NAME…………………………………………............. INDEX NO……......…………………..

121/2   **CANDIDATE'S SIGNATURE…………………**
MATHEMATICS
PAPER II   **DATE………………………………………….**
AUGUST/SEPTEMBER, 2013
TIME: 2½ HOURS

KENYA SECONDARY SCHOOL FORM FOUR TRIAL EXAM - 2013

Kenya Certificate of Secondary Education
MATHEMATICS
PAPER II
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

1. *Write your name, admission and class in the spaces provided at the top of this page.*
2. *Sign and Write the date of examination in the spaces provided above.*
3. *This paper consists of **TWO** Sections; **Section I** and **Section II**.*
4. *Answer **ALL** the questions in **Section I** and any **five** questions from **Section II**.*
5. *All answers and working must be written on the question paper in the spaces provided below each question.*
6. ***Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.***
7. *Marks may be given for correct working even if the answer is wrong.*
8. ***Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.*
9. ***This paper consist of 14 printed pages**.*
10. ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***

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   **GRAND TOTAL**

17	18	19	20	21	22	23	24	TOTAL

## SECTION I (50 MARKS)

1.   Solve the simultaneous equations   (3mks)

$$2 \log y = 8 \log 2 - \log x$$
$$2^y = 4^x$$

2.   A is a transformation matrix $\begin{pmatrix} 7x & 3 \\ -4 & x \end{pmatrix}$ Under A, a square whose area is $10cm^2$ is

mapped onto a square of area 750 cm^2 find the value of x.   (3mks)

3.   The figure below shows two circles of radii 3cm and 2cm. They intersect internally at B CD is a chord
of the larger circle and tangent to the smaller circle. Given that EB=4.5cm, determine
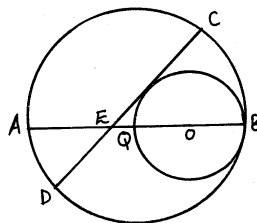
a) The perpendicular distance from Q to the chord CD.   (2mks)

b) The obtuse angle subtended by chord CD at E.   (2mks)

4. Given that A(9,3,2), B(2,1,-1) and PA = $\begin{pmatrix} 7 \\ 2 \\ 3 \end{pmatrix}$. Determine the coordinates of Q such that

PQ = $^3/_5$ QB. (3mks)

5. The length and breath of a rectangular card were measured to the nearest millimeter and found to be 24.4cm and 15.6cm respectively. Find the percentage error in the calculation of its perimeter.

(3mks)

6. Solve the equation for $0^0 \leq \theta \leq 360^0$ (4mks)

$$10 \cos^2 \theta + \sin x = -1$$

7. The overall grade (R) attained by a student is directly proportional to student's effort(s) teachers effort(t) and the general discipline level (d) of the school. A student doubled his efforts, the teacher went extra by 5% but the school discipline dropped by 40%. Find the percentage change in the overall grade. (3mks)

8. If $(P + 6)(P + 4)$ is equivalent to $(P + a)^2 + 5b$ find the values of a and b given that a and b are constants. (3mks)

9. A ship sails 15km from port P on a bearing of $\frac{1}{3}\pi^c$ to port Q. It then sails from port Q to port R 10km away on a bearing of $\frac{2}{3}\pi^c$. Calculate the distance from P to R to the nearest km. (3mks)

10. A shopkeeper mixes sugar costing sh. 40 per kg with another type which costs sh. 60 per kg. Find the ratio in which the two must be mixed so that if a kilogram of the mixture is sold at Ksh. 55, a profit of 10% is realized. (3mks)

11. A prison warden on a watchtower 10m high observes three prisoners x, y and z. x and z are at an angle of depression 40^0, with x on a bearing of 120^0 while z is on a bearing of 210^0. Y is in between x and z. Find the angle of elevation the prison warden from y. (3mks)

12. Write down the binomial expansion of $(1 - ¼ x)^8$ upto the term including x^3. Hence use the expansion to evaluate $(0.975)^8$ to 4d.p. (3mks)

13. Find the least number of items that must be taken for the sum of the AP $5 + 7 + 9 + \ldots\ldots\ldots$ to exceed 1000. (3mks)

