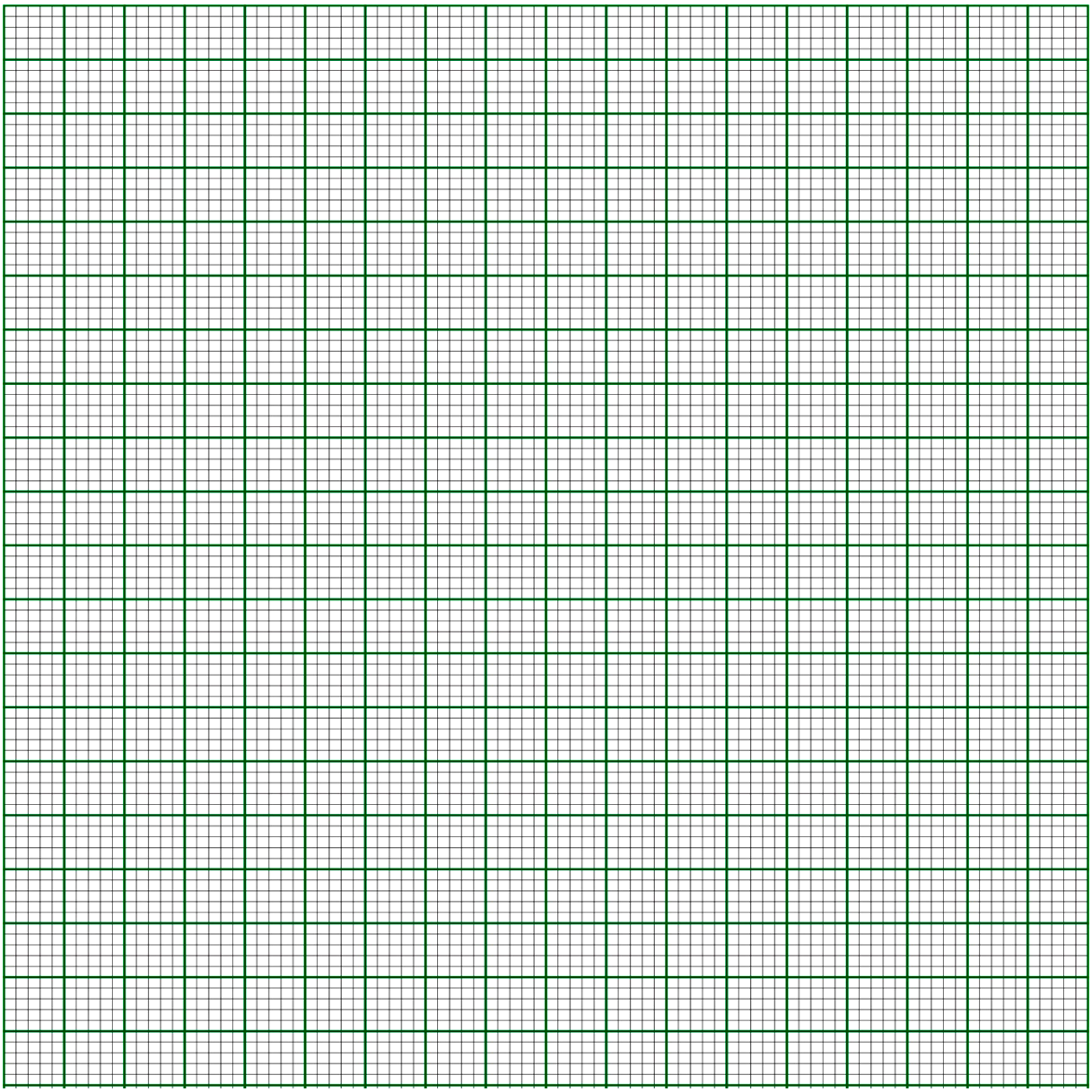
(a) the cost of one kg of the mixture; (2 marks)

(b) the selling price of 5 kg of the mixture given that the mixture was sold at 8% profit. (2 marks)

12. The table shows corresponding values of x and y for the curve Y= ¼ x^3 – 2

X	-3	-2	-1	0	1	2	3
Y	-8.8	-4	-2.3	-2	-1.8	0	4.8

On the grid provided below, draw the graph of Y= ¼ x^3 -2 for -3 ≤ x ≤ 3. Use the graph to estimate the value of x when y =2 (3 marks)



