Name………………………………………………. Adm No…………………………..

Class……………………………….

121/1
Mathematics
Paper 1
2 ½ Hours
MAY/JUNE 2014

CROSS COUNTRY EXAM 2014
Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- Write your name and Admission number in the spaces provided at the top of this page.
- This paper consists of two sections: Section I and Section II.
- Answer ALL questions in section 1 and ONLY FIVE questions from section II
- All answers and workings must be written on the question paper in the spaces provided below each question.
- Show all the steps in your calculation, giving your answer at each stage in the spaces below each question.
- Non – Programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.

FOR EXAMINERS 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 Questions in this Section

1. Evaluate the following;   (**3 marks**)

$$\dfrac{\dfrac{2}{3} - 1\dfrac{1}{4} + \dfrac{5}{6}}{\dfrac{2}{7} + 3\dfrac{1}{5}\ of\ \dfrac{7}{8} \div \dfrac{6}{11} - \left[5\dfrac{1}{3} + \dfrac{9}{10}\right]}$$

2. Use square roots, reciprocal and square tables to evaluate to 4 significant figures the expression;   (**4 marks**)

$$(0.06458)^{\frac{1}{2}} + \left(\dfrac{2}{0.4327}\right)^{2}$$

3. Solve for x in the equation $\dfrac{1}{2}\log_{2} 81 + \log_{2}(x^{2} - \dfrac{x}{3}) = 1$ (**3mks**)

4. The points A, B and C lie on a straight line. The position vectors of A and C are
2**i** + 3**j** + 9**k** and 5**i** – 3**j** + 4**k** respectively; B divides AC internally in the ration 2:1. Find the

(a) Position vector of B. **(2 marks)**

(b) Distance of B from the origin. **(1 mark)**

5. Without using tables, evaluate $\dfrac{0.51 \times 5700}{6.8 \times 0.0095}$ giving the answer in standard form

(3 marks)

6. Evaluate $\int_{-1}^{2}(x^2+1)dx$ **(3 marks)**

3

7. Simplify $\dfrac{p^2 - 2pq + q^2}{p^3 - pq^2 + p^2q - q^3}$ **(3 marks)**

8. What is the equation of the circle whose center lies on the line y - 2y + 2 = 0 and which touches the positive axes?   **(3 Marks)**

9. Find the value of x in the equation $\cos(3x - 180^o) = \dfrac{\sqrt{3}}{2}$ in the range listed below.

     0° x 180° **(3mks)**

10. A farmer has a piece of land measuring 840m by 396m. He divides it into square   plots
of equal size. Find the maximum area of one plot.   **(3 marks)**

11. Give the equation of the normal to the curve $y = x^3 + 2x + 1$ at (1, 4)   **(3 marks)**

12. The position of two towns P and Q are given as P(45^oN, 10^oW) and Q(45^oN,170^oE).Calculate
the difference in distance (i) Through the North Pole and (ii) along the parallel of latitude in
nautical miles.   **(3 marks)**

13. A liquid spray of mass 384g is packed in a cylindrical container of internal radius 3.2 cm. Given that the density of the liquid is 0.6g/cm^3, calculate to 2dp the height of the liquid in the container. **(3 marks)**

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

(b) Hence solve the simultaneous equation using the matrix method **(2 marks)**

$4x + 3y = 6$

$3x + 5y = 5$

15. Find the percentage error in the total length of four rods measuring 12.5cm, 24.5cm, 12.9cm and 10.1cm all to the nearest 0.1cm. **(3 marks)**

16. The following data was obtained from the mass of a certain animal. Complete the table and the histogram below. **(3 marks)**

