NAME……………………………………………………………….ADM………………………STREAM……………………

121/2

MATHEMATICS

PAPER 2

22ND FEB 2014

2 ½ Hours

ST MARY'S MAGINA GIRLS SEC. SCHOOL

INSTRUCTIONS TO CANDIDATES

(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
(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)   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.

FOR EXAMINER'S USE ONLY

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

17	18	20	21	22	23	**24**	TOTAL

1. **Given** that $(X+Y)=8$ and $X^2 - Y^2 = 32$, find the value of

a) $X-Y$ (2mks)

b) $2XY$ (2mks)

2. Use the reciprocal table to find the value of X given   (2mks)

$$X = \frac{7}{0.385} + \frac{8}{40.54}$$

3. simplify $\dfrac{6x^2 - 9xy - 6y^2}{8x^2 - 2y^2}$ (2mks)

4. Solve for x in $125^{(x+y)} + 5^{(3x+1)} = 3250$ (4mks)

5. Express in surd form $\frac{\tan 45 + \sin 45}{\sin 90 - \cos 45}$ and simplify by rationalizing the denominator to give the answer in the form $a\sqrt{b}$ where a, b and c are real numbers (3mks)

6. Find the centre and the radius of a circle whose equation is

$4x^2 + 4y^2 + 8x - 16y + 11 = 0$ (3mks)

7. Use Pascal's triangle to expand $(1 + \frac{2}{x})^6$ to forth term. Hence use your expansion to find the value of (1+6) correct to 3 decimal places (4mks)

8. Two grades of tea A and B cost sh. 180 and sh.135 per kg respectively. Determine the ratio in which A should be mixed with B to produce a blend costing sh.150 per kg   (3mks)

9. Each interior angle of a regular polygon is 100° larger than the exterior angle. Determine the number of sides of the polygon (3mks)

10. Two similar containers have a base area of 150 and 240 respectively. Calculate the volume of the larger container in m^3 given that the volume of the smaller one is 500cm³ (3mks)

11. Solve simultaneous equation (4mks)

$$\log_3(x + 2y) = 2$$
$$\log_2(3x + 5y) = 2$$

12. $\int_1^2 5x^4 + 3x^2 + 2x$ (3mks)

13 $.\frac{22}{7}$ Was approximated as 3.142, calculate the percentage error in the approximation   (3mks)

14 There are three athletes P, Q and R in a race. P is twice as likely to win as Q and Q is twice as likely to win as R. Find the probability that

a. P does not win the race (2mks)

b. Either Q or R wins the race (1mk)

15. Make s the subject of the formula $a = \sqrt{(\frac{s^2+q}{q^2})}$ (3mks)

16. Use quadratic formula to solve $8x^2 + 2x - 24$ (3mks)

Answer any **five** questions from this section

17. The table below show how income tax was charged in a certain year

Taxable income pa(Kenya pound)	Tax rate(sh per pound)
1-3630	2
3631-7260	3
7261-10890	4
10891-14520	5
14521-18150	6
18151-21780	7
21781 and above	7.5

During the year, Ann earned a basic salary of sh25200 and a house allowance of sh12600pm.She was entitled to a tax relief of sh960pm. Calculate

a) Ann's taxable income in Kenyan pound per annum (2mks)

b) Net tax she paid per month (6mks)

c) A part from income tax, other deductions amounting to sh1075 are made from her monthly income. Calculate her net monthly pay. (2mks)

18. An arithmetic progression (AP) has the first term **a** and common difference **d**

a) Write down the **first, third** and **eleventh** terms of the AP in terms of **a** and **d** (2mks)

b) The AP above is such that it is increasing and its first, third and eleventh terms forms the first three terms of GP. The sum of the fifth and the ninth terms of the AP is 80.

i) Find the first term and the common difference of the AP (4mks)

ii) Write down the eighth and the tenth terms of the AP (2mks)

ii) Calculate the sum of the first 15 terms of the AP (2mks)

19 Given that $y=7+3x-x^2$, complete the table below (2mks)

x	-3	-2	-1	0	1	2	3	4	5	6
y	-11			7			7			-11

b) On the graph, plot a graph of $y=7+3x-x^2$ (3mks)

c) On the same grid draw the straight line $y=4-x$ (2mks)

d) Use the graph to solve the equation $x^2-4x-3=0$ (1mks)

e) Use calculus to determine the coordinates of the turning point (2mks)

20. The displacement of a particle S (m) after time t (s) is given by

$S=t^3-5t^2+3t+3$. Find the

i) The displacement of the particle after 0 second (2mks)

ii) Time when the particle is at rest   (3mks)

iii) Acceleration of the particle when t=10s   (3mks)

iv)The velocity when time t=0 seconds   (2mks)

21.

The diagram show triangle OPQ in which M and N are points on OQ and PQ respectively such that $OM=\frac{2}{3}\ OQ$ and $PN=\frac{1}{4}PQ$. Lines PM and ON meet at X

a) *Given that OP=p and OQ=q, express in terms of p and q the vectors*

i)PQ

ii) PM

iii) ON

    (4MKS)

b) *You are further given that OX=k ON and PX =h PM, by expressing QX in two ways, find the values of h and k*
            (6mks)

22 The diagram below represents the sketch of the curve $y=12+2x-x^2$ and the line $y=8-x$. The lines intersect the curve at point A and B.

Determine the coordinates of A and B   (4mks)

Use integration to find the area enclosed by the curve and the x-axis between the points A and B (3mks)

Calculate the area of the shaded region   (3mks)

23. Two towns on the earth surface are A (75°N, 100°E) and B (75°N, 80°W).A pilot can fly from A to B along the parallel of latitude or the great circle over the north pole

a) Giving your answers to the nearest km, determine the difference in the distances of thee two routes. (Take R=6370km, $\pi=\frac{22}{7}$) (3mks)

b) The pilot had to fly from B due east at 600km/h for two hours to pint C. Determine the position of point C (4mks)

c) If the local time at point C is 2.40pm, determine the local time at point A (3mks)

24. You are given the matrix $P=\begin{pmatrix} 6 & 7 \\ 4 & 5 \end{pmatrix}$

a) Find its inverse P^{-1} (2mks)

c) Two business women A and B bought beans and maize at sh. b per bag
   and sh. M per bag respectively. A bought 12 bags of beans and 14 bags of
   maize and spent a total of sh. 49400. B bought 8 bags of beans and 10
   bags of maize and spent a total of sh. 34600.

I.   Write down matrix equation to represent this information   (2mks)

II.   Use the inverse matrix in (a) above to determine the price of one bag of
      each commodity (4mks)

d) Given that $\begin{bmatrix} x-1 & x+1 \\ 3x & x \end{bmatrix}$ is a singular matrix, find the possible values of X
   (2mks)