14. The diagram below represents a cross-section of a rectangular metal sheet of sides 12cm by 8cm and 20mm thick with semi-circular parts removed as shown. Determine the total surface area of the sheet of metal.
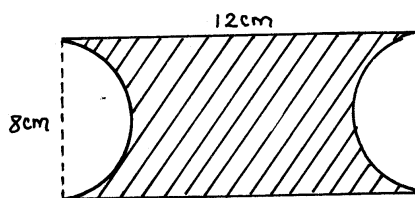
15. Construct a rhombus PQRS with PQ=QR = 6cm and angle PQR = 60^0. On the same diagram construct the locus of T such that PT $\geq$ TQ and T is inside triangle PSR.　　　　(3mks)

16. Solve for x in the equation.

$$5^{2x} - 6 \times 5^x + 5 = 0.$$ 　　　　(3mks)

SECTION II (50 MARKS)

Attempt <u>any FIVE</u> questions from this section.

17. The table below shows the rate at which income tax is charged for all income earned in a month in 2013.

Taxable income P.M (K£)	Rate in % per K£
1 – 236	10%
237 – 472	15%
473 – 708	20%
709 – 944	25%
945 and over	30%

A total of Ksh. 12,000 is deducted from Mr. Rono's monthly salary. He is entitled to a house allowance of Ksh.6000 and a personal relief of Ksh. 1064 p.m. Every month he pays the following and they are all deducted from his salary by his employer.

(i) Electricity bill shs 680

(ii) Water bill shs. 460

(iii) Co-operative shares shs. 1280

(iv) Loan repayment Kshs.5000

a) Calculate his p.a.y.e. (2mks)

b) Calculate his monthly taxable income. (6mks)

c) Calculate his basic salary per month. (2mks)

18.   A student in a maths club has six identical number cards 1 – 6 and five letter cards a, b, …….e. The student asks one of the members to pick one number card and one letter card then records the outcome.

(i) Prepare his /her probability space.   (2mks)

(ii) Find the probability that a letter card and an odd number was picked.   (2mks)

(iii) Find the probability that the number card was an even number.   (2mks)

(iv) Find the probability that the letter card was a vowel and the number card was a prime number.

(2mks)

(v) Find the probability that the letter card was a constant. (2 mks)

19. In the figure below ABCDE is A right pyramid with base AB =8cm, BC = 6cm and AE = DE = BE = CE = 13cm.M and N are mid points of BE and CE respectively.
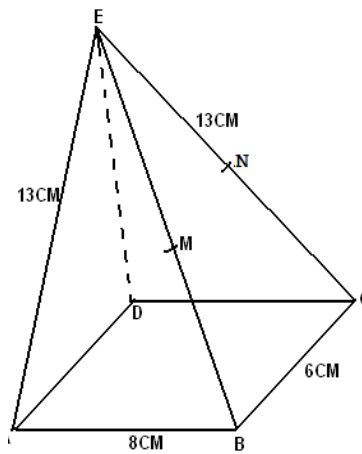
Determine

a. the height of the pyramid (2mks)

b. the angle the length AE makes with the base ABCD (2mks)

c. the angle AED makes with the base ABCD (2mks)

d. The angle between the plane AED and the plane AMND (4mks)

20. A printing firm owner employs both skilled workers and apprentices. He has facilities such that he cannot employ more than 9 people altogether. The firm's orders force him to maintain an output of at least 30 units of printing work per day. On average a skilled man does 5 units of printing work and an apprentice 3 units of work daily. The apprentices' arrangement demands that the printing firm should employ not more than 5 skilled men to one apprentice. The workers union however forbids the firm to employ less than 2 skilled men to each apprentice. Using x to represent skilled men and y to represent the apprentices.

a) Write down 4 inequalities to represent the above information. (4mks)