Mass(kg)	frequency
41-50	20
51-55	
56-65	40

class limits
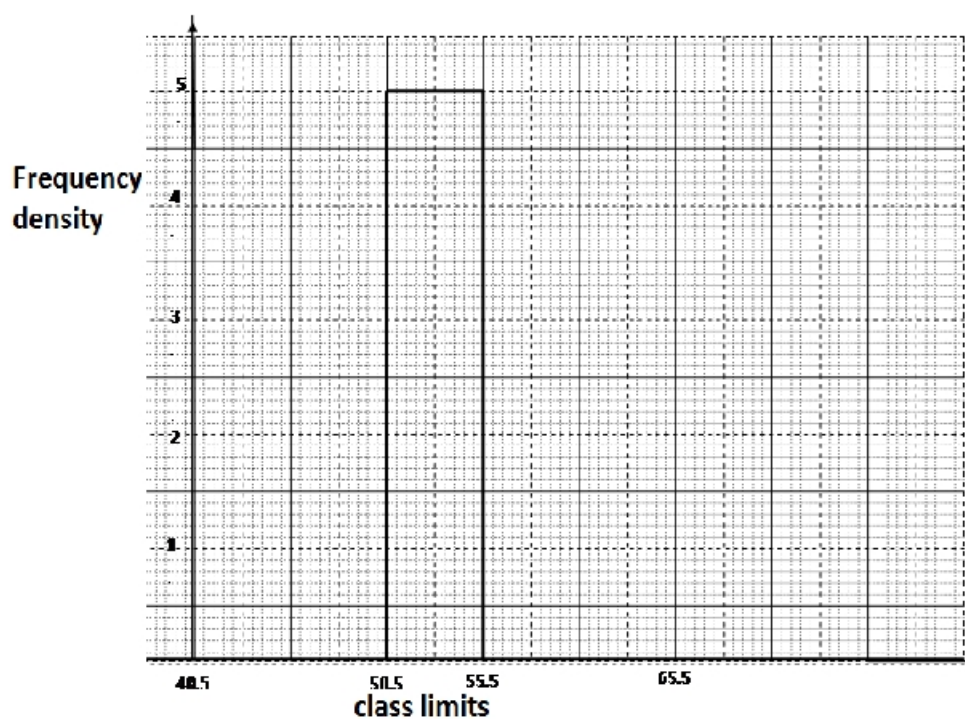
SECTION II (50 MARKS)

Answer any Five Questions in this Section

17. A businessman obtained a loan of Kshs.450,000 from a bank to buy a matatu valued at the same amount. The bank charges interest at 24% per annum compound quarterly:

    (a) Calculate the total amount of money the businessman paid to clear the loan in 1½ years.
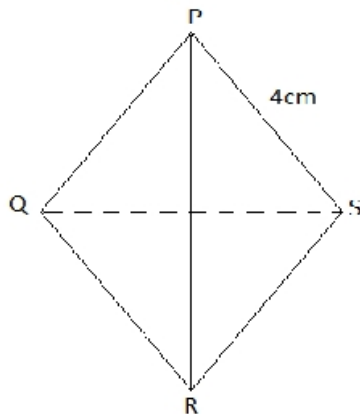
    (4 marks)

    (b) The average income realized from the matatu per day was Kshs.1500. The matatu worked for 3 years at an average of 280 days per year. Calculate the total income from the matatu. **(2 marks)**

    (c) During the three years, the value of the matatu depreciated at the rate of 16% per annum. If the businessman sold the matatu at its new value, calculate the total profit he realized by the end of three years. **(4 marks)**

18. PQRS is a regular tetrahedron of side 4cm.

a) Calculate the angle between planes PSR and QRS (**4 marks**)

b) Calculate the volume of the Tetrahedron (**6 marks**)

19. (a) The first term of an Arithmetic Progression(AP) is 2. The sum of the first 8 terms of the

AP is 156.

(i) Find the common difference of the AP. **(2 marks)**

(ii) Given that the sum of the first n terms of the AP is 416, find n. **(2 marks)**

(b) The third, fifth and eighth terms of another AP form the first three consecutive terms of a

Geometric Progression (GP). If the common difference of the AP is 3, find

(i) The first term of the GP; **(4 marks)**

(ii) The sum of the first 9 terms of the GP, to 4 significant figures. **(2 marks)**

20. Using a ruler and compasses only, construct a triangle ABC such that BC = 8cm, angle ABC = 60^0 and angle BAC = 45^0.

