NYAMBARIA HIGH SCHOOL

END OF YEAR EXAMS

Paving Way For Kenya Certificate of Secondary Education Success

Name …….. Admission no…….

Candidate's Signature…… Date…….

FORM 3

MATHEMATICS

PAPER 2

TIME: 2Hours

INSTRUCTIONS TO CANDIDATES

- Write your name and Admission number in the spaces provided at the top of this page.
- This paper consists of two sections: Section I and Section II.
- Answer ***ALL*** questions from section I and ***ANY FIVE*** from section II
- All answers and workings must be written on the question paper in the spaces provided below each question.
- Show all the steps in your calculation, giving your answer at each stage in the spaces below each question.
- Non – Programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.

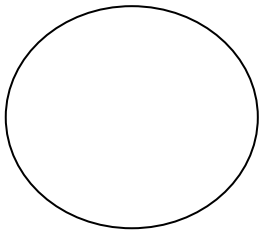
FOR EXAMINERS USE ONLY

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



SECTION I (50 Marks)
(Answer ALL the questions in this section)

1. Find the value of k if the expression $9x^2 + 30x + k$ is a perfect square. **(2 marks)**

2. Cynthia and Ariell can do a piece of work together in 15 days. Ariell working alone can do the same piece of work in 20 days. How long will Cynthia working alone take to do the same work? **(3 marks)**

3. Make y the subject of the formula in $q = m\sqrt{\frac{r^2 - y^2}{y^2 - 3}}$ **(3 marks)**

4. Solve for x given M= $\begin{pmatrix} -2 & 5-3x \\ x & 6 \end{pmatrix}$ is a singular matrix hence state the possible matrices **(3 marks)**

5. Find the value for x in the following equation $log\ (3x + 27) = 1 + \frac{1}{4}\log 81 + \log x$ **(3 marks)**

6. The length and width of a rectangle are 4.8m and 3.2m respectively. If there is an error of 5% in the length and 7% in the width, find the percentage error in the perimeter of the rectangle. **(4 marks)**

7. Emmanuel bought a new computer on hire purchase. The cash value of the computer was Kshs. 56,000. He paid a deposit of Kshs. 14,000 followed by monthly instalments of Kshs. 3,500 each for 18 months. Calculate the rate per annum at which the compound interest was charged. **(3 marks)**

8. For a lifting machine the effort E required to lift a load L in partly constant and partly varies as L. When L = 2, E = 5 ½, and when L = 6, E = 6 ½. Determine the value of L when E = 10 ½. **(4 marks)**

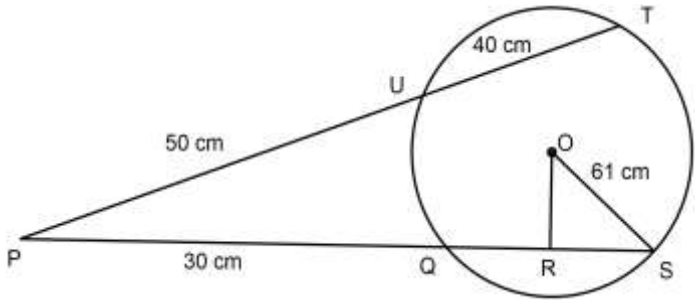
9. (a) Expand $(1 + {}^{3}/_{x})^{5}$ **(1 mark)**

   (b) Use your expansion to the fourth term to evaluate $(2.5)^{5}$ to 3 decimal places. **(3 marks)**

10. An arc length of 15 cm subtends an of angle of 1.5^{c}at the centre of the circle. Find the diameter of the circle to one decimal place. **(4 marks)**

11. Solve for α in the equation 3Cos 5α^{0}= $-\frac{3\sqrt{2}}{2}$ where $0^0 \leq \alpha \leq 180^0$ **(3 marks)**

12. In the figure below OS is the radius of a circle centre O. Chords SQ and TU are extended to meet at P and OR is perpendicular to QS at R. OS = 61 cm, PU = 50 **c**m, UT = 40 cm. and PQ = 30



Calculate the length of

a) QS **(2 marks)**

b) OR to 2 decimal places **(1 mark)**

13. Given that $\frac{5}{\sqrt{7}+3}-\frac{10}{\sqrt{7}-3}=\frac{a\sqrt{7}+c}{b}$ and that a, b and c are constants. Find the values of a, b and c. **(3 marks)**

14. The position vectors of A and T are -i + j - k and 3i + 4j respectively. T is the midpoint of a straight line AB. Find the position vector of B in terms of i, j and k. **(2 marks)**

