

NAME..... INDEX NO.....

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST, 2016
TIME: 2½ HOURS

CANDIDATE'S SIGN.....

DATE.....

**KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY
JOINT EXAMINATION – 2016**

**Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 2
TIME: 2½ HOURS**

INSTRUCTION TO CANDIDATE'S:

1. Write your **name**, **index number** and **school** in the spaces provided at the top of this page.
2. **Sign** and write the **date** of examination in spaces provided above.
3. This paper consists of **two** Sections; Section **I** and Section **II**.
4. Answer all the questions in Section **I** and any **FIVE** questions from Section **II**.
5. All answers and working must be written on the question paper in the spaces provided **below** each question.
6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and **KNEC** Mathematical tables **may be** used, except where stated otherwise.
9. 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

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SECTION I: (50 MARKS)

Answer all the questions in the section.

1. Evaluate using logarithms. (4 marks)

$$\sqrt[3]{\frac{(0.07432)^2 \times (48.38)^3}{8458}}$$

2. A rectangular plot measures 31.4m by 28.3m. What is the percentage error in getting it's area. (3 marks)

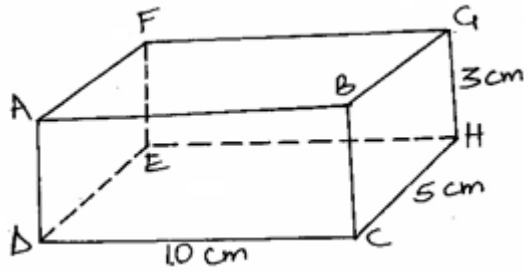
3. Make M the subject in $K = \left(\frac{MV^2}{\chi + M}\right)^{\frac{1}{2}}$. (3 marks)

4. Solve the equation.
 $\sin(2\chi - 30^\circ) = \frac{1}{2}$ for $0^\circ \leq \chi \leq 360^\circ$. (3 marks)

5. y varies inversely as the square of χ . The difference between the value of y when $\chi = 6$ and when $\chi = 10$ is 16. Find the law connecting χ and y . (3 marks)
6. (a) Without using a calculator, expand $(10 - 2\chi)^5$. (2 marks)
- (b) Use your expansion in (a) above to find the value of $(9.8)^5$. (1 mark)
7. Solve the simultaneous equation.
 $\text{Log}_3 (2\chi + y) = 2$
 $\text{Log}_2 (3\chi + 4y) = 4$ (3 marks)
8. Find the inverse of the matrix $\begin{pmatrix} 2 & -2 \\ 3 & 1 \end{pmatrix}$ hence use the matrix method to solve the simultaneous equations. (3 marks)
- $$2\chi - 2y = 6$$
- $$3\chi + y = 5$$

9. A shopkeeper mixes sugar costing Sh.40 per kg with another type which costs Sh.60 per kg. Find the ratio in which the two types should be mixed so that if a kilogram of the mixture is sold at Sh.55, a profit of 10% is realised. (3 marks)
10. A point R divides vector \vec{PQ} in the ratio 5: -2. Find the coordinates of R given that P (3, -6) and Q (-9, 2). (3 marks)
11. χ and Y are complementary angles and $\tan \chi = 3\sqrt{3}$. Find the value of $\frac{1}{2 - \tan y}$ hence rationalize the surd. (3 marks)
12. Find the distance between the centre A of a circle whose equation is $2x^2 + 2y^2 + 6x + 10y + 7 = 0$ and point B (-4, 1). (3 marks)

13. The figure is a cuboid. The dimensions of the cuboid are 10cm by 5cm by 3cm.



- (a) Find the angle between.
(i) lines CG and DE.

(2 marks)

- (ii) lines FG and DB.

