NAME_____ CLASS_____

DATE _____ SIGNATURE _____

MATHEMATICS 121/2
FORM FOUR
1ST TERM 2016
2 ½ HRS.

Kenya Certificate of Secondary Education
MATHEMATICS 121/2
FORM FOUR 1ST TERM EXAMINATION 2016

Instructions
- Write your name and your class in spaces provided
- The paper contains two section. Section I and Section II
- Answer all the questions in section I and any five questions from section II
- All answers and working must be written on the question paper in the spaces provided below each question.
- Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- KNEC Mathematical tables may be used. Except where stated otherwise.

For Examiner's Use Only

Questions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Marks																

Questions	17	18	19	20	21	22	23	24	Grand Total
Marks									

This paper consists of 14 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. Use mathematical tables to evaluate $\sqrt[3]{0.453} + \dfrac{1}{\sqrt{35.42}} - (0.493)^2$ (4marks)

2. Make n the subject of the formula $x = v\left(2 + \dfrac{r}{x}\right)^n$ (3marks)

3. Given that $16p^2 - 16p + q$ is a perfect square. Find the value of q.   (3marks)

4. The column vector of $a = i - 2j + k,$ $b = 6i - 3j + 9k$ and $c = -3i + 2j + 3k$ and that $p = 2a - \frac{1}{3}b + c$ calculate the magnitude of p to 3 significant figures (3marks)

5.   Given that $\begin{pmatrix} x & -1 \\ -5 & x-3 \end{pmatrix}$ is in singular matrix . find x   (2marks)

6.   Point A (2,3) is translated to A'(-2,4) Find the translation vector.   (2marks)

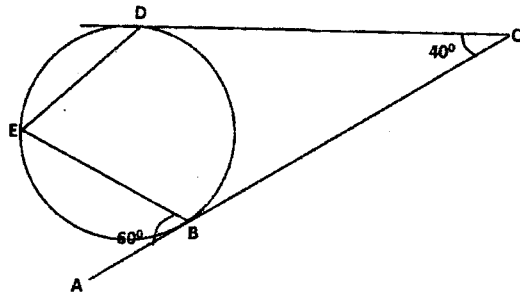7.   Find the upper quatile, lower quatile and the semi interquatile range of the following data.

| 48 | 53 | 49 | 45 | 55 | 49 |
| 47 | 55 | 48 | 57 | 51 | 46 |

(3marks

8.   Find the value of x that satisfy the equation
       Log(x+5) = log4 - log(x+2)   (3marks)

9. On the figure below lines ABC and DC are tangents to the circles at B and D respectively. ∠ACD = 40⁰ and ∠ABE = 60⁰   (4marks)
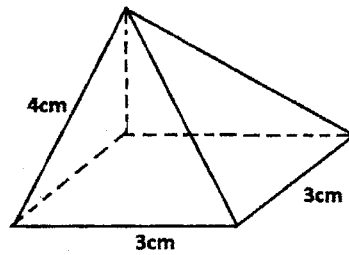

Giving reason find the size of

a) ∠CBD

b) ∠CDE

10. Find the possible values of a in the transformation matrix.

$$M = \begin{pmatrix} a & -2 \\ 1 & a+1 \end{pmatrix}$$

Which maps a figure of area 6.2sq units onto a figure whose area is 49.6 sq units.
                                                                                    (4marks)

11. The diagram below represents a right pyramid on a square base of sides 3cm. The slant edge of the pyramid is 4cm.

a) Draw the net of the pyramid (1mark)

b) Use the net to calculate the surface area after the pyramid (2marks)

12. The surface area of a spherical ball is increased by 21% after pressure was pumped in. If the new circumference is 55cm, calculate the percentage increase in volume of the ball. (3marks)

13. A man invests Kshs 24,000 in an account which pays 16% interest p.a . The interest is compounded quarterly. Find the amount in the account after 1½ years .(3marks)

14. A triangle ABC in which AB = 10cm and AC = 7cm and BC = 8cm, determine the area of the triangle to 2 decimal places

(3marks)

15. Expand $(a+b)^5$ upto the fourth term hence use your expansion to evaluate $(1.03)^5$

(3marks)

