NAME ..... INDEX NUMBER .....

Adm ..... SIGNATURE .....

School ..... DATE .....

121/2
MATHEMATICS
PAPER 2
TIME: 2½ HRS
JULY/AUGUST 2016

WESTLANDS SUB-COUNTY JOINT EXAMINATION

KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)

Paper 2
July/August 2016
Time: 2½ hours

INSTRUCTIONS TO CANDIDATES

a) Write your name, Adm number, index number and Class.
b) This paper consists of **two** sections: Section **I** and section **II**
c) Answer **all** questions in Section **I** and only **five** questions in Section **II**.
d) All working and answers must be written on the question paper in the spaces provided below each questions.
e) Marks may be awarded for correct working even if the answer is wrong.
f) Negligence and slovenly work will be penalized.
g) Non programmable silent electronic calculators and K.N.E.C Mathematical tables are allowed for use.
h) This paper consists of **16** printed pages.
i) Candidates should check the question paper to ascertain that all the pages are printed as indicates and that no questions are missing.

FOR EXAMINER'S USE ONLY

SECTION I

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
MARKS																	

SECTION II

QUESTION	17	18	19	20	21	22	23	24	TOTAL
MARKS									

GRAND TOTAL

SECTION I (50 MARKS)
Answer ALL the questions in this Section in the spaces provided

1. Use logarithms to evaluate (4 marks)

$$\left(\frac{0.96}{8.764\times 0.0034}\right)^{-\frac{1}{4}}$$

2. Given that point A is (-8, -2) and B is (-4, 2), find the co-.ordinates of point C which divides AB in the ratio 7:-3. (3 marks)

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

$V = {}^{1}/_{3}\pi h\,(R^2 - r^2)$

4. M varies with . Find the percentage change in M when p increases by 32% and n decreases by 17%. (3 marks)

$\sqrt{\left(\frac{p}{n}\right)}$

5. A and B are grades of flour that cost Kshs 40 and Kshs 50 per kilogram respectively. In what ratio should the two grades be mixed in order to produce a mixture that costs sh 48 per kilogram? (3 marks)

6. Chords AB and TS of a circle intersect internally at point Q. Given that QA = 8cm, AB = 14cm and QT = 4cm, calculate the length of QS. (2 marks)

7. Find the term independent of y in the expression; (3 marks)

$$\left(3y+\frac{1}{2y^2}\right)^6$$

8. The circle given by the equation $x^2 + y^2 + 2x - 8y + p = 0$ passes through point (2, 4). Determine the value of p, hence find the equation of the tangent to the circle at point (-1, 1) (4 marks)

9. Without using mathematical tables or calculator, express in surd form and simplify. (3 marks)

$$\frac{1-Cos30°}{1+\frac{2}{\sin 45°}}$$

10. Find the equation of a curve which passes through the points (-3, 0) and (2, 0), in the form $y = ax^2 + bx + c$, where a, b and c are constants. (3 marks)

11. Find the area endorsed by the curve $y = x^2 - 10x + 9$, the x axis and the lines $x = 1$ and $x = 5$. (4 marks)

12. Without using mathematical tables or calculator evaluate;

$$\frac{3 \cos 50° - \sin 40°}{\cos 50°}$$ (2 marks)

13. Otieno deposits Ksh 2000 in a bank at the beginning of every year at 10% p.a compound interest for a period of 4 years. The accumulated amount is allowed to stay in the same bank for the next 3 years. Find the total amount at the end of the 7th year to the nearest shilling. (4 marks)

14. ABCD is a trapezium with co-ordinates A(2, 0), B(6, 0), C(6, 5) and D(2, 2). ABCD is mapped onto $A^1B^1C^1D^1$ by a positive quarter turn about the origin. $A^1B^1C^1D^1$ is transformed onto $A^{11}B^{11}C^{11}D^{11}$ by the matrix $\begin{pmatrix} -2 & -1 \\ 1 & -1 \end{pmatrix}$. Find the co-ordinates .of $A^{11}B^{11}C^{11}D^{11}$. (4 marks)

15. The sides of a triangle are measured and recorded as 10cm, 12cm and 20cm. Calculate the percentage error in its perimeter, correct to 2 decimal places. (3 marks)

16. VABCD is a right pyramid on a square base ABCD with sides 10cm. Each slant edge is 12cm long. Calculate, correct to 2 decimal places;

i) the angle between VC and ABCD. (2 marks)

ii) the angle between VDC and VAB. (2 marks)

SECTION II (50 MARKS)
Answer only FIVE questions from this section in the spaces provided

17. The data below shows the time (*in minutes*) taken by 160 girls to do an exam.

a) If the mean time was 65.5 minutes, calculate the values of p and q using a working mean of 74.5. (5 marks)

Time	Number of Girls
20 - 29	20
30 - 39	30
40 - 49	15
50 - 59	7
60 - 69	p
70 - 79	10
80 - 89	14
90 - 99	19
100 - 109	q

b) Calculate the standard deviation. (5 marks)

18. Two boys and three girls play a game of darts. Those of the same sex have equal probability of winning a game while each girl is thrice as likely to win as any boy. Let the probability that a boy wins a game be p.

a) Find the probability, in terms of p, that a girl wins a game. (2 marks)

b) Find p (2 marks)

c) If four games are played, one after another determine the .probability that;

i) girls lose exactly three games. (2 marks)

ii) girls lose at most three games (2 marks)

iii) boys win the first and the last game. (2 marks)

19. The figure below shows a triangle OPQ in which OP = **p** and OQ = **q**. M and N are points on OQ and OP respectively such that p divides ON in the ratio 4:-3 and 2OQ = 3OM.

