Name:…….....Index Number……../……....

121/2
MATHEMATICS ALT A
Paper 2
July/ August 2014
2 ½ hours

Candidate's Signature ……

Date……..……

THE LAMU COUNTY MOCK EXAMINATIONS 2014

Kenya Certificate of Secondary Education
MATHMATICS ALT A
Paper 2
2 ½ hours

Instructions to Candidates

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a). Write your name and index number in the spaces provided above
b). Sign and write the date of the examination in the spaces provided above
c). This paper consists of **TWO** sections: **Section I and Section II**
d). Answer ALL the questions in **Section I** and only **five** questions from **section II.**
e). ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided below and each questions.***
f). Marks may be given for correct working even if the answer is wrong
g). ***Non-programmable*** silent electronic calculators and KNEC Mathematical tables may be used.
h). This paper consists of 16 pages
i). Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
j). Candidates should answer the questions in English

For examiners Use only

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24

SECTION I (50 MARKS)

Answer ALL questions from this section.

1. Without using a calculator, a mathematical tables, write the following in surd form and rationalize the denominator. (3 marks)

$$\frac{1}{\sin 60^0 - 4\sin 45^0}$$

2 (a) Expand $(x + {}^2/_x)^4$ fully and state the constant term of the expansion. (2 marks)

(b) By getting a suitable substitute for x, use your expansion in (a) above to evaluate $(10.2)^4$ correct to 4 d.p. (2 marks)

3. Make P the subject in $T = \sqrt[3]{\frac{P^2+n}{M^2} + R}$ (3 marks)

4. Using logarithms, evaluate correct to 4d.p.

$$\left(\frac{25.48 \text{ X } 0.0212}{6.159}\right)^{0.8}$$ (4 marks)

5. In what proportion must tea costing sh 76 and sh 84 per kg be mixed to produce tea costing sh 81 per kg? (3 marks)

6. A circle whose centre is C (2, 3) passes through a point P (a,b). A point M $(-2, -^{5}/_{2})$ is the mid-point of the line segment CP.

(a) Calculate the co-ordinates of P (1 mark)

(b) Determine the equation of the circle in the form $ax^2 + by^2 + cx + dy + e = 0$ where a, b, c, d and e are integers. (3 marks)

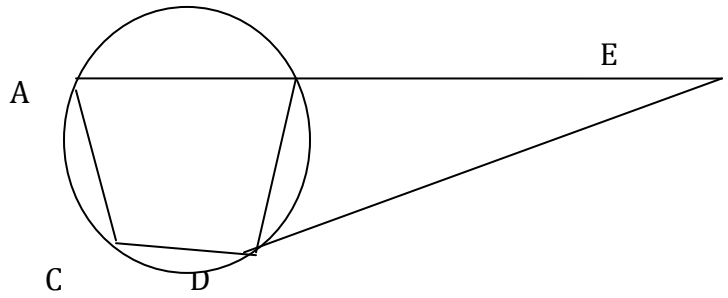
7. Find the quadratic equation whose roots are $x = -{}^{3}/_{2}$ and $x = {}^{4}/_{3}$. (3 marks)

8. The fifth term of an arithmetic progression is 11 and the twenty fifth term is 51. Calculate the first term and the common difference of the progression. (3 marks)

9. T is a transformation represented by the matrix $\begin{pmatrix} 5w & w \\ -3 & 1 \end{pmatrix}$. Under T a sphere whose area is 10 cm^2 is mapped into a square of are 120 cm^2. Find the value of w. (3 marks)

10. If $4x^2 + ax + b = (cx - 5)^2$ for all value of x. Find value of a, b and c. (3 marks)

11. In the figure below DE is a tangent to the circle at D with centre at O
$<BDE = 80^0$, $<BED = 32^0$.



Calculate the angle CAB. Given that AB = 9 cm, BE = 12 cm, calculate length DE.
(3 marks)

12. Find the equation of the normal to the curve $x^2 = 4y$ at (6, 9). (3 marks)

13. Solve for θ for $-90 \leq \theta \leq 180^0$ in the equation $3\sin^2\theta - 1 = 2\sin\theta$. (3 marks)

14. Calculate the shortest distance in nautical miles between M(45°N, 38°E) and N(45°N, I 42°W) (3 marks)

15. Under a transformation whose matrix $y = \begin{pmatrix} x-2 & -2 \\ x & x \end{pmatrix}$, a triangle whose area is $13.5cm^2$ is mapped on a triangle whose area is $54cm^2$.
Find two possible values of x. (3 marks)

16. A variable **P** varies as the square of **Q** and inversely as square root of **R.** Find the percentage change in **P** when **Q** is increased by 5% and R reduced by 19%.

