

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

SCHOOL.....CANDIDATE'S SIGNATURE.....

DATE.....

MATHEMATICS PAPER 121/2

TIME: 2 $\frac{1}{2}$ HOURS



KCSE ACHIEVERS PREDICTION



Kenya Certificate of Secondary Education

INSTRUCTIONS TO CANDIDATES

- Write your **name**, **index number**, **signature** and **date** of the examination in the spaces provided
- The paper contains two sections. Section I and section II
- Answer **ALL** questions in section I and any five questions in section II
- Answers and working **must** be written on the question paper in the spaces provided below each question
- Show all steps in your calculation below each question
- Marks may be given for correct working even if the answer is wrong
- Non programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise

FOR EXAMINERS' USE ONLY

SECTION I

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
MARKS																	

SECTION II

QUESTION	17	18	19	20	21	22	23	24	TOTAL
MARKS									

GRAND TOTAL

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SECTION I (50 MKS)

SECTION I (50 MARKS) Answer ALL questions in this section.

1. Make y the subject of the formula : $v = \frac{A \sqrt{x^2 + y^2}}{y}$ (3 marks)

2. Solve for x in the equation: $\text{Log}_8(6 - 2x) - \text{Log}_8(x - 2) = -1/3$ (3 marks)

3. Three quantities P , Q and R are such that P varies directly as the cube of Q and inversely as the square root of R . Find the percentage change in P if Q decreases by 10% and R decreases to 36%. (3 marks)



4. A circle with its Centre at O (-2, 0) passes through a point (1, 4). Write down the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$ (3 marks)

5. Express: $\frac{\cos 30^\circ}{\tan 45^\circ + \sqrt{3}}$ in surd form and simplify by rationalizing the denominator (3 marks)

6. In a transformation, an object with area 9cm^2 is mapped onto an image whose area is 54cm^2 . Given that the matrix of transformation is $\begin{pmatrix} x & x-1 \\ 2 & 4 \end{pmatrix}$ Find the value of X (3 marks)



7 a) Find the binomial expansion of $\left(1 + \frac{1}{2x}\right)^7$ up to the 4th term with increasing powers of x. (2 marks)

b) Hence estimate the value of $(1.05)^7$ correct to 4 decimal places. (2 marks)

8. A computer with a marked price of Kshs. 40000 can also be bought on hire purchase terms. Kibet bought the computer on hire purchase by making a deposit of Ksh 10000 and cleared the balance with equal 12 monthly installments of KShs. 3500 each. Determine the monthly interest rate of hire purchase to 2 significant figures. (3 marks)



9. A dealer blends Kericho tea that costs sh 300 per 100g packet with Ketepa that costs ksh 160 per 200g packet. In what ratio must the dealer mix the two so that by selling a 100g packet of the blend for ksh 250, a profit of 25% is made? (4 marks)

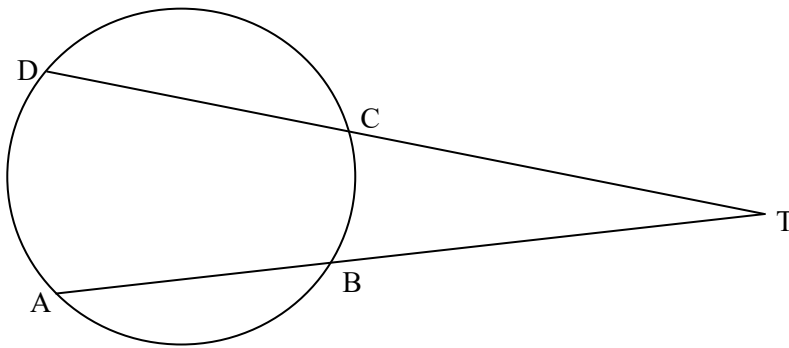
10. Solve for x in the equation: $\sin 2\theta = -0.5$ for $0^\circ \leq \theta \leq 360^\circ$ (3 marks)

11. Use completing of the square method to solve: $2x^2 - 6x + 4 = 0$ (3 marks)

12. A carpenter wishes to cut a 1m long piece of wood into 3 equal parts. He approximates the length of each piece to 0.33m. Calculate the percentage error due to this approximation (3 marks)



13. Calculate length DT in the figure below given AT and DT are secants that intersect at T and $AB = 5$ cm, $BT = 4$ cm and $DC = 9$ cm. (3 marks)



14. An arc of a circle of diameter 7 cm subtends an angle of 1.2 radians to the Centre of the circle. What is the length of the arc? (2 marks)



15. Given matrix $A = \begin{pmatrix} x-2 & x-4 \\ x & 2 \end{pmatrix}$. Find the possible values of x if A is a singular matrix.