    (a) On the same diagram, measure the length of :   **(5 marks)**

          (i)   AC

          (ii)   BC

    (b) Draw the circumcircle of the triangle ABC.   **(2 marks)**

    (c) Construct the locus of a point P within the triangle by shading the unwanted region inside the circumcircle such that the following conditions are satisfied:

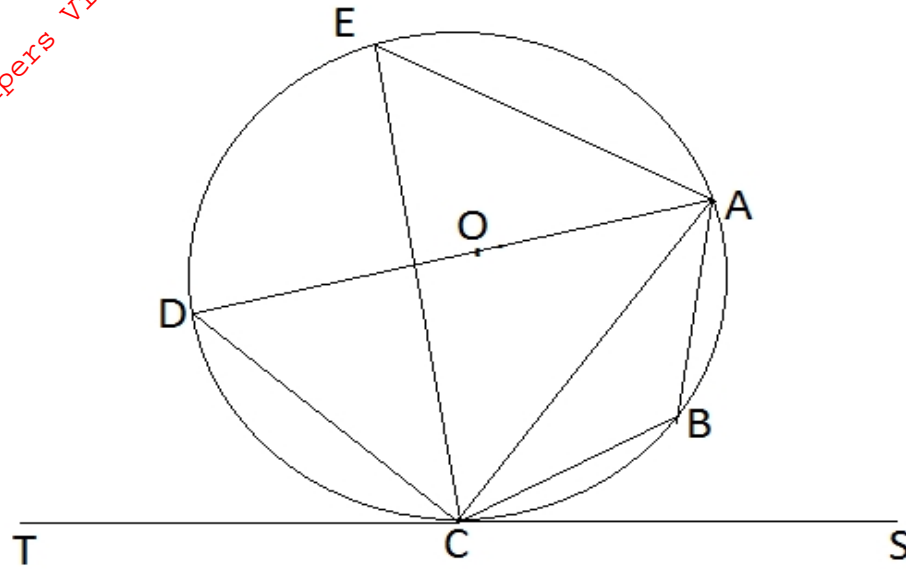   **(3 marks)**

          (i)   P is closer to A than B.

          (ii)   Angle PAB $\angle$ angle PAC.

21. (i) By calculations show that $y = x^3 - 3x^2 + 2x$ and $y + 3 = 3x$ intersect at x = -1, 1 and 3

(3 marks)

(i) Sketch the curve and the line on the same axis, hence calculate the area enclosed by the curve, lines $x = 0$ and $y + 3 = 3x$ **(7 marks)**

22. In the figure below DA is a diameter of the circle ABCDE centre O. TCS is a tangent to the circle at C, AB = BC and angle DAC = 38^0

Giving reasons, determine the following angles:

(a) $\angle DCT$ **(2 marks)**

(b) $\angle DEA$ **(2 marks)**

(c) $\angle ACB$ **(2 marks)**

(d) $\angle BDC$ **(2 marks)**

(e) $\angle BOA$ **(2 marks)**

23. The coordinates of a triangle ABC are   A(1, 1)   B(3, 1)   and   C (1, 3).

   (a) Plot the triangle ABC.   **(1 mark)**

   (b) Triangle ABC undergoes a translation vector $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$.   Obtain the image of A' B'

      C ' under the transformation, write the coordinates of A' B' C'.   **(2 marks)**

   (c) A' B' C' undergoes a reflection along the line X = 0, obtain the coordinates and

      plot on the graph points A" B" C", under the transformation   **(2 marks)**

   (d) The triangle A" B" C" , undergoes an enlargement scale factor -1, centre

      origin.   Obtain the coordinates of the image A"' B"' C"'.   **(2 marks)**

   (e) The triangle A"' B"' C"' undergoes a rotation centre (1, -2) angle 120^{0}. Obtain

      the coordinates of the image A^{iv} B^{iv} C^{iv}.   **(2 marks)**

   (f) Which triangles are directly congruent.   **(1 mark)**

24. A matatu and Nissan left town A for town B 240km away at 8.00a.m travelling at 90km/hr and 120km/hr respectively. After 20 minutes the Nissan had a puncture which took 30 minutes to mend.

a) How far from town A did the Nissan catch up with the matatu?   **(6 marks)**

b) At what time did the Nissan catch up with the matatu?   **(1 mark)**

c) At what time did the matatu reach town B?   **(3 marks)**