(3 marks)

SECTION II (50 MARKS)

Answer ANY FIVE questions in this section.

17

Monthly taxable income Kshs per month	Tax rates %
1-9680	10
9681-18800	15
18801-27920	20
27921-37040	25
37041 and above	30

A civil servant is provided with a house at nominal rent of Kshs.6260 per month. In addition the government gives her a medical allowance of Kshs 8,000 per month, entertainment allowance of Kshs. 6,000 per month and a car allowance of Kshs.2, 000 per month. She is entitled to a personal tax relief of Kshs.1, 800 per month. If the civil servant's net tax is Kshs 6,800 per month, determine her:-

(a) Gross tax per month (2 marks)

(b) Taxable income per month (5 marks)

(c) Basic salary per month (3 marks)

18. A cylindrical petrol tank can be filled by tap P in 6 hours. The same tank can be emptied when full in 12 hours by tap Q starting with the tank emptying both taps P and Q turned on at the same time and tap Q is turned off after 4 hours. Find:

(a) The time taken to fill the tank. (6 marks)

(b) The capacity of the tank if the first tap delivers a total of 1260 litres. (4 marks)

19. (a) If the probability of one student solving a problem is $^6/_7$, of a second student solving it is $^7/_8$ and of a third student solving it is $^8/_9$. Find the probability that:

(i) They will all solve it. (1 mark)

(ii) At least one will solve it. (2 marks)

(b) A thief was to pass two watchmen P and Q (in the order when entering). On the way in, the probability he is arrested by P of $^4/_5$. If the escaped P, the probability that he also escapes Q is $^1/_9$. On the way out, the probability of being caught by Q is $^9/_{10}$ and that of being caught by P is $^5/_6$.

(i) Find the probability of entering unseen. (2 marks)

(ii) Find the probability of entering and coming out unseen. (2 marks)

(iii) What is the probability that he is caught on the way out? (3 marks)

20. In a tetrahedron OABC, its base ABC lies on a horizontal plane and is an equilateral triangle with side 5cm. OA = OB = OC = 8 cm. E is the mid-point of AB.

(a) Calculate the length, in cm to 3 significant figure of CE. (2 marks)

(b) X is a point which divides CE in the ratio 2:1 and OX is vertical. Calculate to 3 significant figures.

(i) The length of OX (3 marks)

(ii) The size of the angle, the degrees between the line OA and the plane

ABC. (2 marks)

(iii) The size of the angle, in degrees between the plane OAB and plane ABC. (3 marks)

21. Find the exact area bounded by the curve $y = 2x^2 - 4x + 5$, the x axis, the line $x = -2$ and $x = 1$. Estimate the same area using trapezoidal rule of 7 ordinates hence calculate the % error in your approximated area. (10 marks)

22. Particle P moves in a straight line such that , t seconds after passing through a fixed point O, its velocity V cm/s given by the equation $V = 3t^2 - 15t + 18$. Find:

(a) The values of t for which P is instantaneously at rest. (2 marks)

(b) An expression in terms of t for the distance P from O after t seconds. (2 marks)

(c) The total distance travelled by P in the first 4 seconds after passing point O. (3 marks)

(d) The distance P from O when the acceleration of P is zero. (3 marks)

23. (a) Complete the table below, given that $y=2\sin x+\cos\frac{1}{2}x$ for $0^o \leq x \leq 360^o$.

(2marks)

x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y													

(b) On the grid provided draw the graph of $y=2\sin x+\cos\frac{1}{2}x$ for $0^o \leq x \leq 360^o$

(3 marks)

Use a scale of 1cm to represent 30° on x-axis and 1cm to represent 2 units on y-axis.

(c) Find the value of x for which the function reaches its maximum. (1 mark)

(d) Use your graph to solve the equation $2(2\sin x+\cos\frac{1}{2}x) = 1$. (3 marks)

(e) State the amplitude of $y=2\sin x+\cos\frac{1}{2}x$ (1 mark)

24. a) Using a ruler and pair of compasses construct ΔPQR such that PQ= 7.5cm, the ratio of $\angle QPR : \angle PQR = 5:3$ and $\angle QRP = 60^0$. (4 marks)

b) Construct the locus of a point S, on the same side as R which moves such that $\angle PSQ = 75^0$. (3 marks)

c) Construct the locus of a point T which moves such that it is always equidistant from lines PQ and PR and produce it to intersect the locus of S at M. (1 mark)

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

ANSWERS:

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