(2 marks)

14. Simplify: $\frac{x-3}{x+3} - \frac{x^2-3x}{x^2-9}$.

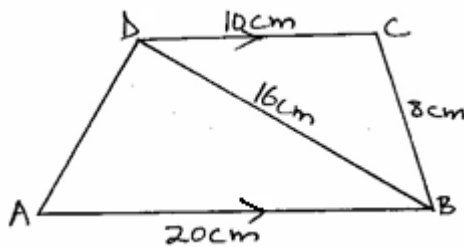
(3 marks)

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15. Evaluate: $\int_3^5 (\chi^3 - 7\chi^2 + 7\chi + 15) d\chi$.

(3 marks)

16. In the figure below ABCD is a trapezium with DC parallel to AB. DC = 10cm, BC = 8cm, DB = 16cm and AB = 20cm.



- (a) Calculate the sine of angle BDC.

(2 marks)

- (b) Hence calculate the area of ΔABD .

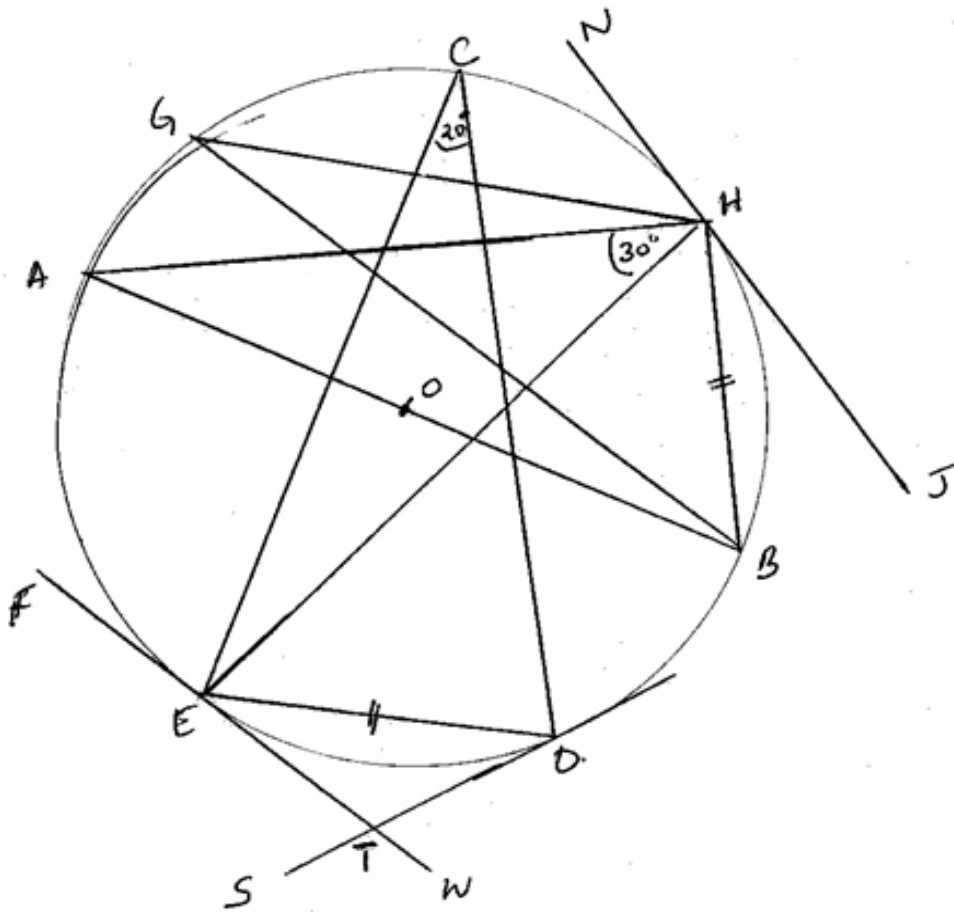
(1 mark)

SECTION II: (50 MARKS)

Answer only ANY FIVE questions in this section.

