YESMAERK TUITION SERVICES
121/2
MATHEMATICS
PAPER 2
DEC TUITION 2015
2½ HOURS

NAME:……

INSTRUCTIONS TO CANDIDATES

1. *Write your name and index number in the spaces provided at the top of this page.*
2. *This paper consists of two sections: Section I and Section II.*
3. *Answer all questions in section I and any five questions from Section II.*
4. *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*
5. *Marks may be given for correct working even if the answer is wrong.*
6. *Non- programmable silent electronic calculators and KNEC Mathematical tables may be used.*

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

Gran Total

This paper consists of 16 pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

SECTION I (50 marks)

(Answer all questions in this section)

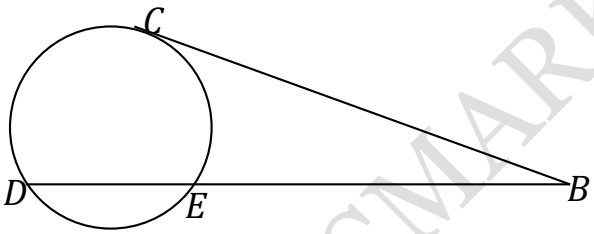
1. Use logarithms tables to evaluate $\left(\frac{6.79\times 0.3911}{\log 5}\right)^{-\frac{3}{4}}$ (4 mks)

2. Find the value of K if the following expression is a perfect square. (3mks)
   $4x^2y^2 + 12xy + kxy + 25$

3. If $\frac{\sqrt{14}}{\sqrt{7-\sqrt{2}}} - \frac{\sqrt{14}}{\sqrt{7+\sqrt{2}}} = a\sqrt{7} + b\sqrt{2}$ find the values of a and b, where a and b are rational numbers. (4mks)

4. Simplify $\frac{Cos\ 390^0}{Tan\ (-225^0)+\sqrt{3}}$ without using a calculator or tables leaving your answer in form of $a+b\sqrt{c}$ where a, b, and c are integers. (3mks)

5. In the figure below CB is a tangent to the circle, DEB is a straight line where point B divides line DE externally in the ratio 5: -4. Find DE given that CB=$12\sqrt{3\ cm}$ (3 mks)



6. Solve for x without using a calculator or tables $Log_3\ (x+24) - log_3(log_2 64) + 1 = log_3(9-x)$ (3 mks)

7. A quantity T is partly constant and partly varies as the square of S.
   a) Using constants a and b write down an equation connecting T and S (1 mk)

   b) If S=16 when T=24 and S=36 when T=32,find the values of the constants a and b (2 mks)

8. a) Expand $(x - \frac{1}{2x})^6$ upto the constant term. (2mks)

b) Hence use your expansion in (a) above to find the approximate value of $(9.95)^6$ correct to 4 s.f. (2mks)

9. Coffee at sh.50 per kilogram is mixed with coffee of sh.60 per kilogram in the ratio 2:3. What ratio should this mixture be mixed with coffee at sh.40 to produce a coffee costing sh.52 per kilogram (3mks)

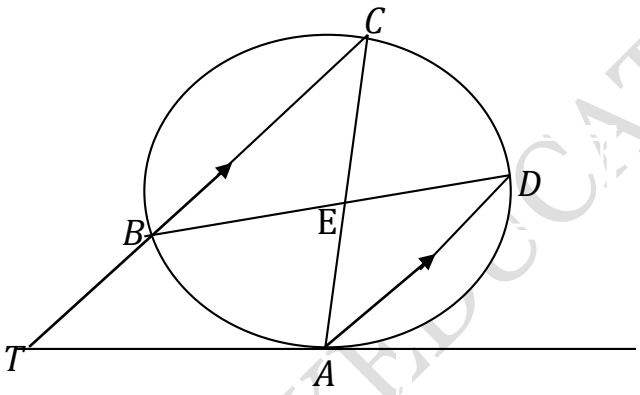
10. A cocktail of drinks is made by mixing mango juice and passion juice in the ratio 2:3. The cost of mango juice is ksh. 97.50 Per litre and that of passion juice is ksh 122.50 per litre. What would have been his selling price if he was to make a profit of 30%? (3mks)

11. Given the equation of a circle $4x^2 + 4y^2 - 32x + 32y + 28 = 0$; find the centre and the radius of the circle. (3mks)

12. The position vectors of **A** and **P** are $3\mathbf{i} - 4\mathbf{k}$ and $-7\mathbf{i} + 9\mathbf{j} - 24\mathbf{k}$ respectively. If P divides AB in the ratio 2:-3, find the distance between P and B. (3mks)