(3 marks)

16. Working together two taps A and B can fill a tank in 2 hours. By itself tap A can fill the tank in 6 hrs. Tap A and B are opened at the same time and after running for 1 hour, an outlet taps which can drain the full tank by itself in 12 hours is opened and Tap A is closed. Find the total time taken to fill the tank.

(4 marks)



SECTION II – 50 MARKS

Answer only FIVE questions from this section.

17. In a form 4 class there are 24 girls and 30 boys. The probability that a girl participates in games is 0.4 whereas that of a boy is 0.6.

a) A student is picked at random from the class. Find the probability that the student picked:

i) Is a boy and will participate in games (2 marks)

ii) Will not participate in games (2 marks)

b) Two similar bags A and B are such that, bag A contains 3 blue balls and 7 red balls while bag B contains 4 green balls and 8 blue balls. The balls are similar in shape and size. A ball is drawn from bag A and bag B. Determine the probability that:

i) One of the balls drawn is green. (2 marks)



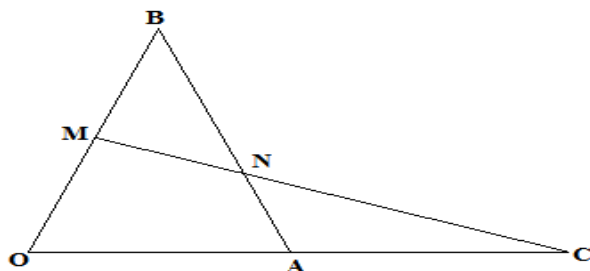
ii) The balls drawn are of the same colour.

(2 marks)

iii) None of the balls drawn is red

(2 marks)

18. In the triangle OAB below, $OA = a$, $OB = b$ and $3OA = 2OC$. M divided OB in the ratio 1:1.



a) Express in terms of a and b only, the vectors

i) BA

(1 mark)

ii) OC

(1 mark)

iii) MC

(1 mark)

b) Given further that $MN = hMC$ and $BN = kBA$,

i) Express vector MN in two different ways in terms of a , b , h and k

(2 marks)

ii) Find the value of h and k .

(4 marks)



c) State the ratio MN:MC

(1 mark)

19. A group of people planned to contribute equally towards buying a plot valued at Ksh. 270,000. After the contribution, 2 members joined of the group. As a result, a refund of Ksh 1500 was made to the members who had already contributed.

a) Let the original number of people be x , express in terms of x :

i) The original contribution

(1 mark)

ii) The new contribution

(1 mark)

b) Find how much each member contributed finally

(5 marks)



- c) Calculate the percentage decrease in the contribution per person caused by the members who joined. (3 marks)

20. The table shows income tax rates for a certain year.

Monthly taxable pay K£	Rate of tax in Ksh. Per K£
1- 434	2
435 - 866	3
867- 1298	4
1299 - 1730	5
Over 1730	6

A company employee earns a monthly basic salary and is also given taxable allowances amounting to Ksh 10480. If the employees' tax on the 5th band is Ksh 3420,

- a) Calculate the employee's monthly taxable income tax in K£. (2 marks)

- b) The employee is entitled to a personal tax relief of Ksh. 1056 per month. Determine the net tax. (4 marks)



- c) In a certain month, the employee received a 25% increment in his basic salary. Calculate his net monthly pay. (4 marks)

21.(a) In a geometrical progression the sum of the second and third term is **12** and the sum of the third and fourth terms is **−36**. Find the first term and the common ratio. (4 marks)

- (b) In an arithmetic progression the **12th** term is **25** and the **7th** term is three times the second term, find;

- i) The first term and the common difference (4 marks)



iii) The sum of the first 10 terms of the arithmetic progression.