17. (a) A die and a coin (both fair) are thrown on a horizontal floor. (2 marks)
- (i) List all the possible outcomes. (2 marks)
- (ii) Find the probability of getting even number on the die and a tail on the coin or an odd number on the die and a head on the coin. (3 marks)
- (iii) Find the probability of getting a number greater than or equal to 3 on the die and a head on the coin. (2 marks)
- (b) The probability that a student gets grade A in Mathematics is $\frac{9}{10}$. If she gets grade A in Mathematics then the probability that she gets grade A in Physics is $\frac{4}{5}$. If she does not get grade A in Mathematics then the probability that she gets grade A in Physics is $\frac{3}{8}$. Calculate the probability that she gets grade A in Physics only. (3 marks)

18. The figure below shows a circle centre O, AB is a diameter. Chords ED and BH are equal NHJ, FET, STD are tangents to the circle angle $\angle ECD = 20^\circ$ and $\angle AHE = 30^\circ$. The figure is not drawn to scale.



Determine angles.

- | | |
|----------------------|-----------|
| (i) $\angle EHB$. | (2 marks) |
| (ii) $\angle ETS$. | (2 marks) |
| (iii) $\angle HGB$. | (2 marks) |
| (iv) $\angle EHJ$. | (2 marks) |
| (v) $\angle AOE$. | (2 marks) |

19. An arithmetic progression has the first term as a and the common difference as d .

(a) Write in terms of a and d , the 3rd, 9th and 25th terms of the progression. (1 mark)

- (b) The progression is increasing and the 3rd, 9th and 25th terms form the first three consecutive terms of a geometric series. If the sum of the 7th term and twice the 6th term of the arithmetic progression is 78.

Calculate:

The first term and the common difference of the arithmetic progression.

(6 marks)

- (b) Find the sum of the first nine terms of the A.P.

(3 marks)

20. The table below shows tax rates in the year 2012.

<u>Income in K£ p.a.</u>	<u>Rates of tax in %</u>
1 – 5208	10
5209 - 9744	15
9745 – 14292	20
14293 - 18840	25
Over 18840	30

(a) Mrs. Mwangi pays Ksh.5400 as PAYE. She is entitled to a house allowance of Ksh.9000p.m and claims a monthly tax relief of Ksh.1093.

Calculate;

(i) Her gross tax per annum. (2 marks)

(ii) Her monthly basic salary in Ksh. (6 marks)

(b) She also has monthly contributions as follows:

(i) Cooperative society contribution of Ksh.2000.

(ii) Loan repayment of Ksh.2500.

Calculate her net monthly salary. (2 marks)