b) On the graph paper represent the inequalities. (4mks)
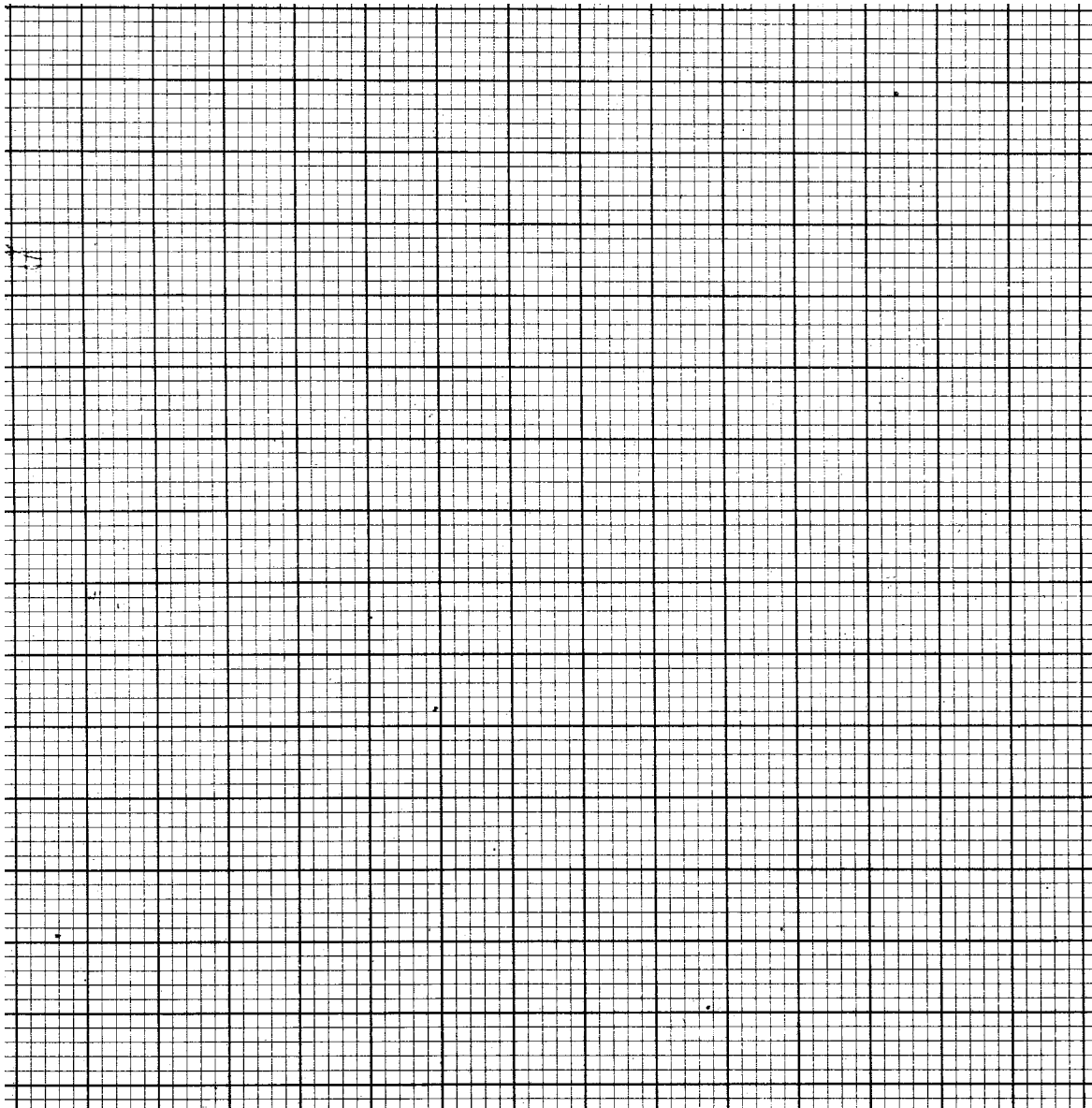
c) If the firm pays each skilled man sh.80 per day and an apprentice sh. 40. Find the maximum number of each type of workers employed for higher expenditure   (2mks)

21. A piston moves along a straight wire. The end of the piston passes a point B when t=0; the acceleration a m/s^2 is given by a=1-2t. If the velocity of the piston at B is 6m/s, find

a) an expression for velocity of the piston t seconds after passing point B.   (2mks)

b) The time when the piston comes to rest.   (4mks)

c) the distance of the piston from B when it comes to rest.   (4mks)

22. Complete the table below   (2 mks)

X	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
Sinx	0	0.5	0.87	1		0.5	0	-0.5		-1	-0.87	-0.5	0
2sin ½ x	0		1	1.41		1.93	2		1.73	1.41	1		0