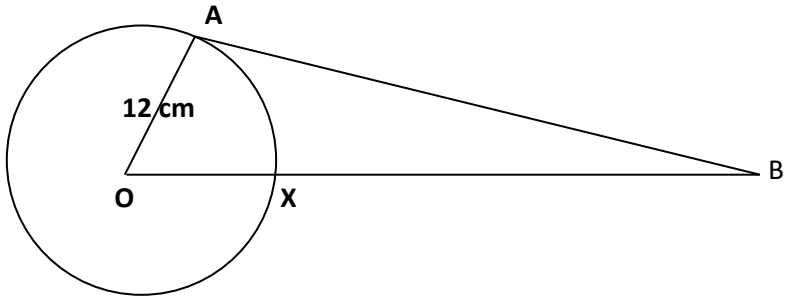
13. Use logarithms tables to solve the equation below. (4marks)

$$\sqrt[5]{\frac{83.6\ x\ 0.00541}{156}}$$

14. Solve for x given that the following is a singular matrix. (2marks)

$$\begin{pmatrix} 1 & 2 \\ x & x-3 \end{pmatrix}$$

15. In the figure below, AB is a tangent to the circle center O and radius 12 cm. The area of the triangle AOB is 120cm^2. OXB is a straight line.



Calculate XB correct to 1d.p. (3 marks)

16. Omondi makes two types of shoes: A and B. He takes 3 hours to make one pair of type A and 4 hours to make one pair of type B.He works for a maximum of 120 hours to make x pairs of type A and y pairs of type B.It costs him sh 400 to make a pair of type A and sh 150 to make a pair of type B.His total cost does not exceed sh 9000. He must make at least 8 pairs of type A and more than 12 pairs of type B.Write down four simplified inequalities representing the information above. (4marks)

SECTION II-50 MARKS

(Answer any five questions in this section)

17. The probability that our school will host soccer and rugby tournament this year is 0.8. If we host the probability of winning soccer is 0.7. If we don't host the probability of winning soccer is 0.4. If we win soccer the probability of winning rugby is 0.8, otherwise if we lose soccer the probability of winning rugby is 0.3.

(a) Draw a tree diagram to represent this information. (2marks)

b).Use the tree diagram to find:

(i).The probability that we will lose both games. (2marks)

(ii).The probability that we will win only one game. (2marks)

(iii).The probability that we will host and lose both games. (2marks)

(iv).The probability that we win at least one game, if we host. (2marks)

18. Income rates for income earned were charged as follows.

Income in K£. Per month	**Rate in Ksh. Per £**
1 - 420	2
421 - 900	3
901 - 1500	4
1501 – 1800	5
1801 - 2400	6
2401 and above	7

A civil servant earns a monthly salary of Ksh.19,200. His house allowance is Ksh.12,000 per month. Other allowances per month are transport Ksh.13,000 and medical allowance Ksh.2,300. He is entitled to a family relief of Ksh.1,240 per month. Determine

(a)(i) His taxable income in K£ per month. (2marks)

(ii) Net tax. (5marks)

b).In addition, the following deductions were made.

NHIF Sh.230

Service charge Ksh.100

Loan repayment Ksh.4, 000

Cooperative shares of Ksh.1, 200

Calculate his net salary per month in shillings. (3marks)

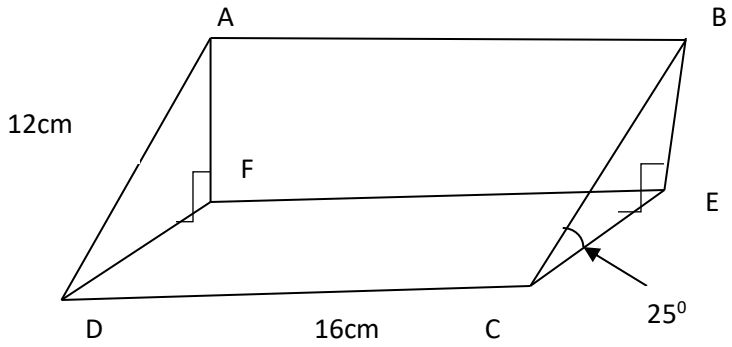
19. P varies directly as V and inversely as the square root of R. Given that P = 180, R = 25 when V = 9.

