Name: .... **Adm No**: ....**Class**: ....

Candidate's Signature:...

121/2
MATHEMATICS ALT A
Paper 2
July 2014
2½ hours

KAKAMEGA COUNTY JOINT EVALUATION TEST-2014

Kenya Certificate of Secondary Education (K.C.S.E.)

MATHEMATICS ALT A

Paper 2

Instructions to candidates

(a) *Write your name and index number in the spaces provided above.*
(b) *Sign and write the date of 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 from **Section II**.*
(e) *All answers and working must be written on the question paper in the spaces provided below each question.*
(f) ***Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.***
(g) *Marks may be given for correct working even if the answer is wrong.*
(h) ***Non – programmable** silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.*
(i) ***This paper consists of 15 printed pages.***
(j) ***Candidates should check the question papers 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

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50 Marks)

*Answer **all** the questions in this section in the spaces provided*

1. Use logarithms to evaluate: (3 marks)

$$\left(\frac{36.15 \times 0.2753}{1.938^2}\right)$$

2. Given that $a^2x^2 + 6ax + k$ is a perfect square, find k. (3 marks)

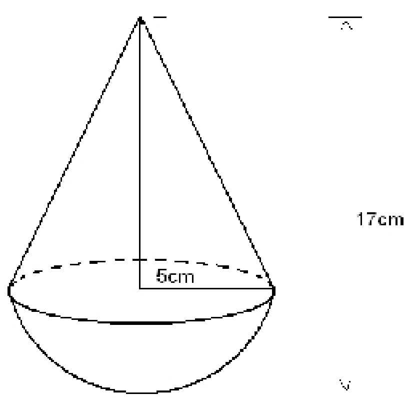
3. Make h the subject of the formula. (3 marks)

$$E = 1 - \prod \sqrt{\frac{h - 0.5}{1 - h}}$$

4. Given that P varies directly as V and inversely as the cube of R and that P = 12 when V = 3 and R = 2,
(i) Find an equation connecting P, V and R. (3 marks)

(ii) Find the value of V when P = 10 and R = 1.5 (1 mark)

5. The figure below shows a toy which consists of a conical top and a hemispherical base.



The hemispherical base has a radius of 5cm and the total height of the toy is 17cm. calculate the volume of the toy. (Take $\pi = 3.142$) (3 marks)

6. a. Find the inverse of the matrix $\begin{pmatrix} 3 & -4 \\ 5 & 3 \end{pmatrix}$ (1 mark)

b. Hence solve the following simultaneous equations using matrix method (3 marks)

$$3x - 4y = 2$$
$$3x + 5y = 13$$

7. The first term of an arithmetic sequence is $(2x+1)$ and the common difference is $(x+1)$. If the product of the first and the second terms is zero, find the first three terms of the two possible sequences. (4 marks)

8. Solve for x in the equation $\log 5 - 2 + \log(2x+10) = \log(x-4)$ (3 marks)

9. (a) Expand $\left(1+\frac{1}{5}x\right)^4$ (1 marks)

(b) Use the first three terms of the expansion in (a) to find the approximate value of $(0.98)^4$ (2 marks)

10. Draw a line DF=4.6cm.Construct the locus of point K above DF such that angle DKF = 70^0. (3 marks)

11. Machine A can complete a piece of work in 6 hours while machine B can complete the same work in 10 hours. If both machines start working together and machine A breaks down after 2 hours, how long will it take machine B to complete the rest of the work? (3 marks)

12. Evaluate $\int_{-1}^{2}\left(2x^2 - 3x - 14\right)dx$ (3mks)

13. The base and perpendicular height of a triangle measured to the nearest centimeter are 6cm and 4cm respectively. Find
(a) The absolute error in calculating the area of the triangle. (2 marks)

(b) The percentage error in the area giving the answer to 1 decimal place. (1 mark)

14. Given that $\frac{x}{x+2y} = \frac{3}{8}$, find the ratio x:y (2 marks)

15. Complete the table below for the function $y = 3x^2 - 8x + 10$

x	0	2	4	6	8	10
y	10	6	26		138	

Hence estimate the area bounded by the curve $y = 3x^2 - 8x + 10$ and the lines $y = 0$, $x = 0$ and $x = 10$ using trapezoidal rule with 5 strips. (3 marks)

16. If $\frac{1}{3-\sqrt{5}} - \frac{2+2\sqrt{5}}{3+\sqrt{5}} = a + b\sqrt{c}$, find the value of a, b and c (3 marks)

SECTION II (50 MARKS)

Answer only FIVE questions in this section in the spaces provided.

17. The table below shows the Kenya tax rates in a year

Income (Ksh per annum)	**Tax rate (per £)**
1 – 116,160	10%
116,161 – 225,600	15%
225,601 – 335,040	20%
335,041 – 444,480	25%
Over 444,481	30%

In that year, Ushuru earned a basic salary of Ksh 30000 per month. In addition, he was entitled to a medical allowance of Ksh 2,800 per month and a traveling allowance of Ksh 1800 per month. He is housed by the employer and pays a nominal rent of 2000. He also claimed a monthly family relief of Ksh 1056. Other monthly deductions were union dues Ksh 445, WCPS Ksh 490, NHIF Ksh 320, COOP shares Ksh 1000 and risk fund Ksh 100

Calculate:

(a) Ushuru's annual taxable income. (2 marks)

(b) The tax paid by Ushuru in that year (5 marks)

(c) Ushuru's net income in that year (3 marks)

18. (a)Complete the table for the function $y = \frac{1}{2} Sin2x$, where $0^0 \leq x \leq 360^0$ (2 marks)