a) Using a scale of 1cm represents 30^0 on the horizontal axis and 2cm to represent 1 unit on the vertical axis draw the graphs of the functions y=sin x and y=2 sin ½ x on the same axis. (5 mks)
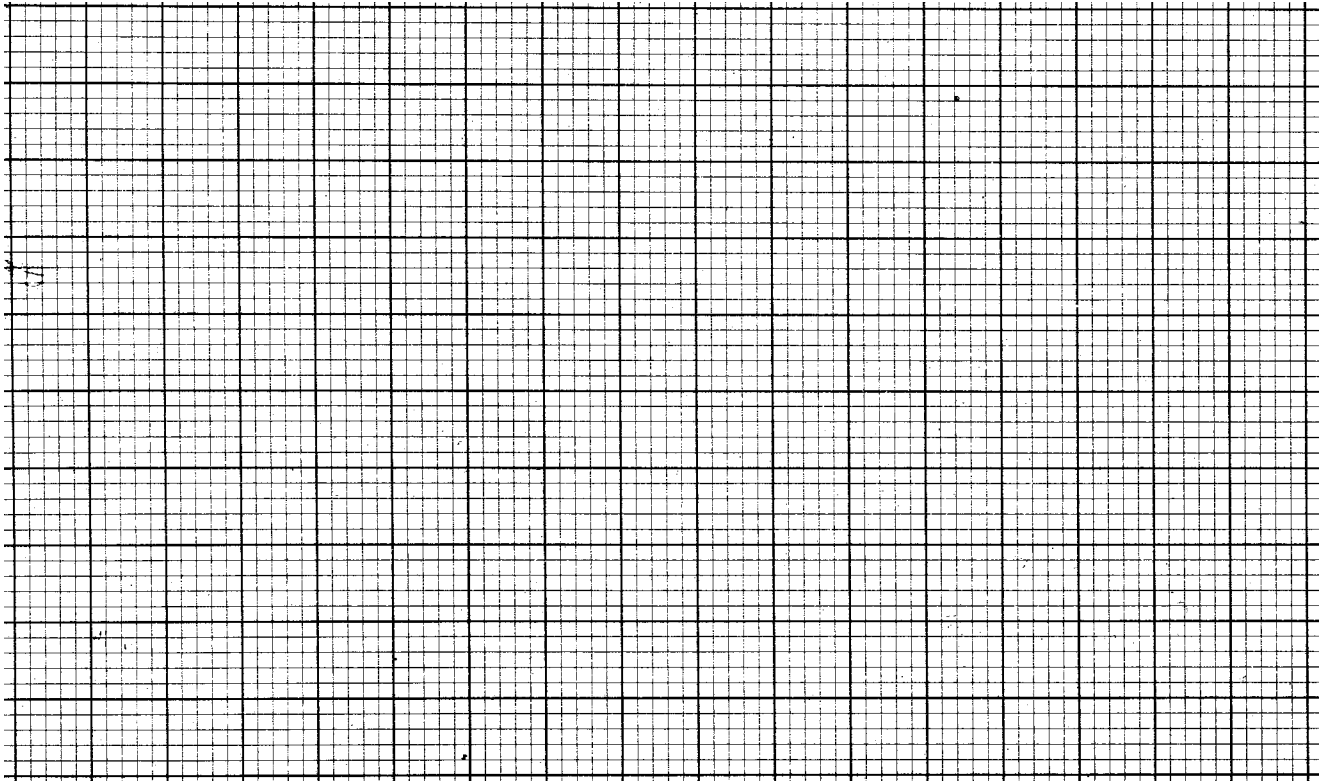
b) Use your graph to solve the equations

(i) 2 sin ½ x – sin x = 0.   (1mk)

(ii) 1.5 – 2 sin ½ x = 0.   (2mks)

23.   In a triangle ABC, M is a point on BC such that BM:MC = 3:2. A point N divides AB externally such that 2AN = 3NB. Given that AB = **a** and AC = **c.**

a) Write down the following in terms of **a** and **c**

(i) $\overrightarrow{AM}$. (1mk)

(ii) $\overrightarrow{AN}$ (1mk)

(iii) $\overrightarrow{MN}$ (2mks)

b)   NM produced meets AC at L such that $AL = pAC$ and $NL = kMN$ where P and K are scalars.

(i) Write down two expressions for $\overrightarrow{AL}$. (3mks)

(ii) Find the values of p and k. (2mks)

c) State the ratio AL:LC (1mk)

24.   The position of two towns A and B on the Earth's surface are $(36^0N, 49^0E)$ and $(36^0N\ 131^0W)$ respectively (Taking the Earth's radius = 6370km and $\pi = {}^{22}/_7$)

a) Find the longitudinal difference between the two towns. (1mk)

b) Calculate the distance between the towns.

(i) Along a parallel of latitude (in km). (2mks)

(ii) Along the great circle in km and neutical miles. (4mks)

c) Another town C, is 840km due East of town B. Locate the position of town C.   (3mks)

ANSWERS:
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END