Name: _____ **Adm No.**_____

Class:_____

Date: _____

121/2
MATHEMATICS
Paper 2
MAY/JUNE 2014
Time: 2½hours

CROSS COUNTRY EXAM 2014
Kenya Certificate of Secondary Education
121/2 Paper 2
MATHEMATICS
2½ hours

Instructions to Candidates

1. *Write your name, admission number and class at the top of this paper.*
2. *The paper contains **2** sections; Section **A** and Section **B**.*
3. *Answer **ALL** the questions in section A and only five in section B in the spaces provided.*
4. *Non-Programmable silent electronic calculators and KNEC mathematical tables may be used where necessary.*

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

SECTION 1(50 MARKS)

Answer all questions from this section

1. Use logarithms to evaluate correct to 4 s.f (4 marks)

$$\left(\frac{54.5221-0.3521}{Tan\,24.8\times\cos 78}\right)^{\frac{1}{2}}$$

2. Solve for x and y (3 marks)

$3^{2x-y} = 27$

$4^{x} \div 16^{y} = 1$

3. A line L_1 passes through point B and is parallel to the line $2y = 5x - 16$. M is the mid-point of line AB. Given the coordinates of A and M are (2, 3) and (4, 2) respectively, find the equation of line L_1 in the form $y = mx + c$. (3 marks)

4. Two similar containers have masses 256kg and 108 kg respectively. If the surface of the smaller container has an area of $810cm^2$, what is the area of the corresponding surface of the larger container? (3 marks)

5. From the information below, calculate the standard deviation of the data given. (4 marks)

   8, 12, 4, 1, 6, 5

6. A man spent $\frac{1}{9}$ of his salary on food and $\frac{1}{4}$ of the remainder on electricity and water bills. He paid fees with 20% of his salary and invested 16% of what was left on business. After taking a game drive on which he spent ksh 2000, he saved ksh 5350. Calculate his total monthly earnings. (4 marks)

7. The cash price of a fridge is ksh 30,000. Anne bought the fridge on hire purchase by paying a deposit of ksh. 7,500 and 14 monthly installments of ksh.1875 each. Calculate the monthly rate of interest she was charged. Give your answer to 2 decimal places. (4 marks)

8. Express the following in surd form and simplify by rationalizing the denominator.
(3 marks)

$$\frac{1}{1-\sin 45^{0}}$$

9. Mr. Omondi bought peas at ksh. 50 per kg and beans at ksh. 60 per kg. In what ratio must he mix the two so that a profit of 20% is realized by selling the mixture at ksh.36 per kg?
(3 marks)

10. Find the value of x in; (2 marks)
Cos (3x – 30) = Sin (7x + 50)

11. Simplify the following expression (3 marks)

$$\left(2x+\frac{1}{x}\right)^4+\left(2x-\frac{1}{x}\right)^4$$

12. The shape below is part of a symmetrical figure about O. The order of rotational symmetry is 3. Complete the figure. (2 marks)

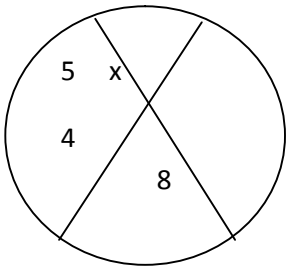
13. Solve the simultaneous inequalities and state the integral values. (3mks)

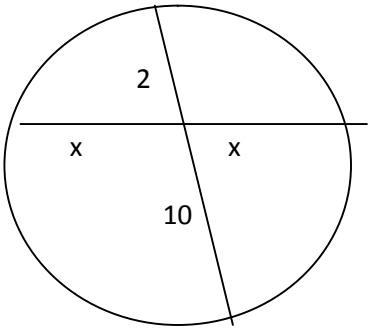
$4x - 3 \leq 6 + x$

$-8 - 3x < x + 4$

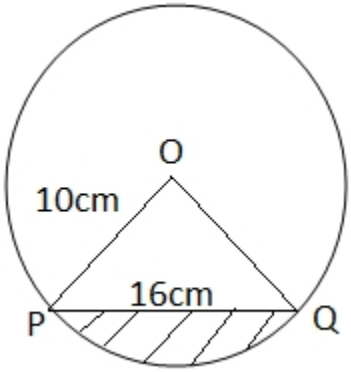
14. The distance s meters of an object varies partly with time t seconds and partly with square root of time. Given that s = 16 when t = 4 and s = 48 when t = 16. Write an equation connecting s and t. (3 marks)