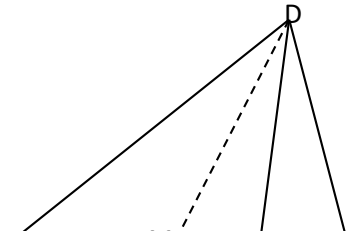
13. A point P undergoes a clockwise rotation of 30^0 about the origin and maps onto the image $P^1(\sqrt{3}, -1)$. Use matrix method to determine the co-ordinates of the object Point P. (3mks)

14. In the figure below if angle ACB=40^0 angle ATB=45^0 and TC is parallel to AD. Calculate angle ABT and AEB (3 mks)



15. Transformations M and N are represented by the matrices $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ and $\begin{pmatrix} 3 & 0 \\ 1 & 3 \end{pmatrix}$ Point R has co-ordinates (3,-2). Find the co-ordinates of MN(R) (3 mks)

16. ABCD is a tetrahedron and M is the midpoint of AB. Given that the base is an equilateral triangle where AB=6cm and that DA=DB=DC=7.5cm, calculate the angle that BD makes with the plane ABC.



(3mks)

SECTION II (50 MARKS)
Answer any FIVE questions from this section

17. the table below shows tax rate in 2003

Income (sh.p.m)	Tax rates
0-8270	0%
8271-15790	10%
15791-23310	15%
23311-30830	20%
30831-38350	25%
38351-45870	35%
45871-53390	45%
Over 53390	50%

Mrs Odundo earns a monthly salary of shs. 23,520, a monthly house allowance of sh.15, 000, medical allowance of sh.3,018 a commuter allowance of sh.916.

Calculate:

a) Mrs Odundo's monthly income. (2mks)

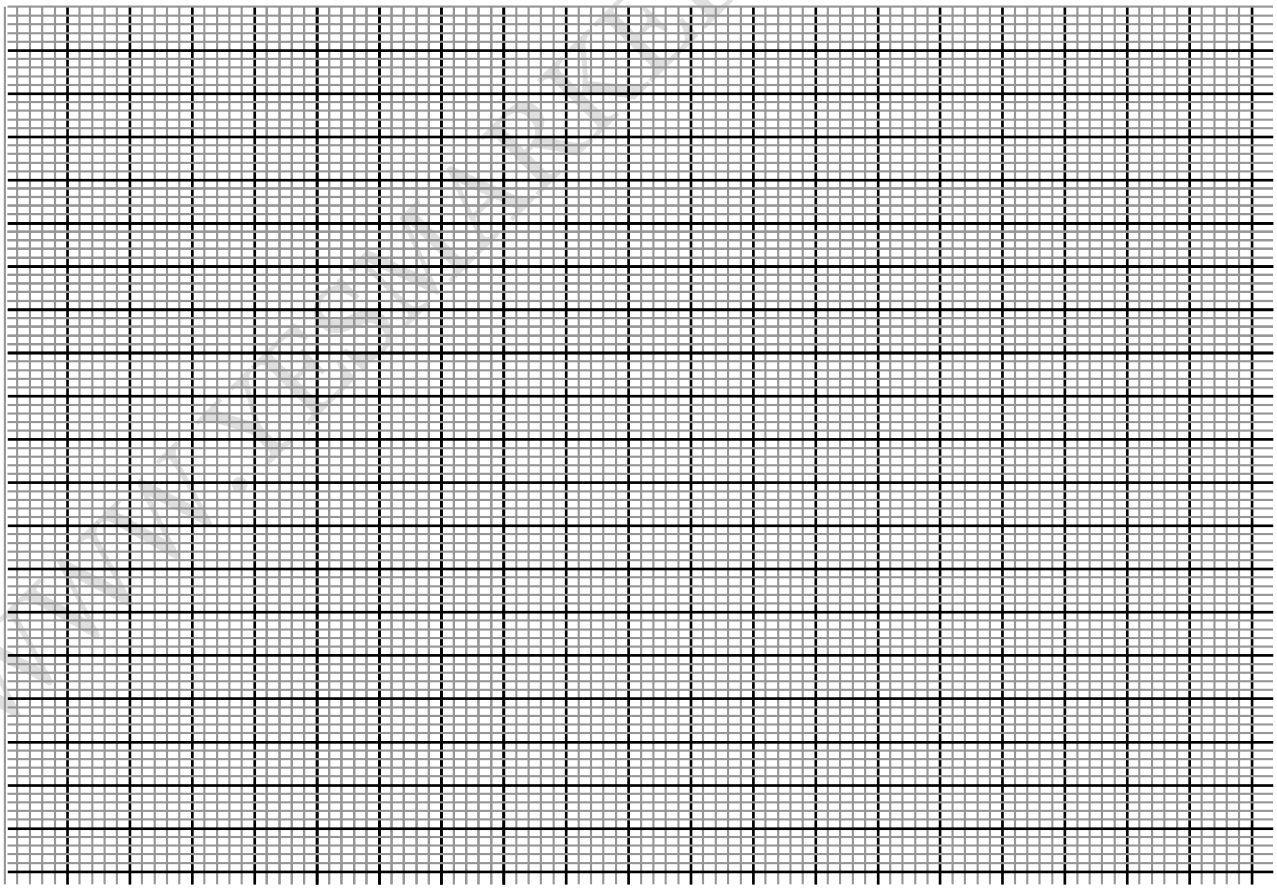
b) The monthly income tax paid by Mrs. Odundo in shillings (6mks)

c) The net monthly salary Mrs. Odundo gets (2mks)