(2 marks)

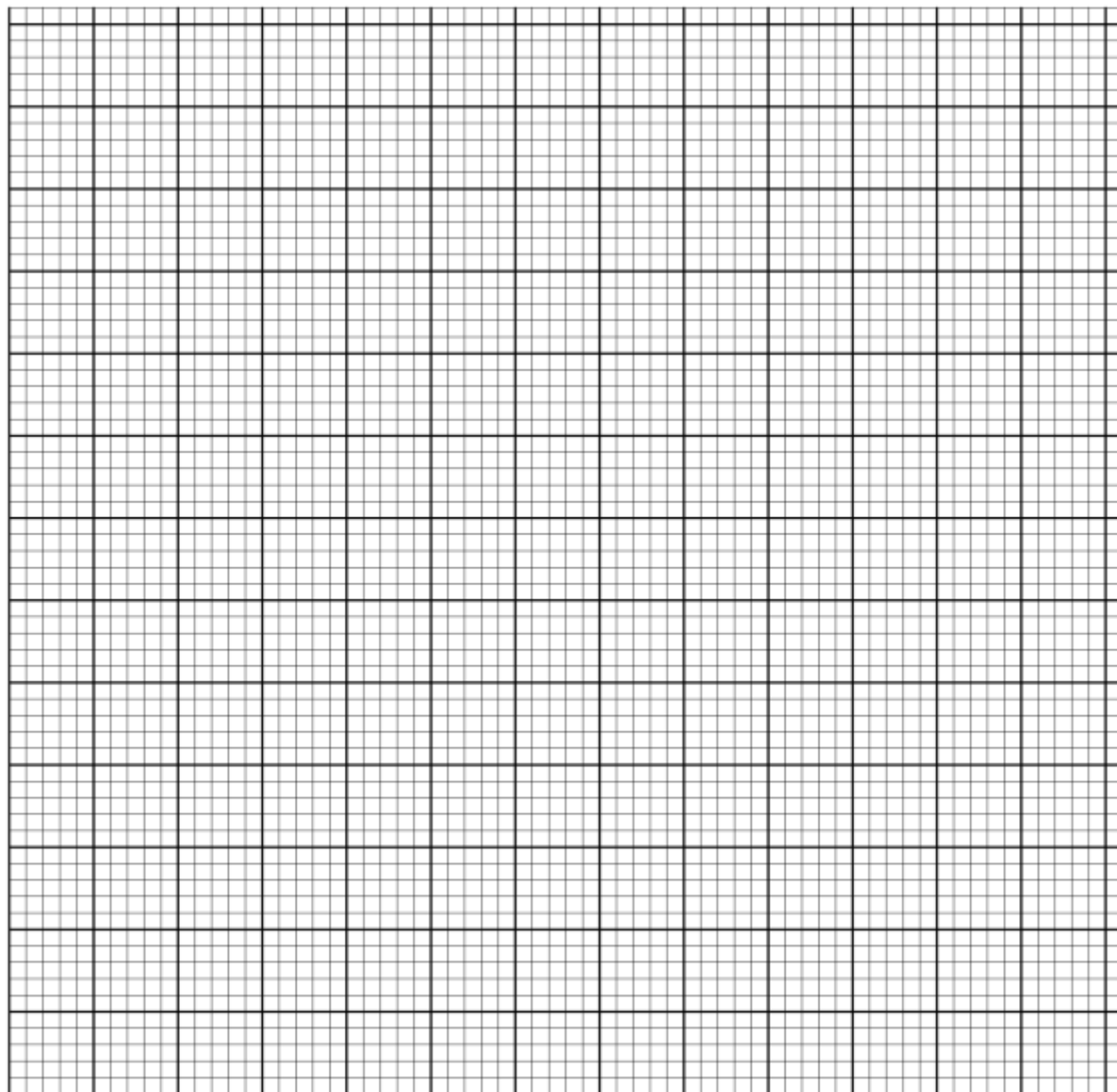
22 a). The table below shows the frequency distribution of marks scored by students in a test.

Marks	1-10	11-20	21-30	31-40	41-50
Frequency	2	4	8	4	2



On the grid provided, draw a cumulative frequency curve for the data.

(3 marks)



b). Use your graph to determine;



(i). The pass mark if only 6 students passed the exam.

(2 marks)

(ii). The upper quartile mark

(1 mark)

c). Find the percentage change if the upper quartile in b(ii) above was found by calculation. (3 marks)