15. Show that for the sum of the values of x in the diagrams below is : $10 \pm 2\sqrt{5}$ (3 marks)





16. The figure below shows a circle center O, radius 10 cm. The chord PQ = 16cm. Calculate the area of the unshaded region. (3mks)



SECTION II (50 MARKS)

Answer only five questions from this section

17. The velocity of a particle after t seconds is given by $V = 20t - 2t^2$. If the particle starts from rest at point O and moves along a straight line; it comes momentarily to rest at point P and starts moving again back towards O. Determine:

    (a) The time when the particle reaches O while on its way back from P. (5 marks)

    (b) The expression for its acceleration a. (1 mark)

    (c) The distance from O to P. (4 marks)

18. The table below shows the marks scored by forty form 4 students in a mathematics test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	2	4	5	7	10	6	3	2	1

(a) (i) Calculate the Mean (3 marks)

(b) The lower quartile (2 marks)

(c) On the grid provided, draw the cumulative frequency curve to represent the above distribution. (3 marks)

(d) From the graph estimate the

(i) 4^{th} decile (1 mark)

(ii) Range of marks of the middle 70% of the students. (1 mark)

19. The probability that a school team will win a match is 0.6. The probability that the team will loose the match is 0.3 and the probability that the team will draw in the match is 0.1. Given that the team will play two matches.
(a) Draw a tree diagram to represent the above information. (2 marks)

(a) What is the probability that the team will
(i) Win the two matches (2 marks)

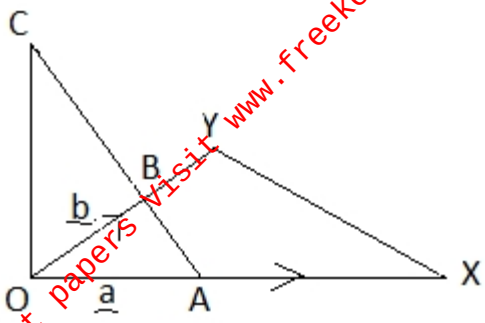
(ii) Either wins all the matches or losses all the matches? (2 marks)

(iii) Wins one match and losses one (2 marks)

(iv) Tie in one match. (2 marks)

20. A radio dealer planned to buy some radios from a wholesaler for sh. 340,000. Before he could buy them the prices of each radio was increased by sh. 300. He now discovers that he can only afford to buy 30 radios less than he had planned to buy with the same amount of money. Determine the number of radios he had originally planned to buy and the new price of each radio. (10 marks)

21. In the figure below **OY** = 2**OB**, **OX** = $^5/_2$ **OA**, **OA** = **a** and **OB** = **b**



(a) Express the following in terms of **a** and **b** (1 mark)

