Name: _____ Index No. _____

Date: _____

MOKASA JOINT EXAMINATIONS

Kenya Certificate of Secondary Education

MARCH/APRIL 2013

MATHEMATICS

(PAPER 2)

TIME: 2 ½ hrs

INSTRUCTIONS TO STUDENTS

1. *Write your name, index number and date at the top of this paper.*
2. *The paper contains 2 sections; Section **I** and Section **II**.*
3. *Answer **ALL** the questions in Section **I** and ANY FIVE from 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 answers at each stage in the spaces below each question.*
6. *Marks may be given for correct working even if the answer is wrong.*
7. *Non-Programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.*

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**

GRAND

Section 1(50 marks)

Answer all questions

1. Use logarithms to evaluate; (4 marks)
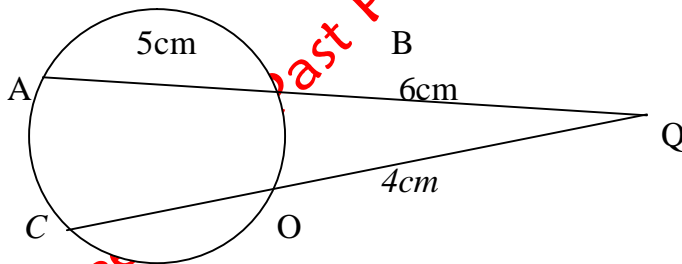
$$5\sqrt{\frac{(0.6873)^2 \text{ x } 438.7}{396.8}}$$

2. Express the following in Surd form and simplify by rationalizing the denominator (3 marks)

$$\frac{1 + \cos 30^0}{1 - \sin 60^0}$$

3.   Solve the quadratic equations by completing the square method

$$2x^2 - xy - y^2 = 0$$

4.   In the figure below AB and CD are chords of a circle which intersect externally at Q. If AD =5cm, BQ=6cm and DQ=4cm, calculate the length of the chord CD.   (2 marks)

5.   (a.)   Expand $(3+\frac{2}{x})^5$ up-to the term x^4.   (2marks)

      (b)   Hence estimate the value of $(3.5)^5$ to 4sf.   (2marks)

6.   A seven sided polygon has three of its angles each equal to   and the other angle are (2 -30),(+
      28), 3(-4) and (126-). Calculate the value of   .

7. A triangle plot ABC is such that AB=36m, BC=4cm and AC=42cm. Calculate the acute angle between edges AB and BC.

8. Make n the subject of the formula (3marks)

$$m = \sqrt[3]{\frac{ax^2 n}{w - n}}$$

9.   The dimension of a cuboid are recorded as 30cm by 25cm by 22 cm to the nearest 1cm. Estimate the percentage error in its volume.
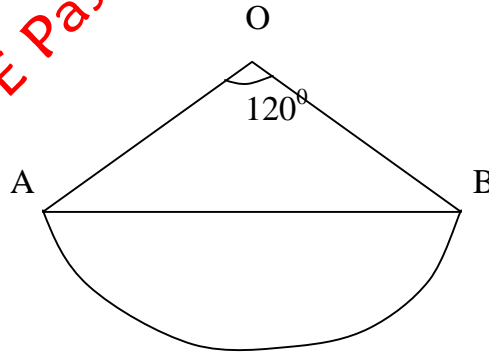
10.   Solve the equation   ½ tan x = sin x for 0   x   360

11. F varies partly as a constant and partly as M. If F=2 , when M=3 and also F=1 when M=2

   a)   Express F in terms of M   (2 marks)

   b)   Calculate the percentage change in F when M is decreased by 20%   (2 marks)

12. The diagram below shows a part of a circle centre O with chord AB=$5\sqrt{3}$ cm and angle AOB= 120^0. Find the length of the arc ACB to id.pp. (Take = 3.142)

13. Pipe A can fill a tank in 2 hours. Pipes B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take

   (a) To fill the tank if A and B are left open and C closed? (2marks)

   (b) To fill the tank with all the pipes open? (2marks)

14. From the top of a cliff the angle of depression of a toy raft is 24^0. The raft now sails 50m towards the cliff and the angle of depression is now 83°. Find the height of the cliff to 3s.f

15. The equation of a circle is given by $2x^2 + 8x + 2y^2 - 10 = 0$. Find the radius and centre of the circle. (3 marks)

16. The coordinates of a triangle PQR are P (2,1), Q (4,3) and R (3,5).

   (a) Show triangle PQR on the grid provided. . (1 mark)

   (b) Triangle PQR is mapped onto P'Q'R' by a positive quarter turn rotation about the origin. Show triangle P'Q'R'. (3 marks)

(c) Triangle P'Q'R' is mapped onto P"Q"R" by an enlargement of scale factor – 2 about the origin. Show triangle P"Q"R"   . (3marks)

(d) (i) Triangle P"Q"R" is mapped onto P'''Q'''R''' by a translation **T,** such that point P''(2, - 4) is mapped onto P'''(-8,-2) .show triangle   P'''Q'''R''' (3marks)