18. a) Complete the table below giving your values correct to 2 decimal points. (2mks)

X	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0
$3\cos x^0$	3.00		2.60		1.50	0.78	0	-0.75	
$4\sin (2x-10)^0$	-0.69	1.37		3.94	3.76		0.69		-3.06

b) taking 1cm to represent 15^0 on the x- axis and 2cm to represent 1 unit on the y-axis, draw the graph of $y=3\cos x^0$ and $y=4\sin(2x-10)^0$ on the same axes on the grid provided. (4 mks)



c) Use your graph to find the values of x for which $3\cos x^0 - 4\sin (2x-10)^0 = 0$ (2 mk)

d) State;

i. The amplitude of the graph $y=3\cos x^0$ (1 mk)

ii. The period of the graph y=4sin (2x-10)0 (1 mk)

19. a) The n^{th} term of a sequence is given by 2^{n+1} -3n, find the 5^{th} term of the sequence. (3mks)

b) Atieno was employed with a starting salary of K£27000 per annum. Her salary was increased by 12% each year for 5 years. Calculate the total amount she earned for five years service. (3mks)

c) The difference of the third and sixth terms of an increasing geometric progression is 468 while the difference of the fifth and eighth terms is 4212. Find the first term and the common ratio. (4mks)

20. The marks scored by 100 students in mathematics test is given in the table below:

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79
No. of students	8	15	15	20	15	14	13

(a) Estimate the median mark. (2 mks)

(b) Using 44.5 as the assumed mean, calculate:-

(i) The mean mark (3 mks)

(ii)The variance: (3 mks)

(iii)The standard deviation: (2 mks)

21. The probability that a candidate at UNAMFAN High School sets her alarm clock on every evening is 0.7. If she does, the probability of her waking up early is 0.9, otherwise it is 0.4. If she wakes up early the probability of reaching school on time is 0.8, otherwise it is 0.3.

a) Illustrate the above information on a tree diagram. (2mks)

b) Find the probability that the student;

i) Doesn't wake up early but reaches school on time. (2mks)

ii) Reaches on time. (2mks)

iii) Sets on the alarm but does not reach school on time. (2mks)

iv) Wakes up late and does not reach school on time. (2mks)

22. a) Using a ruler and pair of compasses only construct triangle ABC in which AB=9cm, BC-8.5cm and angle <BAC = 60^0. (2mks)

b) On the same side of AB as C.

i) Determine the locus of a point angle APB = 60^0 (2mks)

ii) Construct the locus of R such that AR > 4cm. (1mk)

iii) Determine the region T such that angle ACT ≤ angle BCT (2mks)

iv) Locate two points P_1 and P_2 on the locus of P such that the area of triangle $AP_1B = AP_2B = 22.5cm^2$ (2mks)

v) Mark the point Q on the locus of P such that the area of triangle AQB is maximum (1mk.)

23. An aeroplane leaves town A(85^0N, 145^0W) to town B(40^0N, 35^0E), using the shortest route at speed of 450 knots.(Take π =3.142 and R=6370km).

a. i) calculate the distance between A and B in nautical miles. (2mks)

ii) Calculate the time taken to travel from town A to B. (2mks)

iii) Find the time of arrival at B given that plane left A at 2.40am local time (1mk)

b) From B the plane flies westwards to town C (40^0N, 17^0W) at the same speed. Calculate the distance BC in km. (3mks)

c) From town C the plane took off at the same speed at 2.20pm towards town D (10^0N,17^0W). At what time did the plane land at D.? (2mks)

24. A and B are connected by the equation B = KA + M where K and M are constants.
The table below shows the values of A and corresponding values of B.

A	1.5	3.0	4.5	6.0	7.5	9.0
B	8	11	14	17	20	23

(a) Draw a suitable straight line on the grid provided. (3mks)

(b) Determine the gradient of the line. (2mks)

(c) State the values of K and M, hence express B in terms of A. (3mks)

(d) From your graph estimate

(i) B when A = 3.6 (1 mk)

(ii) A when B = 13. (1 mk)