16. Simplify the following leaving your answer in the form $\sqrt[a]{b} + c$ where a and b are constant.

$$\frac{\sqrt{5}}{\sqrt{5}-2} + \frac{2}{\sqrt{5}+2}$$

(3marks)

17.a   Draw the graph of $y = 2x^2 + 3x + 1$ using the range $-3 \leq x \leq 2$ (5marks)

b)   Use the graph to solve $2x^2 + 3x + 1 = 0$ (2marks)

c)   Draw the line $3y = -4x + 8$ on the graph and read the values of x when the two lines intersect. (3marks)

18. In a form four class there are 22 girls and 35 boys . The probability of a girl completing the secondary education centre is $\dfrac{3}{5}$ where as that of a boy is $\dfrac{2}{3}$

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

i) The student picked is a boy and will complete course . (3marks)

ii) The student picked will complete the course (3marks)

b) Two student are picked at random. Find the probability that the student picked is a boy and a girl and that both will not complete the course. (4marks)

19.a) Complete the following table giving your answer to two decimal places   (2marks)

x°	15	30	45	60	75	90	105	120	135	150	165	180
2sinx		1.00		1.73		2.0		1.73		1.00	0.52	0
1-cosx	0.03	0.13		0.50	0.74	1.00		1.50	1.71	1.87		2.0

b)   On the grid provided plot the graph of y = 2 sin x and y = 1 - cos x on the same axis for $0^0 \leq x \leq 180^0$

(5marks)

c)   Solve the equation

(i)   1 - cos x = 2 sin x

(1marks)

ii)   1 - cos x ≥ 1.00

(2marks)

20. A quadrilateral PQRS has vertices p(-4,3), Q(-3,3), R(-2,1) and S(-3,5).

a) on the same axes, draw the quadrilateral PQRS and its image P'Q'R'S' under the

transformation matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ (4marks)

b) Under a different transformation P'Q'R'S' is mapped onto P''(-4,-3), Q''(-3,-3), R''(-2,1) and S''(-3,-5) Find the matrix of transformation. (4marks)

c) Describe fully the transformation that maps PQRS directly onto P''Q''R''S''. (2marks)

21.a) Construct a triangle PQR such that PQ = 7.5cm, the ratio of $\angle$QPR : $\angle$PQR = 5:3 and $\angle$QRP = 60° (3marks)

b) Construct the locus of a point S on the same side as R which works such that $\angle$PSQ = 75° (3marks)

c) Construct the locus of a point T which moves such that its always equidistant from lines PQ and PR and produce it to intersect the locus of S. at M (2marks)

d) By dropping a perpendicular from point M onto PQ at N, Measure MN hence calculate the area of triangle PMQ. (2marks)

22. A plane leaves an airport (A38°,S, 37.05° W) and flies due north to a point B on latitude 52°N

a) Find the distance covered by the plane

i) km   (3marks)

ii) Nm   (1mark)

b) The plane flies due east to a point C 2400km from B. Determine the position of C.

(Take $\pi = \dfrac{22}{7}$ and radius of the earth as 6370km)   (6marks)

23. Income tax for all the income earned was charged at the rate shown below.

Total income p.a (K£)	Rate in shs per K£
1 - 1980	2
1981 - 3960	3
3961 - 6440	5
6441 - 7920	7
7921 - 9900	9
Excess of 9900	10

Mutua earned a salary of shs 12,500 per month in addition he was given a house allowance of shs 6550 per month . He also gets a family relief of shs 300 per month . Find:

a)i) This taxable income p.a in K£ (2marks)

ii) Income tax he pays per month (6marks)

b) Apart from income tax , the following deductions are made per month
   NHIF of shs 320
   Widow and pension scheme 2% of gross salary
   Calculate Mutua's net monthly salary (2marks)

24. A straight line passing through the points (8,-2) and (4,-4) has its equation in the form
   ax + by + c = 0 where a,b, and c are integers

a) Determine the numerical values of a,b and c

(3marks)

b) If the line in (a) above cuts the x - axis at point p, determine the coordinates of p

(2marks)

c) Another line , which is perpendicular to the line in (a) above passes through point p and cuts the y axis at Q. Determine the coordinates of point Q .

(3marks)

d) Find the length of QP (Leave your answer in surd form.

(2marks)