NAME:……………………………………………….INDEX …………..…..DATE……….…

SCHOOL:……………………………………………SIGNATURE……………………………

121/2
MATHEMATICS
PAPER 2
JULY / AUGUST, 2010
2½ HOURS

JOINT INTER-SCHOOLS EVALUATION TEST (JISET)
Kenya Certificate of Secondary Education 2010

121/2
MATHEMATICS
PAPER 2
JULY / AUGUST 2010

INSTRUCTIONS TO CANDIDATES

1. *Write your name and index number in the spaces provided above..*
2. *This paper consists of two sections:* ***Section I and Section II.***
3. *Answer* ***all*** *questions in* ***section I*** *and* ***only five questions*** *from* ***Section II.***
4. *All answers and working* ***must*** *be done on the question paper in the spaces provided below each questions..*
5. *Marks may be given for correct working even if the answer is wrong.*
6. *Non- programmable silent electronic calculators* ***and KNEC*** *Mathematical tables may be used.*

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

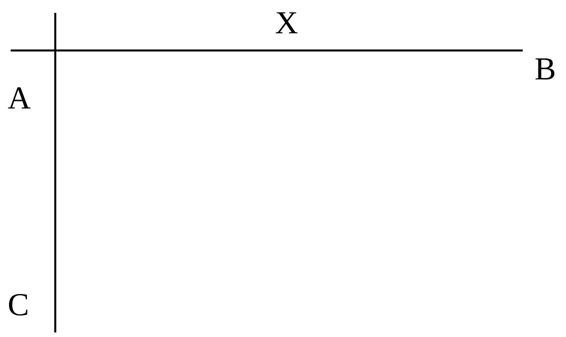
This paper consists of 16 pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

SECTION I (50 MARKS)

1. Given that $25x^2 - 20x + k$ is a perfect square. Find the value of k. (2 mks)

2. The six exterior angles of a hexagon form an arithmetic progression. if the smallest angle is 15^0, find the size of the biggest angle of the hexagon (3 mks)

3. If the equation $RV = 3.2 + \frac{1}{4}V$, where R and V are variables, is re-arranged in form $y = mx + c$, determine the gradient and the y-intercept of the line drawn. (3 mks)

4. 

On the diagram, construct a circle to touch line AB at X and passes through the point C. (3 mks)

5. Make U the subject of the formula (3 mks)

$$X = \frac{U^2V}{U^2 2W}$$

6. During inter-school competitions, rugby and football teams from Ranje sec school took part. The probability that the rugby would win their first match was ⅛ while that the handball team could lose was $4/7$. Find the probability that;

(a) Both teams won their first matches. (1 mk)

(b) At least one team won the first match (3 mks)

7. Solve the equation: (2 mks)

$$Sin\,{}^5\!/_2\,X = -{}^1\!/_2 \text{ for } 0^0 \le X \le 180^0$$

8. Given the column vectors $\mathbf{a} = \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 6 \\ -3 \\ 9 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -3 \\ 2 \\ 3 \end{pmatrix}$ and that $\mathbf{p} = 2\mathbf{a} - \frac{1}{3}\mathbf{b} + \mathbf{c}$

(i) Express **p** as a column vector (2 mks)

(ii) Determine the magnitude of **p** (1 mk)

9. a) Using binomial expansion, determine the first five terms of the expansion:

$\left(2 - \frac{1}{x}\right)^8$ (2 mks)

b) Use the expansion above to evaluate $(1.75)^8$ (2 mks)

10. A globe representing the earth has a radius of 0.2m. Points P (60^0N, 140^0E) and Q (60^0N, 120^0W) are marked on the globe. If O is the centre of the latitude 60^0N, find the area of the minor sector OPQ (3 mks)

11. Given that $A = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix}$ and $B = \begin{pmatrix} 11 & 3 \\ 4 & 1 \end{pmatrix}$ find C such that B × C = A (3 mks)