(i) AB

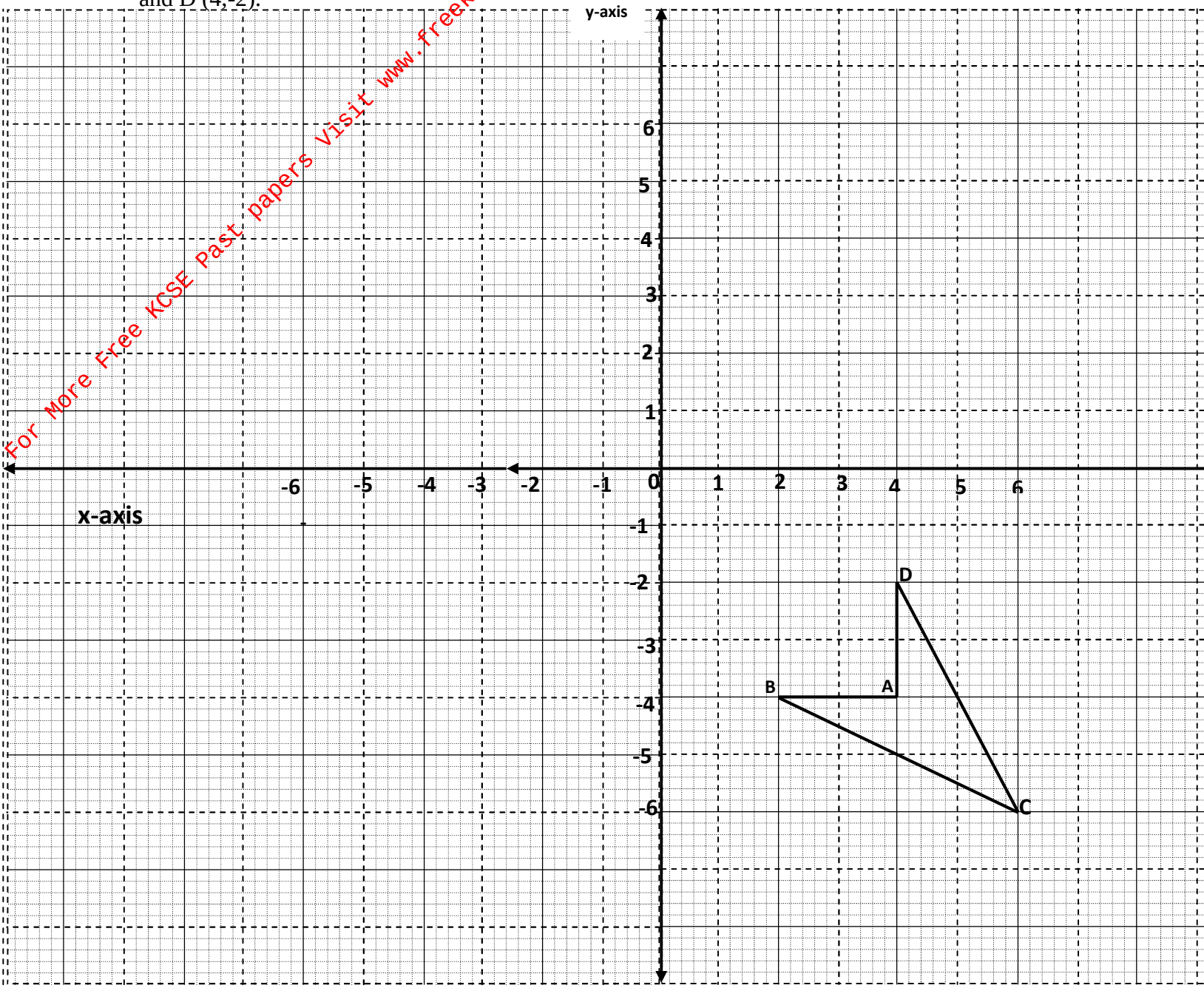
(ii) **XY** (1 mark)

b) Given that **AC** = 6 **AB** , express **OC** & **XC** in terms of **a** and **b** (4 marks)

c) Show that points X, Y and C are collinear (2 marks)

d) State the ratio in which C divides XY (2 marks)

22. The figure below shows a quadrilateral ABCD whose vertices area A (4, -4),B (2,-4),C (6,-6) and D (4,-2).



(a) $A'B'C'D'$ is the image of $ABCD$ under a positive quarter turn about the origin. On the same grid draw the image $A''B''C''D''$. (3 marks)

(b) $A''B''C''D''$ is the image of $A'B'C'D'$ under a reflection along the line $y + x = 0$. On the same grid draw the image $A''B''C''D''$. (3 marks)

(c) Point $A''(-4,-4)$ is mapped onto $A'''(-4,4)$ by a shear y axis invariant.

(i) Determine the shear matrix (2 marks)

(ii) On the same grid show image $A'''B'''C'''D'''$. (2 marks)

23. A farmer has at least 50 acres of land on which he plans to plant potatoes and cabbages. Each acre of potatoes requires 6 men and each acre of cabbages requires 2 men. The farmer has 240 men available and he must plant at least 10 acres of potatoes. The profit on potatoes is ksh. 1000 per acre and on cabbages is ksh.1200 per acre. If he plants x acres of potatoes and y acres of cabbages.

(a) Write down three inequalities in x and y to describe this information. (3 marks)

(b) Represent these inequalities graphically. (4 marks)

(c) Use your graph to determine the number of acres for each crop which will give maximum profit and hence find the maximum profit. (3 marks)

24. (a) A, B and C are points on a horizontal level ground. An electricity pole, 12m high, stands at a point A. The bearing of B from A is 050^{o}, and the bearing of C from B is 096^{0}. If AB=23m and BC = 14m, calculate

(i) The distance AC (2 marks)

(ii) The angle of elevation of the top of the pole from C. (2 marks)

(b) In a triangle PQR, PQ = 8km angle RPQ = 55^{o} and angle PQR = 73^{o}. A point T lies within the triangle such that it is equidistant from P, Q, and R, calculate

(i) The length PR (2 marks)

(ii) The length PT (2 marks)

(iii) The size of angle PTR. Give a reason for your answer. (2 marks)