15. Without using a calculator or mathematical table evaluate $\frac{2tan60^0}{sin45^0-cos30^0}$ leaving your answer in simplified form. **(3 marks)**

16. The equation of a circle is $x^2 + y^2 + 6x - 10y - 2 = 0$. Determine the co-ordinates of the centre and the area of the circle in terms of π **(3 marks)**

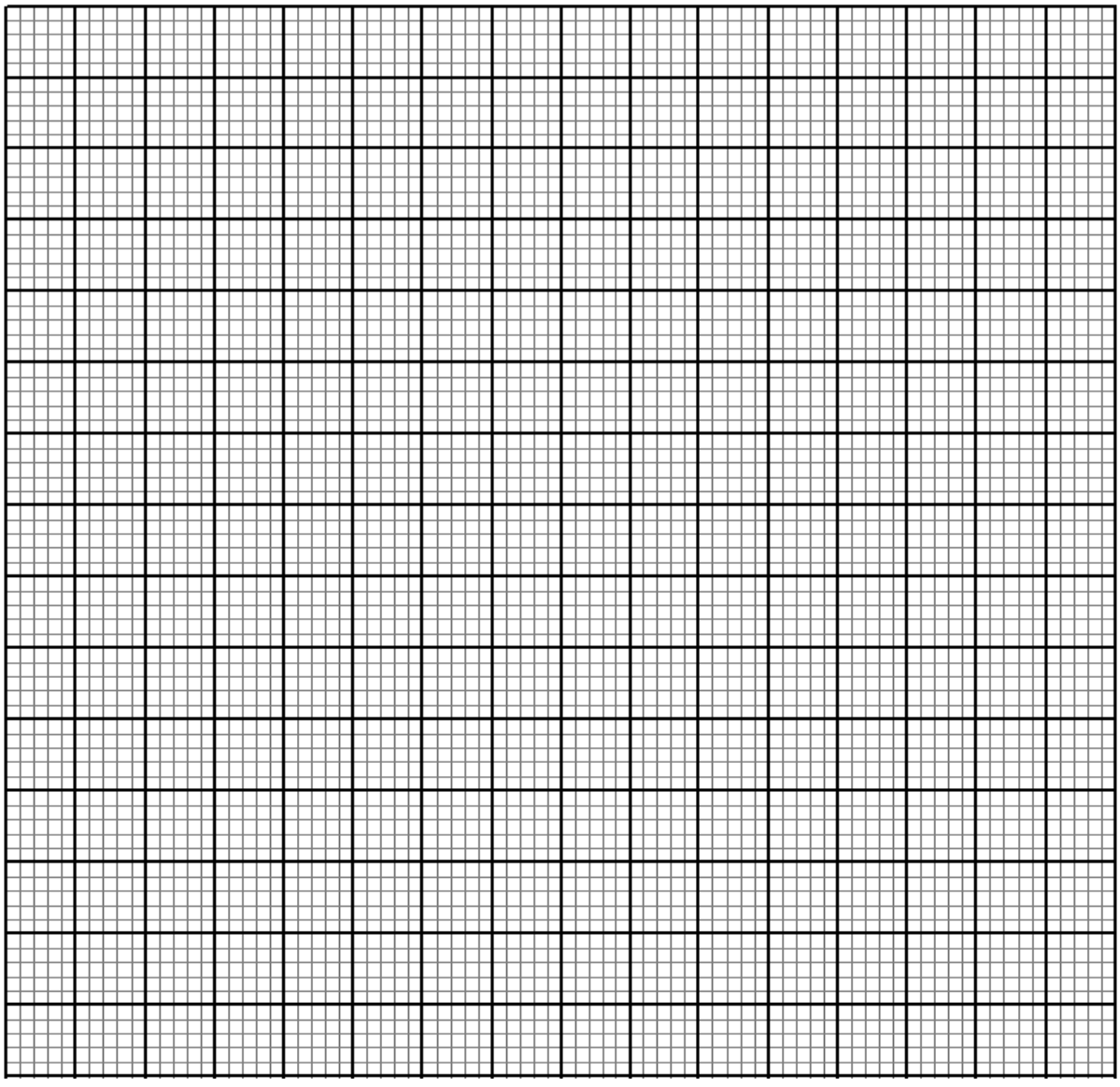
SECTION II (50 marks)

(Answer ONLY 5 questions in this section)

17. (a). Complete the table below for the function $y = (x + 3)(x + 1)(x - 2)$ **(2 marks)**

X	-4	-3	-2	-1	0	1	2	3
0 y					-6			

(b). Using the values obtained in the table above draw the graph of $y = (x + 3)(x + 1)(x - 2)$. **(3 marks)**



(a) Using your graph in (b) above, solve the following equations.

i. $x^3 + 2x^2 - 5x - 6 = 0$ **(2 marks)**

ii. $x(x^2 + 2x - 4) = 8$ **(3 marks)**

18. If $(x - 2\frac{1}{8})$, $(x - \frac{1}{4})$ and $(x + 3\frac{13}{2})$ are the first three consecutive terms of geometric progression.