12. Wekesa deposited a certain amount of money in bank that paid compound interest at the rate of 20% P.A. Calculate to the nearest year the time he would have to wait for his investment to tripple. (3 mks)

13. A quantity P varies partly as t and partly as the square of t. When t = 20, P = 45 and when t = 24, P = 60. Find P when t = 32. (4 mks)

14. Naliaka bought maize and beans from a wholesaler. She mixed the maize and beans in the ratio 5:3. She had bought the maize at sh.30per kg and the beans at sh.60 per kg. If she was to make a profit of 30%, what should be the selling price of 1kg of the mixture? (3 mks)

15. The length and breadth o a rectangular room are 15cm and 12 cm respectively. If each of these measurements is liable to 1.5% error, calculate the absolute error in the perimeter of the room (3 mks)

16. The table below shows the number of defective bolts from a sample of 40

No of bolts	0	1	2	3	4	5
Frequency	20	8	6	4	1	1

Calculate the standard deviation of the data above (4 mks)

SECTION II (50 MARKS)

17. a) (i) On the grid provided, with the same scale on both axes, draw the square S whose vertices are (0, 0), (2, 0), (2,2) and (0, 2). (1 mk)

(ii) Find the coordinates and draw the image T of S under the transformation whose matrix A maps a point (x, y) onto (x', y')

where; $\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} 2x - y \\ x + 2y \end{pmatrix}$ (3 mks)

(iii) Draw the image U of S under the transformation whose matrix is

$B = \begin{pmatrix} 2 & 1 \\ -1 & 2 \end{pmatrix}$ (2 mks)

(b) (i) Find the product AB and draw the image V of S under the transformation whose matrix is AB (3 mks)

(ii) Describe the single transformation that maps S onto V (1 mk)

18. The table below shows the rate at which income tax is charged for all taxable income.

INCOME	RATE IN EXCH TWENTY SHILLINGS
On the first shs.116 160	10%
On the next shs.109 440	15%
On the next shs.109 440	20%
On the next shs.109 440	25%
On all income over shs.444 480	30%

Mr. Nyongesa earns a basic salary of sh.54, 450 per month. He is housed by the company and therefore 15% of his monthly salary is added to the basic salary as a taxable income. He is also given taxable medical and transport allowances of shs.4,000 and shs.2,000 per month respectively. He is entitled to a family relief of sh.1, 100 per month.

(a) Calculate Nyongesa's annual taxable income (3 mks)

(b) Calculate his monthly P.A.Y.E after the relief (5 mks)

(c) If 20% of his basic salary goes towards deductions, determine his monthly income. (2 mks)

19. Using ruler and pair of compasses only for constructions in this question.

(a) Construct triangle ABC such that AB=AC=5.4cm and angle ABC=30^0. Measure BC (4 mks)

(b) On the diagram above, a point P is always on the same side of BC as A. Draw the

locus of P such that angle BAC is twice angle BPC (2 mks)

(c) Drop a perpendicular from A to meet BC at D. Measure AD (2 mks)

(d) Determine the locus Q on the same side of BC as A such that the area of triangle

BQC = $9.4cm^2$ (2 mks)

20. The curve $y = 2x^2 - 6x + 9$ passes through the point P(2, 5)

(a) Determine the gradient function of the curve (1 mk)

(b) Determine the coordinates and nature of the turning point of the curve (5 mks)

(c) Find the equation in the form $y = mx + c$ of the

(i) Tangent to the curve at P (2 mks)

(ii) Normal to the curve at P (2 mks)

21. (a) Complete the table below, leaving all your values correct to 2 d.p. for the functions y = cos x and y = $2\cos(x + 30)^0$ (2 mks)

X^0	0^0	60^0	120^0	180^0	240^0	300^0	360^0	420^0	480^0	540^0
cosX	1.00			-1.00		0.50				
2cos(x+30)	1.73		-1.73		0.00					

(b) For the function y = $2\cos(x+30)^0$

State:

(i) The period (1 mk)

(ii) Phase angle (1 mk)

(c) On the same axes draw the waves of the functions y = cos x and y = $2\cos(x+30)^0$ for $0^0 \le x \le 540^0$. Use the scale 1cm rep 30^0 horizontally and 2 cm rep 1 unit vertically (4 mks)

(d) Use your graph above to solve the inequality $2\cos(x + 30^0) \le \cos x$ (2 mks)

22. An aircraft flies from a point A ($1^0 15'$S, 37^0E) to a point B directly North of A. The arc AB subtends an angle of 489^0 at the centre of the earth. From B the aero plane flies due west to a point C on longitude 23^0W. Take radius of the earth as 6370km.