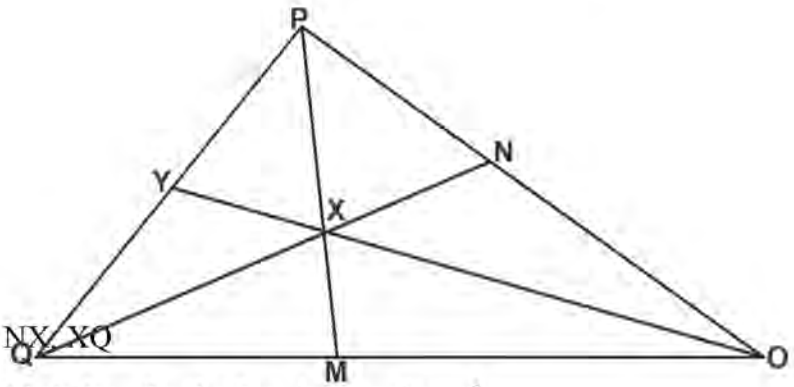
a) Express the following vectors in terms of p and q.

i) PM (1 mark)

ii) QN (1 mark)

iii) PQ (1 mark)

b) i) Lines PM and QN intersect at X such that PX = hPM and QX = kQN. Express OX in two different ways and hence find the values of h and k. (6 marks)



ii) Find the ratio NX : XQ (1 mark)

20. a) Complete the table below for the function $y = 4x - x^3$

(2 marks)

b) Use the completed table and the mid-ordinate rule with 4 strips to estimate the area bounded by the curve $y = 4x - x^3$, the axis and the lines $x = -2$ and $x = 2$. (2 marks)

c) Use the completed table and the trapezium rule with ordinates to estimate the area bounded by the curve $y = 4x - x^3$, the x-axis and the line $x = -2$ and $x = 2$. (3 marks)

d) By integrating the given function, find the exact area in part (b) above. (3 marks)

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y		-2.625				1.875			0

21. Two towns A(65°S, 35°E) and B(65°S, 145°W) are on the earth's surface. Two planes P and Q take off from A at the same time and at the same speed heading towards B. Plane P flies on the parallel of latitude while plane Q flies along the longitude. (*Take radius of earth = 6360km,* $\pi = {}^{22}/_{7}$)

a) Calculate the shortest distance between the two towns along the parallel of latitude. (3 marks)

b) Calculate the shortest distance between the two towns along the longitude. (3 marks)

c) Find the position of plane P when plane Q is landing at B. (4 marks)

22. The table below shows the corresponding values of x and y that are known to satisfy the relation $y = kx^n$

a) Draw a suitable straight line graph to represent this information. (6 marks)

b) Determine the values of k and n to 1 decimal place. (3 marks)

c) State the law relating y to x (2 marks)

x	1	2	3	4	5	6
y	3	12	27	48	75	108

23. A shopkeeper sees two types of exercise books in his shop. He keeps a maximum of 100 dozen exercise books which comprise of ruled and squared books. These must be more ruled exercise books than squared books and more than 45 dozens squared books.
Let the number of dozens of ruled books be x and squared one be y.

a) Write down in terms of x and y, all the three inequalities. (3 marks)

b) On the graph provided , draw the inequalities (4 marks)

c) If the shopkeeper makes a profit of 80cts on one ruled exercise book and 50cts on one squared exercise book.

i) Determine the number of dozen books he must keep to set maximum profit. (1 mark)

ii) Find the maximum profit. (2 marks)

24. a) Complete the table below for the equation $y = x^3 - 2x^2 - 4x + 7$ (2 marks)

b) Using the scale,
1cm to represent 1 unit on the x axis and 1cm to represent 5 units on the y axis draw the graph of $y = x^3 - 2x^2 - 4x + 7$. (3 marks)

c) Use your graph to estimate the roots of the equation; $x^3 - 2x^2 - 4x + 7 = 0$ (1 mark)

d) By drawing an appropriate straight line, use your graph to solve the equation;
i) $x^3 - 2x^2 - 4x + 2 = 0$ (1 mark)

ii) $x^3 - 2x^2 - 3x + 3 = 0$ (3 marks)

x	-3	-2	-1	0	1	2	3	4
y