(a) Find P to the **nearest whole numbe**r when V = 6 and R = 26. (3marks)

(b) Find the value of V when P = 360 and R = 0.64. (3marks)

(c).If V increased by 16% and R decreases by 25%, find the percentage change in p. (4marks)

20. The length of the solid is 16cm and has a 12cm long slanting edge at 25^0 to the horizontal.



Find to 2 d.p:

a) The length BE (2marks)

b) The length CE (2maks)

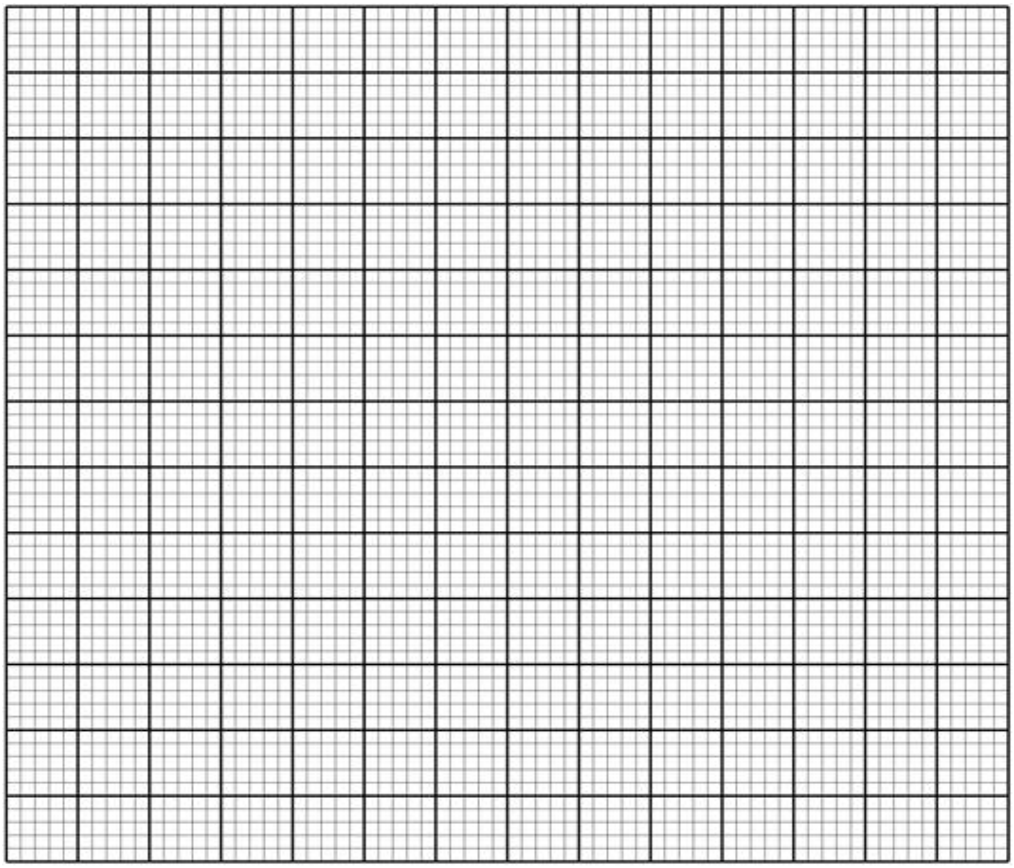
c) The angle between the line BD and plane ABEF (4marks)

d) The angle between the line BD and plane DCEF (2marks)

21. A quadrilateral with vertices at K (1,1), L(4,1), M(2, 3) and N (1, 3) is transformed by a matrix T = $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$ to a quadrilateral K'L'M'N'

a) Determine the coordinates of the image (3marks)

b) On the grid provided draw the object and the image (2marks)



i) Describe fully the transformation which maps KLMN onto K'L'M'N (2marks)

ii) Determine the area scale factor of the image and its object. (1mark)

iii) Find a matrix which maps K'L'M'N' onto KLMN (2marks)

22. The positions of two towns A and B on the earth's surface are (61^0N, 140^0E) and (61^0N,39^0W) respectively. (Take $\pi = \frac{22}{7}$ and radius of the earth as 6370km).