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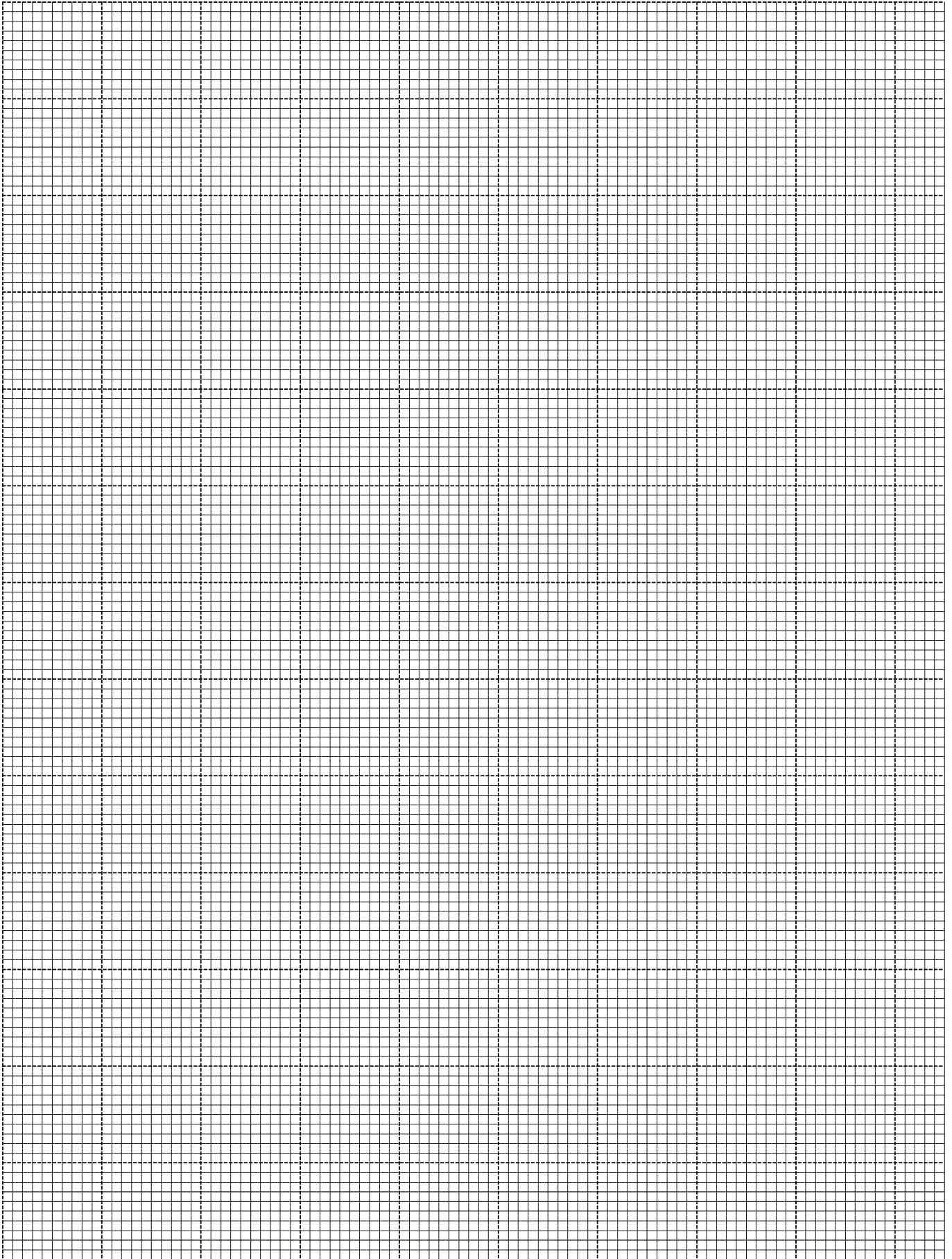
21. The table below shows the marks scored by students in a Mathematics test.

Marks	30 - 39	40 - 49	50 - 54	55 - 59	60 - 64	65 - 69
No. of students	6	20	19	20	20	15

(a) Calculate the median mark. (3 marks)