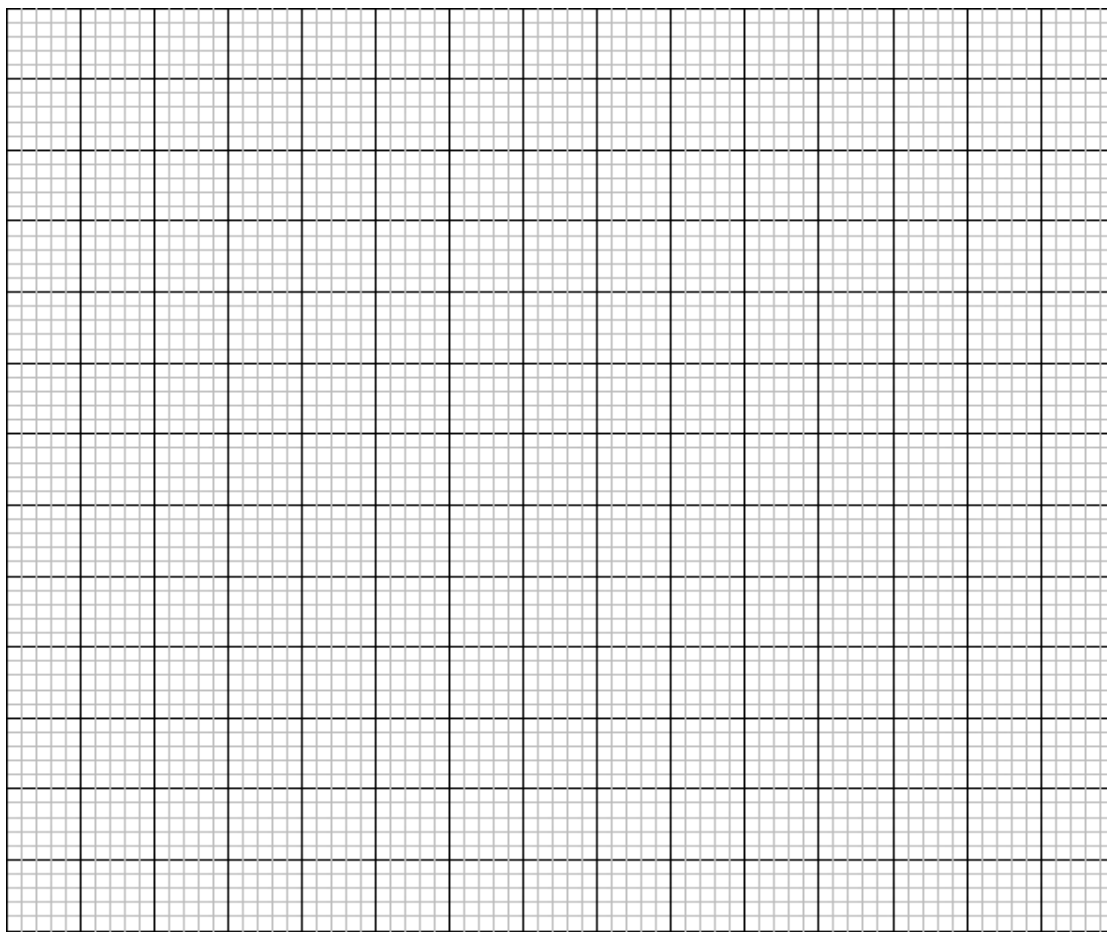
23 a) Complete the table below for $y = -2 \sin x$ and $y = 3 \cos x$.

(2 marks)

x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
-2 Sin x	0.00		-1.73			-1.00	0.00			2.00	1.73		
3 Cos x	3.00		1.50			-2.60	-3.00			0.00	1.50		

b.) Draw the graph $y = -2 \sin x$ and $y = 3 \cos x$ using 1 cm to represent 30° horizontal axis and 2 cm to represent 1 unit on the vertical axis.

(5 marks)



c) Use the graph to solve:

i) $3 \cos x + 2 \sin x = 0$

(1 mark)



ii) $1 - 2\sin x = 2$

(2 marks)

24. A triangle **ABC** with vertices at **A** (1,-1) ,**B** (3,-1) and **C** (1, 3) is mapped onto triangle **A¹B¹C¹** by a transformation whose matrix is $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$. Triangle **A¹B¹C¹** is then mapped onto **A¹¹B¹¹C¹¹** with vertices at **A¹¹** (2, 2), **B¹¹** (6, 2) and **C¹¹** (2,-6) by a second transformation.

(i) Find the coordinates of **A¹B¹C¹**

(3 marks)

(ii) Find the matrix which maps **A¹B¹C¹** onto **A¹¹B¹¹C¹¹**.

(3 marks)

(iii) Determine the ratio of the area of triangle **A¹B¹C¹** to triangle **A¹¹B¹¹C¹¹**.

(1 mark)

(iv) Find the transformation matrix which maps **A¹¹B¹¹C¹¹** onto **ABC**

(3 marks)





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