Section II (50 marks)
Answer any FIVE Questions from this section

17.   The following table relate to a tax rate of certain country in a given year.

Taxable income K£ pa	Rate (ksh/K£)
1 to1800	2
1801-3600	3
3601-5400	5
5401-7200	7
7201-9000	9
9001-10800	10
10801-12600	12
12601 and above	13

Katwa is employed by a company that houses him and pays a nominal rent of ksh 200 per month .
He is entitled to a life insurance relief of sh 40 per month and a personal relief of k£ 900 pa .On top
of the basic pay the company gives him a commuter allowance of sh 2000 per month and medical
allowance of sh 1500 per month . To get the taxable pay income 15% of the basic pay is added to
the basic pay less nominal rent. If in the month of February of that year ,Katwa's PAYE was sh
3443. 30 .Calculate the monthly,

I) taxable income   (6 marks)

II) basic pay.   (4 marks)

18.   The figure below shows triangle ABO in which M decides OA in the ratio 2:3 and N divides OB in the ratio 4:1. AN and BM intersect at X.

(a)   Given that $\overrightarrow{OA}=\mathbf{a}$ and $\overrightarrow{OB}= \mathbf{b},$ express in terms of $\mathbf{a}$ and $\mathbf{b}$

(i) $\overrightarrow{AN}$

(ii) $\overrightarrow{BM}$
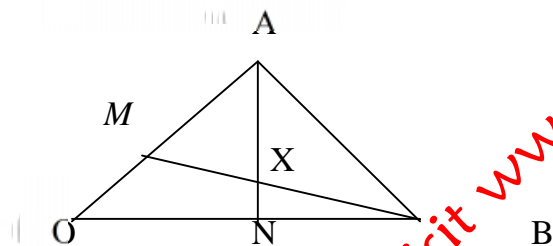
(b)   If AX = s**AN** and **BX** = t**BM** where s and t are constants, write an expression for X in terms of **a, b** s and t. Find the values of s and t hence write **OX** in terms of **a** and **b**.

(c)   Finds the ratios MX: XB and AX : XW.

19.   The fourth, seventh and sixteenth term of an arithmetic progression are in geometric

progression. The sum of the first six terms of the arithmetic progression is 12.

Determine the

(a)   First term and the common difference of the arithmetic progression.   (6marks)

(b)   Common ratio of the geometric progression   (2marks)

(c) Sum of the first six terms of the geometric progression   (2marks)

20. The table below gives marks obtained in a mathematics test by 47 candidates

Marks	31to 35	36to40	41to45	46 to50	51to55	56to60			
No of candidates	4	6	12	15	8	2			

a) Calculate the mean score   (2 marks)

b) On the grid provided draw a cumulative frequency graph and use it to estimate

   I) the median score

   II) the semi-interquartile range   (6 marks)

c) In order to pass the test a pupil had to score more than 40 marks. Calculate the percentage of

   pupils who passed.   (2 marks)

22.   The displacement S, metres of a particle moving along a straight line after t seconds is given by
       $S=2t^3 - 3t^2 + t$.

       (a)   Find its initial acceleration.   (3 marks)

       (b)   Find its velocity and acceleration when t=1   (3 marks)

       (c)   Find the maximum speed attained.   (2 marks)

       (d)   Find the velocity attained in the fourth second.   (2 marks)

23. The figure below is a square based pyramid ABCDV with AD=DC=6cm, and height VO=10cm.
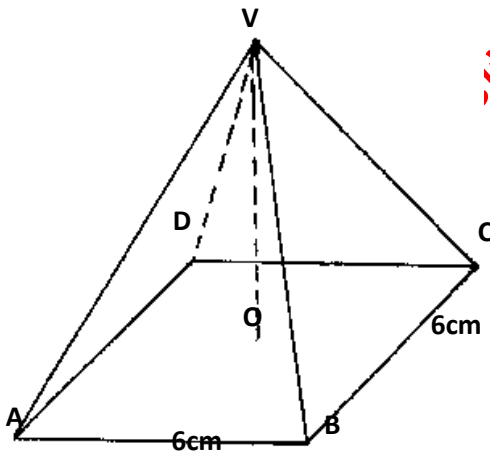
(a) State the projection of VA on the base ABCD. (1mark)

(b) Find:(i) The length of VA (3marks)

(ii) The angle between VA and ABCD (2mks)

(iii) The angle between VDC and ABCD. (2marks)

(iv) Volume of the pyramid.   (2marks)

24.   A businessman wants to make plastic buckets. There are two types of machines that can make
        plastic buckets, type A and B. Type A makes 120 buckets a day, occupies $20m^2$ of space and is
        operated by 5 men. Type B makes 80 buckets a day, occupies $24m^2$ and is operated by 3 men.
        The businessman has $200m^2$ of space and 40 workers (men)

        a)   If x and y represent the number of type A and type B machines respectively. Form all
                the inequalities representing the information above.   (3 marks)

        b)   On a graph paper draw the inequalities and shade the unwanted regions.

        c)   Determine the number of machines of each type that the businessman needs to buy so as
                to make a s many buckets as he can in a day.   (3 marks)

        d)   Find what his daily profits would be if the profit per bucket from type A and B
                machines were sh 250 and sh 300 respectively.   (1 mark)