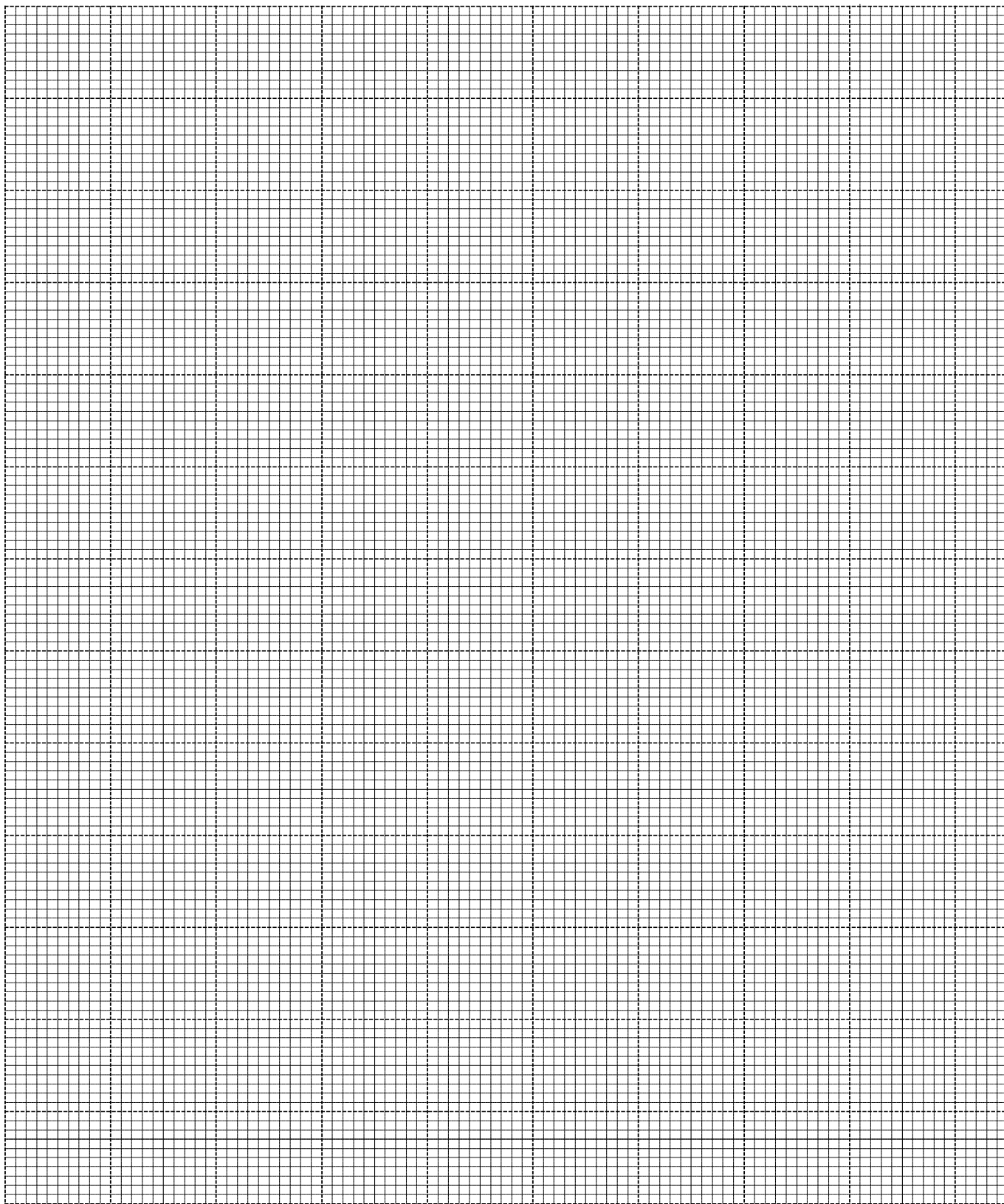
(b) Using an assumed mean of 52, calculate the mean mark. (3 marks)

- (c) On the grid provided, draw a histogram to represent the information shown above. (4 marks)



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22. (a) Draw the graph of the function.
 $y = 6x + x^2 - x^3$ for $-3 \leq x \leq 4$



