Name……………………………………………………… Index No. …………………….

School ……………………………………………………...

121/2
MATHEMATICS ALT. A
PAPER 2
JULY / AUGUST 2016
2 ½ HOURS

KIGUMO SUB-COUNTY CLUSTER EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES
1. Write your name, school and Index Number in the spaces provided above
2. This paper consists of two sections. Section I and Section II.
3. Answer **ALL** the questions in Section I and ONLY **FIVE** questions in Section II.
4. All answers and working must be written on the question paper in the spaces provided below each question.
5. Show all the steps in your calculations, giving your answer at each stage in the space provided below each question.
6. Marks may be given for correct working even if the answer is wrong.
7. Negligence and slovenly work will be penalized.
8. Non programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.
9. This paper consist of 16 printed pages
10. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.
11. Candidates should answer the questions in English.

Section I   **FOR EXAMINER'S USE ONLY**

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

Answer all questions in this section in the spaces provided.

1. Factorise $x(x + 1) - y(y + 1)$ (3 mks)

2. Make t the subject of the formula. (3 mks)
$$L = \frac{pt}{t - x}$$

3. The area of a rectangle is 15cm². The rectangle is transformed by the matrix T where $T = \begin{pmatrix} 3 & 2 \\ 1 & 2 \end{pmatrix}$

   Calculate the area of the image. (2 mks)

4. The position vector of P and q is 3i - 2j + k and 2i + j - 3k respectively. Determine the column vector PQ and hence calculate its length to 2 decimal places. (3 mks)

5. Solve for **x** (3 mks)
$3\log_{10}2 + 2\log_{10}3 - \log_{10}(x + 2) = 1$

6. Two chords PQ and RS are produced to meet at T. Given that PQ = 8cm, QT = 6cm and ST = 5cm. Find the length RS. (3 mks)
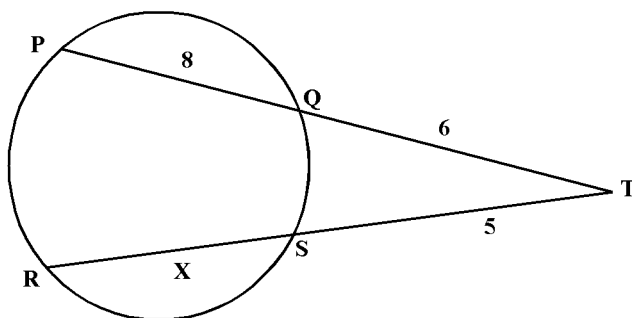
7. H varies as V and inversely as the square of r. Find the percentage change in h if V is increased by 20% and at the same time r is increased by 50%. (3 mks)

8. Calculate the value of a plot worthy ksh. 250,000 at 3 years. If it appreciates at 12.5% per annum to the nearest whole unit. (3 mks)

9. Solve for **x.**
    4 sin x = 3 for $0 \leq x \leq 360^0$. (3 mks)

10. a) Expand

$(1 + \frac{1}{2}x)^6$ upto the 5th term. (2 mks)

b) Use the expansion above to find the value of $(1.2)^6$. (2 mks)

11. P(20°N, 5°E) and Q(K°N, 5°E) are two points on the earth surface. If the shortest distance between them along the line of longitude is 3000nm. Find the value of k. (3 mks)

12. A trader bought grade A tea at sh. 150 per kg and grade B at sh. 100 per kg. She mixed them to make a blend. Which she sold at a profit of 20%. If the selling price was sh. 144 per kg. Find the ratio in which she mixed grade A to grade B. (4 mks)

13. Find the radius and the centre of a circle given by the equation.
$x^2 + y^2 = 4x + 6y - 9$ (3 mks)

14. Rationalise the denominator and simplify completely. (3 mks)

$$\frac{3}{2\sqrt{6} + \sqrt{3}}$$

15. Given matrix m = $\begin{pmatrix} 3 & -4 \\ 5 & 2 \end{pmatrix}$ find its inverse m^{-1}.

Hence solve the simultaneous equation below using matrix method.
3x - 4y = 17
5x + 2y = 11   (3 mks)

16. The probability of Odhiambo wearing a jacket is $^2/_3$. If he does not wear the jacket the probability that it rains is $^1/_3$. Find the probability that he wears the jacket and it does not rain.   (3 mks)

17. Jane and Mary can dig a shamba in 12 and 15 days respectively. Jane did the work for three days alone and she was joined by Mary on the 4th day and both of them worked for next two days. Find

i) The proportion of the work Jane had done before she was joined by Mary. (2 mks)

ii) The work they had done in the first 5 days. (3 mks)

iii) The work remaining undone by the end of the first five days. (1mk)

iv) After five days they were joined by John who can dig the shamba alone in 10 days. How long will the three take to clear the remaining proportion of work. (4 mks)

