NAME……..INDEX NO…….

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2009
TIME:2 ½ HRS

NANDI EAST DISTRICT JOINT EVALUATION TEST 2009

Kenya Certificate of secondary Education
Mathematics
Paper 2
Time 2 ½ hrs

SECTION 1 (50 MARKS)
ANSWER ALL QUESTIONS

SECTION I: (50 MARKS)

1. Simplify the expression below and give your answer in rationalized surd form
   $\frac{4 \cos 300^0 \sin 120^0}{\text{Tan } 240^0 - \text{Cos } 150^0}$ (2 marks)

2. Three sides of a triangle are stated as 4.2m, 2.8m and 3.0m to the nearest 0.1. Find the percentage error in its perimeter (3 marks)

3. The 2nd term of an AP is three times the 7th term. If the term is 1, find the 1st term and the common differences (3 marks)

4. Solve the simultaneous inequality below and state the positive integral values of X
¼ X -3 ≤X + 2 ≤ 21 – 2X (3 marks)

5. Make X the subject of the formula in the equation (3 marks)

$$y = \frac{bX}{\sqrt{aX^2 + b}}$$

6. Rationalize and simplify: (3 marks)

$$\frac{3}{3-2\sqrt{3}} - \frac{5}{3+2\sqrt{3}}$$

7. Solve the following trigonometric equation Cos 2X = Sin X for O≤ x ≤360^0
(3 marks)

8. Expand $(1 - \frac{1}{2}X)^5$ and use the expansion to evaluate $(0.95)^5$.
   Give your answer to 4s.f. (4 marks)

9. Find the centre and radius of a circle whose equation is
   $3X^2 - 24X + 3y^2 + 6y + 3 = 0$ (3 marks)

10. Find the acute angle between lines $3y - 4X - 6 = 0$ and the line $2y = 2X + 3 = 0$.
    Give your to 2 d.p) (3 marks)

11. Find the value of X for which the matrix $\begin{pmatrix} X + 4 & 2 \\ 10 & X - 4 \end{pmatrix}$ is singular
    (3 marks)

12. Two quantities F and d are such that F varies with d and partly varies as the square of d. When d = 2 F= 20 and when d= 3, F = 105. Write down the law connecting F and d. (3 marks)

13. A chord 15cm long is 10cm from the centre of a circle. Calculate the length of a chord 12 cm from the centre of the circle. (The chords are parallel) (3 marks)

14. If 2 log X + log y = 3, express y in terms of X (3 marks)

15. The cash prize of a wardrobe is sh. 8000. It can be bought on hire purchase by a deposit of sh.800 and 12 monthly installments of sh. 650. Calculate the rate of interest (3 marks)

16. A hot tap can fill a bath in 5 minutes while a cold water tap can fill the same bath in 3 minutes. The drain pipe can empty the full bath in 4 minutes.
    (i) If the bath is empty, how long would it take to fill it if the hot and cold taps are open and the drain closed (3 marks)

SECTION II (50 MARKS)

ANSWER ANY FIVE QUESTIONS

17. The table below shows the rate of taxation in a certain year

Income tax in K £ p.a	Rate of tax in Ksh. Per K£
1 – 4000	2
4001 – 7500	3
7501 – 11000	4
11001 – 14500	5
14501 – 18000	8
18001 - 21500	9
Over 21500	10

Mr. Kering is a teacher at certain school X. In a certain month his PAYE was sh 7694. However Kering has the following allowances; Hardship allowance 30% of the basic salary; house allowance Kshs 6000 per month and medical allowance 1700 per month. Mr. Kering is entitled to a family relief of Kshs: 1056 per month. Calculate:

(a) Kering's total gross tax per year (2 marks)

(b) Kering's monthly taxable income (4 marks)

(c) Kering's basic salary per month (2 marks)

(d) In addition to PAYE the following deductions are made every month
- Co-operative shares Kshs: 1000
- W.C.P.S 2 % of the basic salary
- Calculate his net income per month (2 marks)

18. A right pyramid ABCDV has a rectangular base of sides 5m by 4m, VA = VB = VC = VD = 6m. A point E on OV is such that OE = $^1/_3$ OV where O is the centre of the base. Find the

(a) Height of the pyramid (3 marks)

(b) Angle between the plane VBC and the base (2 marks)

(c) Angle between EB and DB (3 marks)

(d) Angle – between the plane ABCD and AEB (2 marks)

19. In a certain Mathematical relationship the values of P and Q are observed to satisfy the relationship $Q = tp^2 + KP$ where t and K are constants. Below is a table of values of P and Q.