(a) Find the difference in the Longitude between A and B, hence find the distance between two towns in nautical miles. (3marks)

(b) The position of another point C is (61^0N, 40^0W). Calculate the shortest distance between A and C.in kilometers. (3marks)

(c) Another point D is 430km east of town B and on the same latitude. Find the position of D. (4marks)

23. The following table shows the distribution of marks obtained by 50 students.

Marks	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69	70 – 74	75 – 79
No. of students	3	9	13	15	5	4	1

By using an assumed mean of 62, calculate

a). The mean (5 marks)

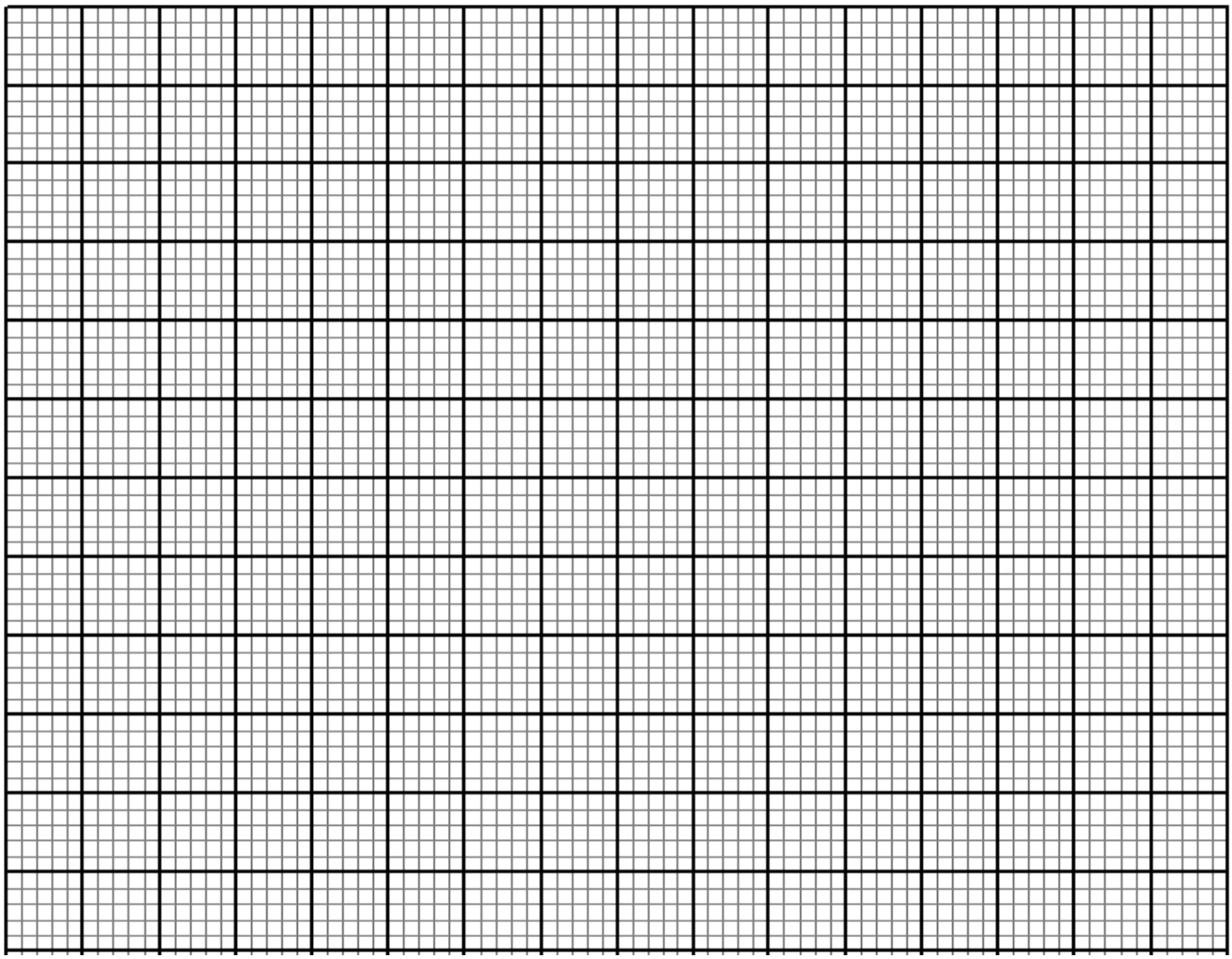
b).The variance (3 marks)

c).The standard deviation (2 marks)

24. a) Complete the table below for y=sin 2x and y=sin (2x + 30) giving values to 2d.p (2 marks)

X	0	15	30	45	60	75	90	105	120	135	150	165	180
Sin 2x	0				0.87				-0.87				0
Sin (2x + 30)	0.5				0.5				-1				0.5

b).On the same axes, draw the curves (4marks)



c) Use the graph to solve $sin\ (\ 2x\ +\ 30) - sin\ 2x\ =\ 0$ (2 marks)

d) State the period and amplitude of $y\ =\ sin\ (\ 2x\ +\ 30)$ (2 marks)