(a) Determine the value of x and the common ratio. **(4 marks)**

(b) Calculate the sum of the first 6 terms of this progression. **(3 marks)**

(c) Another sequence has the terms – 13, -16, -16, -19, _ _, _310. Find the sum of this sequence. **(3 marks)**

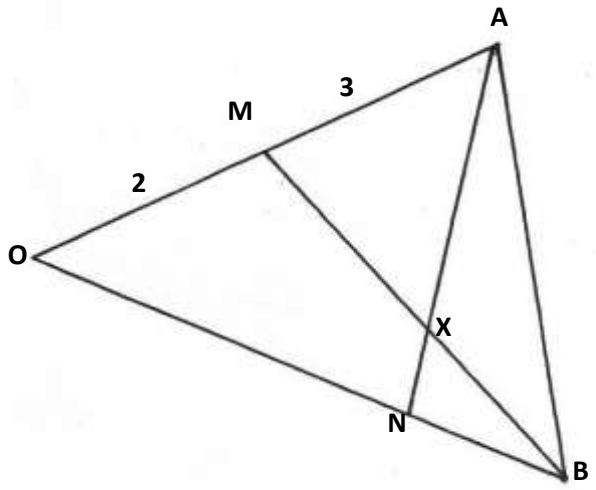
19. Construct triangle ABC in which $AB = 5.4\ cm$, $BC = 7.4\ cm$ and $AC = 8.4\ cm$.
Construct an escribed circle opposite angle ACB **(5 marks)**

(a) Measure the radius of the circle **(1 mark)**

(b) Measure the acute angle subtended at the centre of the circle by AB **(1 mark)**

(c). Calculate the area of triangle OBA with O as the centre of the circle **(3 marks)**

20. The figure below shows triangle OAB in which M divides OA in the ratio 2:3 and N divides OB in the ratio 4:1



(a) Given that **OA**= **a** and **OB** =**b**, express in terms of **a** and **b**

(i) **AN** **(1 mark)**

(ii) **BM** **(1 mark)**

(b) Express **OX** in terms of **a**, **b**, t and s given that **AX**= s**AN** and **BX** = t**BM** where t and s are constants. **(2 marks)**

(c)Find the value of s and t hence write **OX** in terms of **a** and **b.** **(6 marks)**

21. A firm planned to buy x plastic chairs for a total cost of Kshs.16,200. The supplier agreed to offer a discount of Kshs. 60 per chair. The firm was then able to get three extra chairs for the same amount of money.

(a) Write an expression in terms of x, for the:

(i) original price of each chair **(1 mark)**

(ii) Price of each chair after the discount. **(1 mark)**

(b) Form an equation in x and hence determine the number of chairs the firm bought. **(5 marks)**