P	1	2	3	4	5	6	7
Q	3	22	57	108	175	258	357

(a) Use the graph below to draw a suitable line graph and determine the values of t and K. (7 marks)

(b) Hence write the relationship between P and Q (1 mark)

(d) Determine the values of Q when P = 10 (2 marks)

20. Two towns on the earth's surface are located at R(7^0N, 30^0E) and K (13^0S, 30^0E.). A plane flies from R to K the shortest route between the two towns

(a) Calculate the shortest distance between R and K in nautical miles (3 marks)

(b) Given that the speed of the aircraft is 360knots. Determine how long it takes to fly from R to K in seconds (3 marks)

(c) The plane further flies L(13^0S, 65^0W.) Calculate the distance along the circle of latitude in km (Radius of the earth = 6370 km) (3 marks)

21. A committee of 3 people is to be chosen at random from a group of 3 men and 4 women. Find probability that the committee will consist of:

(a) Women only (2 marks)

(b) Men only (2 marks)

(c) Two women and one man (2 marks)

(d) More women than men (2 marks)

(e) More men than women (2 marks)

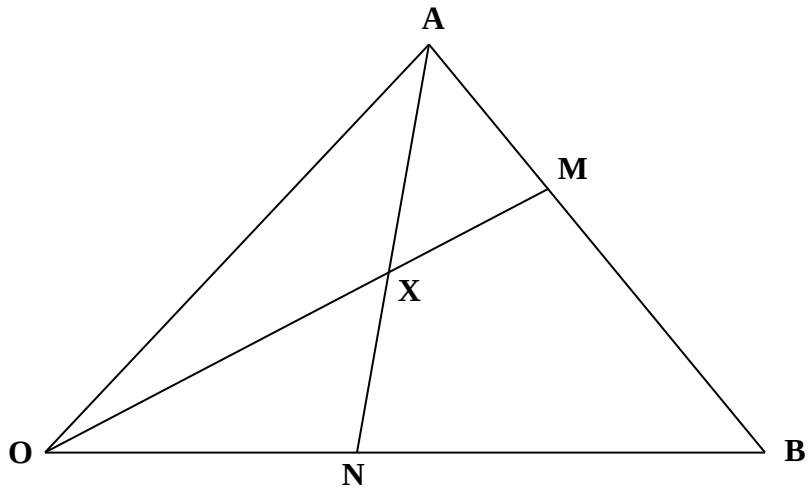
22. A factory manufactures two products which are produced on three machines X, Y, Z the first product requires 2 hours on machine X, 3 hours on machine Y and 1 hour on machine. The second product requires 1 hour on machine X, 4 hours on machine Y and 2 hours on machine Z. Machine X can be used for at least 100 hours, machine Y for at most 240 hours and machine Z for at least 90 hours

(a) Form inequalities to represent the above information and draw a graph to represent them. (3 marks)

GRAPH

(b) The profit per unit is Shs. 300 for the first product and shs. 400 for the second product. Determine the number of units of each product that should be produced to give maximum profit (4 marks)

23. The following figure shows a triangle OAB in which M divides AB in the ratio 1: 4 and N divides OB in the ration 1:1



If OA = a, OB =b, OX = h Om and AX = KAN,
Express
(i) OX in terms of a, b and h (3 marks)

(ii) OX in terms of a, b and k (3 marks)

(b) Determine the values of h and K (2 marks)

(c) Substitute the values of h, and K in OX (2 marks)

24. (a) Find the equation of the normal to the curve $y=3X^2 - 6X$ at the point $X = 3$
(4 marks)

(b) A stone is thrown vertically upwards from ground level and its height (h)t seconds later is $h = (30t - 4.9t^2)m$

(i) Find the greatest height reached by the stone (4 marks)

(ii) Find its height when $t = 2$ seconds (2 marks)