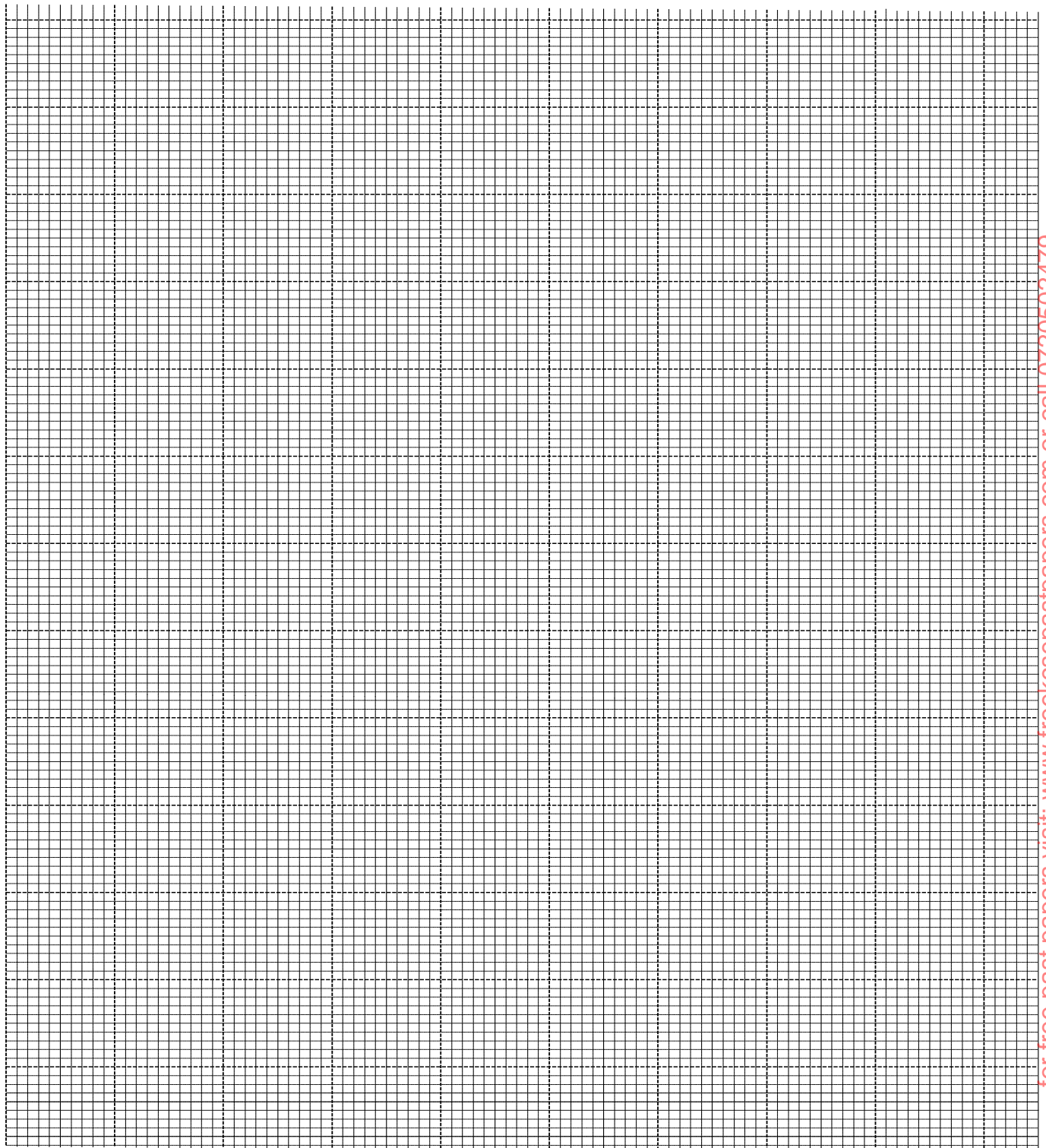
- (b) By drawing a suitable straight line(s) on the graph in (a) above estimate the roots of the following equations.

(i) $6x + x^2 - x^3 = 0$

(ii) $2x + x^2 - x^3 = 0$

23. In a school trip there were x buses and y luxury vans. Each bus was hired at Ksh.1000 and could carry 60 students. Each van was hired at Ksh.2000 and could carry 30 students.
- (a) Express the following statements as inequalities in x and y .
- (i) There must be some van or vans. (1 mark)
- (ii) There should at least 3 buses. (1 mark)
- (iii) The school should be not spend more than Ksh.18000 on the trip. (1 mark)
- (iv) Not more than 420 students are to go on the trip. (1 mark)

- (b) Illustrate inequalities graphically. (4 marks)
- (c) Use your graph to determine the maximum number of students that can go on the trip and corresponding expenditure. (2 marks)



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24. Using a ruler and compasses only.
- (i) Construct a parallelogram ABCD such that $AB = 10\text{cm}$, $BC = 7\text{cm}$ and angle $ABC = 105^\circ$. (3 marks)
 - (ii) Construct the loci of P and Q within the parallelogram such that $AP \leq 4\text{cm}$ and $BQ \leq 6\text{cm}$. (3 marks)
 - (iii) Calculate the area within the parallelogram but outside regions bounded by the loci of P and Q. (4 marks)