(a) (i) State the location of B (2 mks)

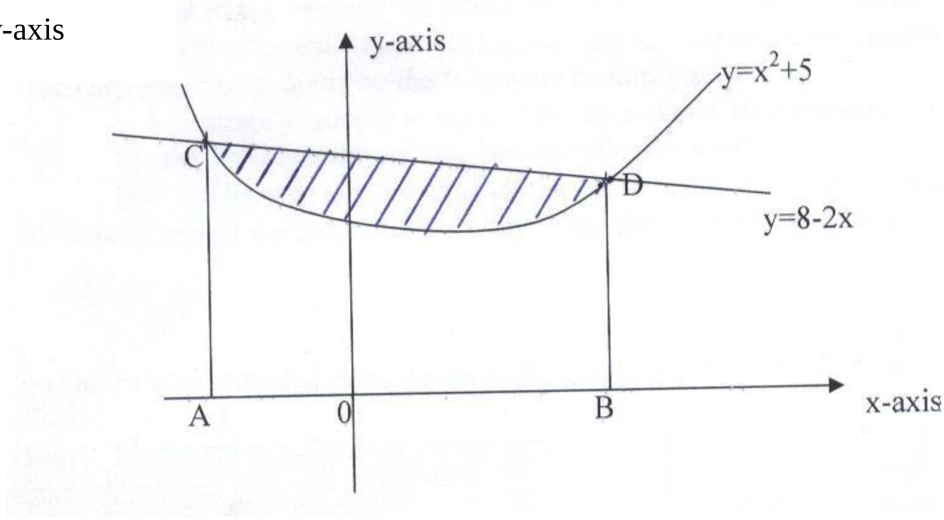
(ii) Find the distance in km traveled by the aero plane between B and C (3 mks)

(b) (i) The aeroplane left B at 1.00am local time. What was the local tie at C? (2 mks)

(ii) If it maintained an average speed of 840km/h between B and C, at what local time did it arrive at C? (3 mks)

23. The diagram below, not drawn to scale shows part of the curve $y = x^2+5$ and the line $y = 8-2x$. The line intersects the curve at points C and D. Lines AC and BD are parallel to the y-axis.

the y-axis



a) Determine the coordinates of C and D (4 mks)

b) Use integration to calculate the area bounded by the curve and the x- axis between the points C and D (3 mks)

c) Calculate the area enclosed by the lines CD, CA, BD and the x-axis (2 mks)

d) Hence determine the area of the shaded region (1 mk)

24. A carpenter makes two kinds of tables, hexagonal and rectangular. To make each hexagonal table requires 6 man-hours whereas rectangular ones require 3 man – hours each. The cost of the material for hexagonal table is sh.120 and shs.100 for the rectangular one. The profit obtained from a hexagonal table is sh.80 and a rectangular table is sh.60. The carpenter has to abide by the following conditions:

(i) A contract to supply at least 15 hexagonal and 10 rectangular tables per week.

(ii) Only 240 man-hours may be available in a week

(iii) His total weekly expenditure of all tables must not exceed shs.6,000

a) Write down all the inequalities to satisfy the three conditions above (3 mks)

(b) On the grid provided draw the inequalities in (a) above and shade the unwanted region. (4 mks)

c) Using a search line, determine:

(i) The number of hexagonal and rectangular tables to be made to maximize profit (2 mks)

(ii) The maximum profit acquired from selling the tables (1 mk)