Name…………………………………………Adm NO:……….. class. ……………

Index No………………………………..

121/2
MATHEMATICS
PAPER 2
March/April 2017
2 ½ HOURS

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

INSTRUCTIONS TO CANDIDATES

1. Write your name, school and Index Number in the spaces provided at the top of this page
2. The paper consists of two 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. Marks may be given for correct working even if the answer is wrong.
6. Negligence and slovenly work will be penalized
7. Non programmable silent electronic calculator and KNEC Mathematical tables may be used except where stated otherwise.

Section I   FOR EXAMINER'S USE ONLY

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

*This paper consists of 14 printed pages.*Candidates should check the question paper to ensure that all pages are printed as indicated*and no questions are missing*

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SECTION I (5O MARKS),

1. Make r the subject of the formula (3mks)

    $V = \sqrt[3]{\pi r^2 + hl}$

2. Using completing of the square method solve for X; (3mks)
    $$2x^2 - 7x = -5$$

3. Joe bought a cow for Ksh. 5,000. After two years, he sold it for ksh. 8,600. Calculate the annual rate of appreciation in the value of the cow. (3mks)

4. State the period, the amplitude and the phase angle of the function. (3mks)

    $Y = 5\cos(5x + 50)$

5. A book cost ksh.3,600 when bought in cash. A customer bought at hire purchase by making a down payment of ksh.1,000, then a ten monthly instalments of ksh.300 per month. Calculate the rate of interest per month. (3mks)

6. Using the line below, measure out Line AB of length 3cm, construct on one side of line AB the locus of a point P such that <APB=30^0. (3mks)

_____

7. Akinyi bought maize and beans from a wholesale. She then mixed the maize the maize and beans in the ratio 4:3. She bought the maize at ksh.21 per Kg and the beans at ksh.42 per Kg. if she was to make a profit of 30%, what should be the selling price of 1Kg of the Mixture. (3mks)

8. Expand and simplify the expression $(2+3x)^6$ to the power of X^2 hence use your expansion to solve $(1.91)^6$ to 1 decimal place (4mks)

9. The first, the third and the nineth terms of an increasing arithmetic progression are the three consecutive terms of the geometric progression. If the first term of the A.P is 3, determine the common difference and the common ratio of the GP. (3mks)

10. A quantity P varies partly as the square of Q and partly as the cube of Q. when Q=20, P=416 and when Q=40, P=3264. Find P when Q=10. (3mks)

11. In the circle below, draw tangents from the point P to the circle and measure the length of the tangent. (3mks)

12. Given that T $\begin{pmatrix} 2 & 1 \\ 5 & 3 \end{pmatrix}$ and A $\begin{pmatrix} 3 & -1 \\ -5 & 2 \end{pmatrix}$

    (a) Find the matrix TA.   (1mk)

    (b) Hence solve the simultaneous equation given below by matrix method   (2mks)

       $2y + x = 4$

       $5y + 3x = 11$

13. Solve for y in the following.   (3mks)

        $\log_3 y - 4 = \log_3 5$

14. Solve for X for the range of $0^0 \leq X \leq 360^0$ in   (4mks)

       $\cos(2x-5) = -0.6231$

15. Express in surd form and simplify the expression by rationalizing the denominator.

(3mks)

$$\frac{2}{1 - \cos 45°}$$

16. Find the percentage error in the calculation of the area of a plot whose measurement is given as

6.0 cm × 3.5 cm

(3mks)

Section II

17. Mr Onyango is an employeee and earns a basic salary of kshs.20,000. In addition he gets, medical allowances os ksh. 2,500, house allowance of ksh. 2,000 and a non-taxable risk allowance of ksh. 2,000. He is entitled to a personal relief of ksh.1,056 per month. His other deductions include Sacco loan of ksh. 10,000, water and electricity of ksh. 2,500. Using the table below , calculate

Income in kenya pounds per annum	Rate in shs/pound
1 – 5808	2
5809 - 11280	3
11281 - 16752	4
16753 - 22224	5
Over 22224	6

(a) Taxable income in Kenya pounds per annum.   (2mks)

(b) Calculate his P.A.Y.E in Kenya shillings.   (5mks)

(c) Calculate his net pay.   (3mks)

18. The probabilities that James, Shadrack and Olusala will be late for breakfast are $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$ respectively. Using a tree diagram, calculate the probability that on any morning;

(a) Draw the tree diagram. (2mks)

(b) None of them will be late. (2mks)

(c) Only one of them will be late. (2mks)

(d) At least one of them will be late. (2mks)

(e) Atmost one of them will be late. (2mks)

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19. The positions of two towns A and B on the earth's surface are (61^0N, 140^0E) and (61^0N, 39^0W) respectively. (Take $\pi = \frac{22}{7}$ and radius of the earth as 6370km).