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
$2x$	0^0	60^0	120^0	180^0	240^0	300^0	360^0	420^0	480^0	540^0	600^0	660^0	720^0
$Sin2x$	0^0	0.866			0^0				0.866		-0.866		
$y = \frac{1}{2} Sin2x$	0^0	0.433			0^0								

(b) On the grid provided, draw the graph of the function $y = \frac{1}{2} Sin2x$ for $0^0 \leq x \leq 360^0$ using the scale 1cm for 30^0 on the horizontal axis and 4cm for 1 unit of y axis. (3 marks)

(c) Use your graph to determine the amplitude and period of the function $y = \frac{1}{2} Sin2x$ (2 marks)

(b) Use the graph to solve

(i) $\frac{1}{2} Sin2x^0 = 0$ (1 mark)

(ii) $\frac{1}{2} Sin2x^0 - 0.5 = 0$ (2 marks)

19. The following are marks out of 100 scored by 40 learners in a Mathematics contest.

Marks	40 – 49	50 – 59	60 – 69	70 – 79	80 - 89	90 – 99
No. of learners	4	6	8	12	8	2

(a) (i) Using an assumed mean of 64.5, calculate the standard deviation of the data. (5marks)

b. On the grid provided, draw a cumulative frequency curve. (3 marks)

From your graph, determine;

(i) The median (1mark)

(ii) The interquartile range (1mark)

20. A triangle ABC with vertices at A (1,-1) B (3,-1) and C (1, 3) is mapped onto triangle $A^1B^1C^1$ by a transformation whose matrix is $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

Triangle $A^1B^1C^1$ is then mapped onto $A^{11}B^{11}C^{11}$ with vertices at A^{11} (2, 2) B^{11} (6, 2) and C^{11} (2,-6) by a second transformation.

(i) Find the coordinates of $A^1B^1C^1$ (3 marks)

(ii) Find the matrix which maps $A^1B^1C^1$ onto $A^{11}B^{11}C^{11}$. (2 marks)

(iii) Determine the ratio of the area of triangle $A^1B^1C^1$ to triangle $A^{11}B^{11}C^{11}$. (3 marks)

(iv) Find the transformation matrix which maps $A^{11}B^{11}C^{11}$ onto ABC (2 marks)

21. In a form 2 class $\frac{2}{3}$ are boys and the rest are girls. $\frac{4}{5}$ of the boys and $\frac{9}{10}$ of the girls are right handed; the rest are left handed. The probability that a right handed student will answer a question correctly is $\frac{1}{10}$ and the corresponding probability for a left handed student is $\frac{3}{10}$ irrespective of the sex.

By use of tree diagram; Determine

(a) The probability that a student chosen at random from the class is left handed. (5 marks)

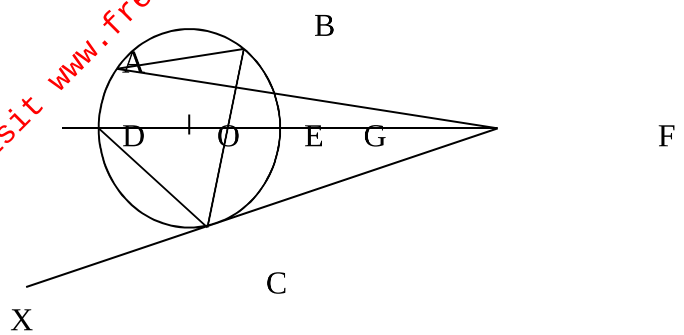
(b) Given that getting a boy or a girl at any stage in a family of three children is equally likely;

(i) Use the letters B and G to show the possibility space for all families with three children (1 mark)

(ii) Using the possibility space calculate the probability that a family of three children has at least one girl. (2 marks)

(iii) The oldest and the youngest are of the same sex. (2 marks)

22. In the figure below O is the centre of the circle. DEF is a straight line. FCX is a tangent at C. $\angle DCX = 60^0, \angle AFD = 5^0 \, and \angle ABC = 85^0$. FCX is the tangent to the circle and $\angle BAF = 10^0$



a) Find the sizes of the following angles giving reasons.

(i) $\angle DFC$ (3 marks)

(ii) $\angle DAF$ (2 marks)

(iii) $\angle OCB$ (2 marks)

b) If GF is 10 cm and the radius of the circle is 7 cm.
Calculate GF (3 marks)

23. An aeroplane that moves at a constant speed of 600 knots flies from town A (14^0N, 30^0W) southwards to town B (X^0S, 30^0W) taking $3\frac{1}{2}$ hrs. It then changes direction and flies along latitude to town C (X^0S, 60^0E). Given ® = 3.142 and radius of the earth R= 6370 km

(a) Calculate

(i) The value of X (3 marks)

(ii) The distance between town B and town C along the parallel of latitude in km. (2 marks)

(b) D is an airport situated at (5^0N, 120^0W), calculate

(i) The time the aeroplane would take to fly from C to D following a great circle through the South Pole. (3 marks)

(ii) The local time at D when the local time at A is 12.20 p.m (2 marks)

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

(a) List all inequalities representing the above information given that the business man buys **x** machines of type **A** and **y** machines of type **B**. (3 marks)

(b) Represent the inequalities above on the grid provided. (3 marks)

(c) Using your graph find the number of machines of type A and those of type B that the business man should buy to maximize the daily chair production. (2 marks)

(d) Given that the price of a chair is Ksh.250, determine the maximum daily sales the businessman can make. (2 marks)