18. In the figure below the circle centre Q radius 21cm represent the number of people in a town in Kenya who are affected with HIV/AIDS. The circle with centre P radius 14cm represent the number of people in the same town who are infected with T.B. The shaded area represents the number of people infected with both HIV/AIDS and TB.
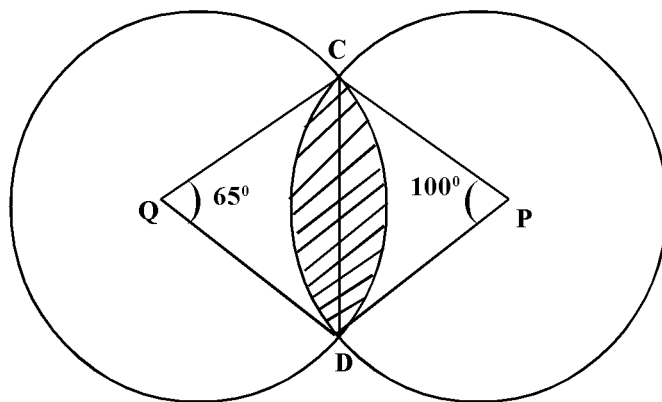
Calculate:

a) The area of the circle representing the number of people infected with HIV/AIDS. (2 mks)

b) The area representing those infected with TB. (2 mks)

c) The area representing those infected with both HIV/AIDS and TB. (6 mks)

19. The following table shows the rate at which income tax was charged during a certain year.

Monthly taxable income in Kenya shillings	Tax rate per cent (%)
0 - 9860	10%
9861 - 19720	15%
19721 - 29580	20%
29581 - 39440	25%
39441 - 49300	30%
49301 - 59160	35%
Over 59160	40%

A civil servant earns a basic salary of ksh. 35 750 and a monthly house allowance of sh. 12 500. The civil servant is entitled to a personal relief of sh. 1062 per month.

a) Calculate his net monthly tax. (6 mks)

b) Apart from the salary the following deductions are also made from his monthly income.
   WCPS at 2% of the basic salary.
   Loan repayment ksh. 1325
   NHIF sh. 480
   Calculate his net monthly earnings. (4 mks)

20. The 2nd, 6th and 14th term of an A.P forms the first three consecutive terms of a G.P.
    a) Find the common ratio of the G.P.   (5 mks)
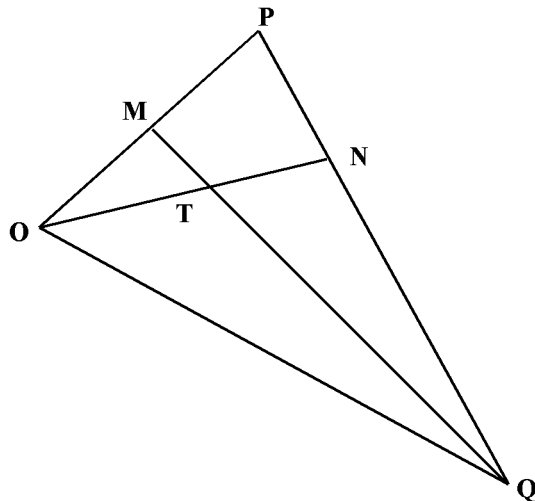
b) Given that the common difference of the AP is 2 find
i) The 1st and the 5th terms of the G.P.   (3 mks)

ii) The sum of the first 6 terms of the G.P.   (2 mks)

21. In the figure below OP = p and OQ = q. M and N are points on OP and PQ respectively, such that OM:MP = 3:2 and PN:NQ = 1:3. Lines ON and QM meet at T.

a) Express the following in terms of p and q. (3mks)
   i) PQ

   ii) ON

   iii) QM

b) Given that OT = kON and QT = hQM. Express OT in two different ways hence solve for h and k.

(5 mks)

c) Find the ratio OT:TN and QT:TM. (2 mks)

22. a)   Fill the table for the curves given by; $y = 3 \sin(2x + 30^0)$ and $y = \cos 2x$ for values of x in the range
         $0 \le x \le 180^0$.   (2 mks)

x	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
$y = 3\sin(2x + 30^0)$	1.5		3	2.6	1.5		-1.5			-1.00	-1.50	0	1.5
$y = \cos 2x$	1		0.5	0		-0.87	-1.0	-0.87	0.5			0.87	1