(c) Calculate the discount offered to the school as a percentage. **(3 marks)**

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

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

b) Use your tree diagram to find

i) the probability that we will lose both games. **(3 marks)**

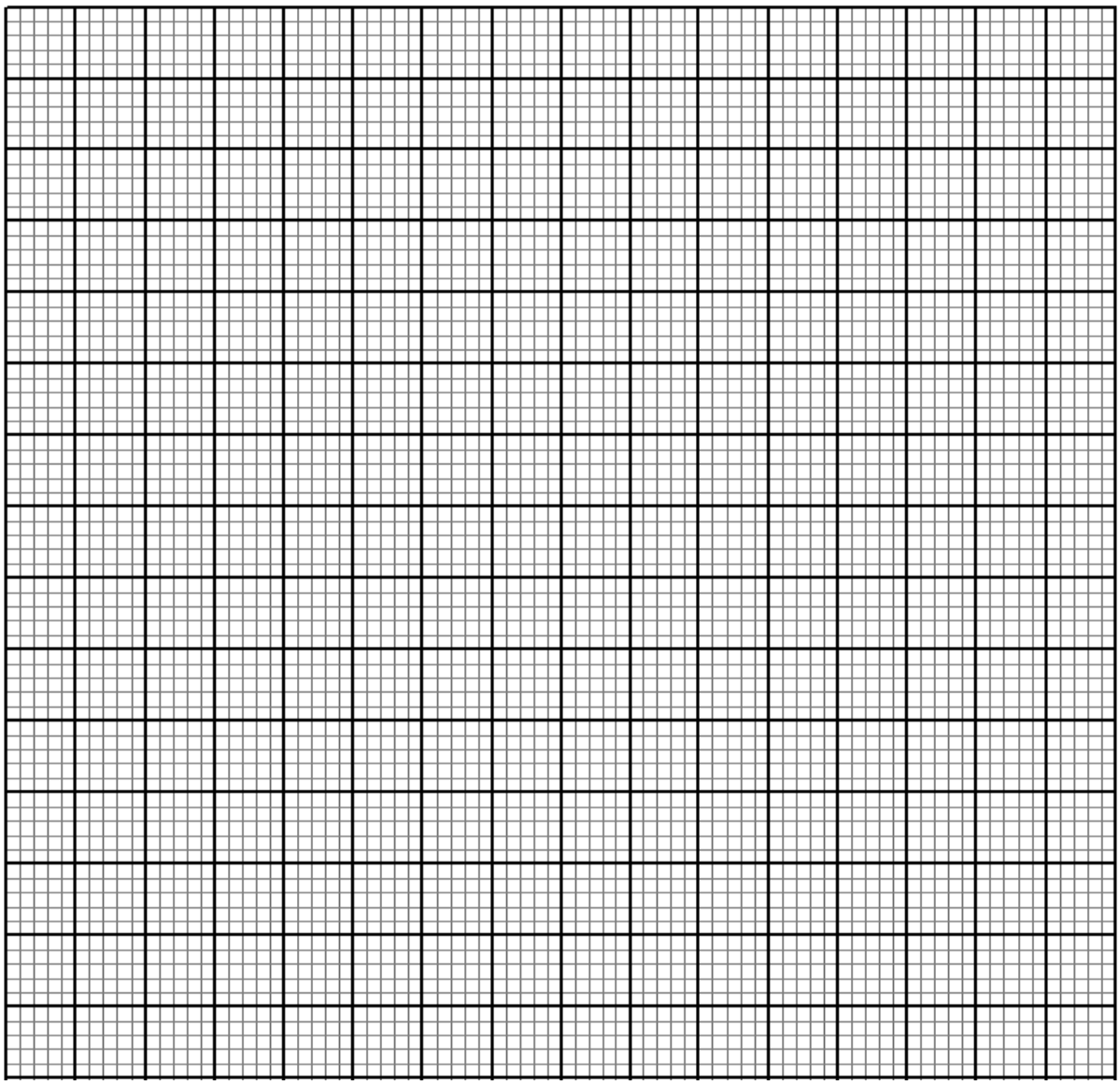
ii) the probability that we will win only one game. **(3 marks)**

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

23. a) Complete the table below by filling in the blame boxes to 1 decimal place. **(4 marks)**

X	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0
$3 \sin x^0 - 1$	-1.0	0.5						
$\cos x^0$	1.0							

b) On the same axis draw the graphs $y = 3 \sin x^0 - 1$ and $y = \cos x^0$ using a scale of y= axis 1cm to represent 1 unit the x – axis 1cm represent 15^0. **(4 marks)**



(i) Use your graph to solve the equation $3 \sin x^0 - \cos x^0 = 1$ **(2 marks)**

24. The table below shows the taxation rates for income earned.

Income in KShs. Per month	Tax rates (%)
Under 9681	10
From 9681 but under 18801	15
From 18801 but under 27921	20
From 27921 but under 37041	25
37041 and above	30

In that year, Mr. Hamisi paid a net tax of KSh. 5,512 per month. He gets a house allowance of KShs. 10,000, medical allowance of KShs. 2400 and acting allowance of KShs. 2820 per month. He was entitled to a monthly personal relief of KShs. 162. He has a life insurance policy for which he pays a monthly premium of KSh. 1,500 and claims a relief at a rate of 10% of the premium paid per month. The following deductions also made every month.

(i) N.H.I.F. KSh. 320

(ii) Co-operative society shares KSh. 6000

(iii) Union dues KSh. 200

(a) Calculate Mr. Hamisi's monthly basic salary in KSh. **(7 marks)**

(b) Calculate his net monthly salary. **(3 marks)**