(a) Find the difference in the Longitude between A and B, hence find the distance between two towns in nautical miles. (3mks)

(b) The position of another point C is (61^0N, 40^0W). Calculate the shortest distance between A and C. (3mks)

(c) Another point D is 430km east of town B and on the same latitude. Find the position of D. (4mks)

20. The figure below represents a prism with a cross section of an equilateral triangle of side 7cm and length 13cm, as shown below.
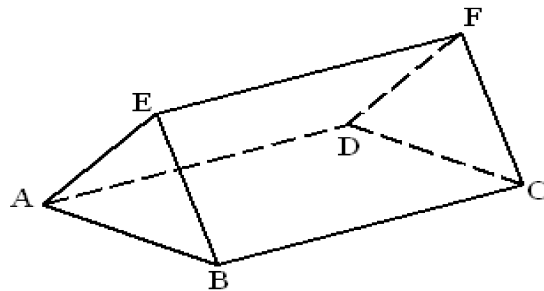
(a) Calculate the angle between line EB and the plane ABCD. (2mks)

(b) **Calculate** the angle between the plane ABCD and the line BF. (2mks)

(c) M is the midpoint of EF. **Calculate**

(i) The length BM (2mks)

(ii) The angle between the line BM and the plane ABCD. (2mks)

(d) **Calculate** the angle between the plane ABM and the base plane ABCD. (2mks)

21. The table below shows marks of 50 candidates in an exam.

Marks	F
21 – 30	5
31 – 40	7
41 – 50	9
51 – 60	11
61 – 70	8
71 – 80	5
81 – 90	5

Calculate

(a) The interquartile range.   (4mks)

(b) The standard deviation using an assumed mean of 55.5.   (6mks)

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22. A certain uniform supplier is required to supply two types of shirts: one for girls labelled G and the other for boys labelled B. The total number of shirts must not be more than 400. He has to supply more of type G than of type B. However the number of type G shirts must not be more than 300 and the number of type B shirts must not be less than 80. by taking x to be the number of type G shirts and y the number of type B shirts,

(a) **Write down** in terms of x and y all the inequalities representing the information above.   (2mks)

(b) On the grid provided in the next page **draw** the inequalities and shade the unwanted regions.
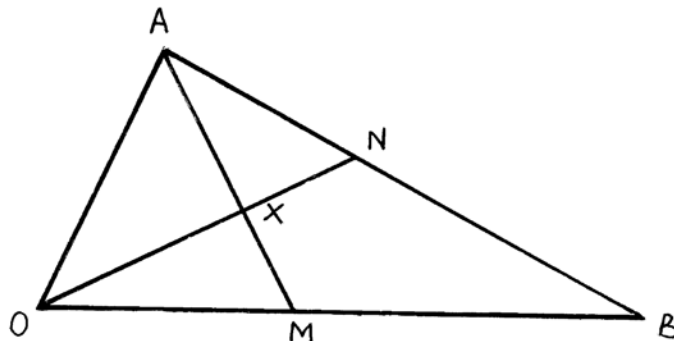
(4mks)

(c) Given that type G costs Shs. 500 per shirt and type B costs Shs. 300 per shirt. Use the graph in above to **determine** the number of shirts of each type that should be made to maximize profit.

(2mks)

(d) **Calculate** the maximum possible profit.   (2mks)

23. In the figure below M and N are points on OB and BA respectively such that OM:MB=2:3 and BN:NA=2:1. ON and AM intersect at x.

a) Given that $\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = **b** express ON, $\overrightarrow{AM}$ and $\overrightarrow{AB}$ in terms of **a** and **b**. (3mks)

(b) By taking OX=h $\overrightarrow{ON}$ and AX = k$\overrightarrow{AM}$, where h and k are scalars. Find two expressions for OX in terms of **a** and **b**. Hence determine the constants h and k and ratio in which x divides AM.

(7mks)

24.

(a) Complete the table for the function $y = -x + 4x^2 - 6 + x^3$. (2mks)

X	-5	-4	-3	-2	-1	0	1	2
Y	-26			4		-6		16

(b) Use the table values to draw the graph of $y = -x + 4x^2 - 6 + x^3$ on the grid below. (5mks)

(c) Use your graph to solve the following equations

(i) $X^3 + 4x^2 - x - 6 = 0$ (1mk)

(ii) $3x^3 + 12x^2 - 15x - 21 = 0$ (2mks)