b)   Using 1cm to represent 15^0 on the horizontal axis and 1cm to represent 1 unit on the vertical axis draw the
      graphs of $y = 3\sin(2x + 30^0)$ and $y = \cos 2x$ using the same grid.   (4 mks)
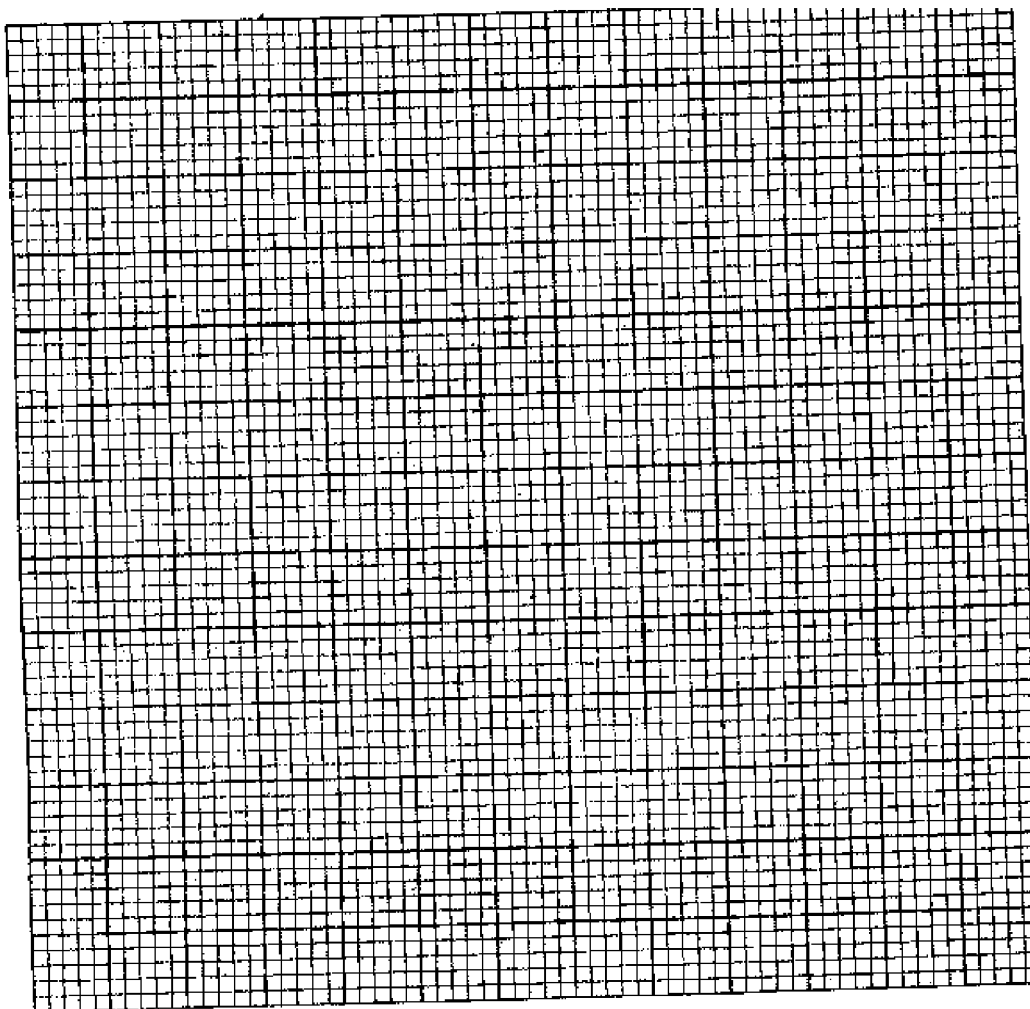
c)   Use your graphs to solve the equation $3 \sin(2x + 30^0) = \cos 2x$.   (1 mk)

d)   Determine the following from your graph.
      i) Amplitude of $y = 3\sin(2x + 30^0)$.   (1 mk)

      ii) Period of $y = 3\sin(2x + 30^0)$ (1 mk)

      iii) Period of $y = \cos 2x$ (1 mk)

23. The heights of 100 maize plants were measured to the nearest centimeter and the results recorded in the table below.

Height x(cm)	frequency	d	d²	fd	fd²	cf
25 - 29	5			-15		
30 - 34	12					17
35 - 39	18	-1	1	-18		35
40 - 44	30	0	0	0		65
45 - 49	17					82
50 - 54	11	2				
54 - 59	7	3				100

a) Complete the table. (2 mks)

b) Calculate to the two decimal places.
i) Mean (3 mks)

ii) The standard deviation (3 mks)

iii) The median (2 mks)

24. A businessman sells two types of mobile phones Samsung and Nokia. The price of one Samsung and one Nokia is ksh. 2000 and ksh. 1600 respectively. He wishes to have at least 20 mobile phones. The number of Samsung phones, should be less or equal to the number of Nokia phones. he has ksh. 96 000 to spend. The profit for Samsung phone is sh. 500 per phone while that of Nokia phone is sh. 300 per phone.
If he buys **x** Samsung phone and **y** Nokia phones.

a) Write all the five inequalities representing the information above. (3 mks)

b) Represent the inequalities in (a) above on the graph paper provided. (4 mks)

c) Find the number of phones he should sell to make maximum profit. (2 mks)

d) Determine the maximum profit. (1 mk)