Name _____ Index No. _____

Candidate's signature _____

Date _____

121/2
MATHEMATICS
PAPER II
JULY/AUGUST 2014
2 ½ HOURS

MBOONI WEST SUB - COUNTY FORM FOUR JOINT EXAMINATION 2014

Kenya Certificate of Secondary Education

MATHEMATICS
PAPER II
JULY/AUGUST 2014
2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

1. Write your name, index number and class.
2. The paper contains two sections: Section I and II
3. Answer ALL questions in section I and ANY FIVE questions from section II.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.
8. This paper consists16 of printed pages. Candidates should check the question paper to ensure that all the pages are printed indicated and no questions are missing.

FOR EXAMINER'S USE ONLY

SECTION 1

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

1. Use logarithms to evaluate (4 Marks)

$$\sqrt[3]{\left(\frac{1.23\ x\ 0.0468}{Log_6}\right)}$$

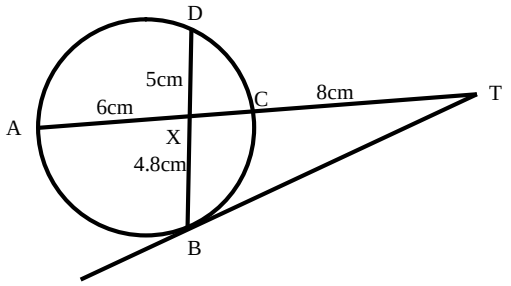
2. Express in surd form. $\frac{1}{2+Sin\ 45^0}$ (3 Marks)
hence rationalize the denominator

3. A car is driven a distance of 30 km measured to the nearest Km in 20 min measured to the nearest min. Between what limit will the average speed be? (3 Marks)

4. Make r the subject of the formula. (3 Marks)

$S = \sqrt{\frac{r^2 + 2xb}{n}}$

5. In the diagram below, BT is a tangent to the circle at B. AXCT and BXD are straight lines. AX = 6cm, CT = 8cm, BX = 4.8cm and XD = 5cm.



Find the length of BT. (2 Marks)

6. Given that X:Y = 1:2 and Z:Y = 2:3, Find the value of (3 Marks)

$\frac{x + y}{2z + 5x}$

7. (a) Expand $(1 - 2x)^6$ in ascending powers of x up to the term in x^3. (2 Marks)

   (b) Hence evaluate $(1.02)^6$ to 4 d.p. (2 Marks)

8. Find the inverse of the matrix $\begin{pmatrix} 3 & 2 \\ 5 & 4 \end{pmatrix}$ (4 Marks)

   Hence or otherwise solve the simultaneous equations

   $3x + 2y = 4$

   $5x + 4y = 9$

9. A merchant blends 350kg of tea costing Sh. 84 kg with 140kg of tea costing Sh. 105 per kg. At what price must he sell the mixture to gain 25% (3 Marks)

10. The life expectancy in hours of 106 bulbs are shown in the table below.

Expectancy (hrs)	90– 94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	130-134	135-139
Frequency (f)	5	14	16	17	24	12	11	4	2	1

Calculate the quantile deviation of the life expectancy (4 Marks)

11. The equation of a circle is given as $3x^2 + 3y^2 - 12x + 18y + 8 = 0$. Find the centre and radius of this circle. (4 Marks)

12. Quantity Q partly varies as quantity R and partly varies inversely as the square of R. Given that Q = 3 when R = 1 and Q = 5 when R = $\frac{1}{2}$

(i) Find the equation connecting Q and R (3 Marks)

(ii) Find the value of Q when R = $\frac{3}{2}$ (1 Mark)

13. Find the integral values of x for which; $5 \leq 3x + 2$ and $3x - 14 < -2$ (3 Marks)

14. Three soldiers Mutiso, Nzangi and Kisilu went for a shooting practice. The probability of Mutiso, Nzangi and Kisilu hitting the target are $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{2}$ respectively. The three gentlement hit the target only once, one after the other. What is the probability that the target was hit atleast once? (2 Marks)

15. Solve for x in the equation. (3 Marks)

$\text{Log}_8 (x + 6) - \text{Log}_8 (x - 3) = \frac{2}{3}$

16. Given that $\underset{\sim}{OA} = \underset{\sim}{i} + 2\underset{\sim}{j} - 3\underset{\sim}{k}$ and $\underset{\sim}{OB} = 2\underset{\sim}{i} - \underset{\sim}{j} - 2\underset{\sim}{k}$

Find $|\underset{\sim}{AB}|$ (2 Marks)

SECTION II – 50 MARKS

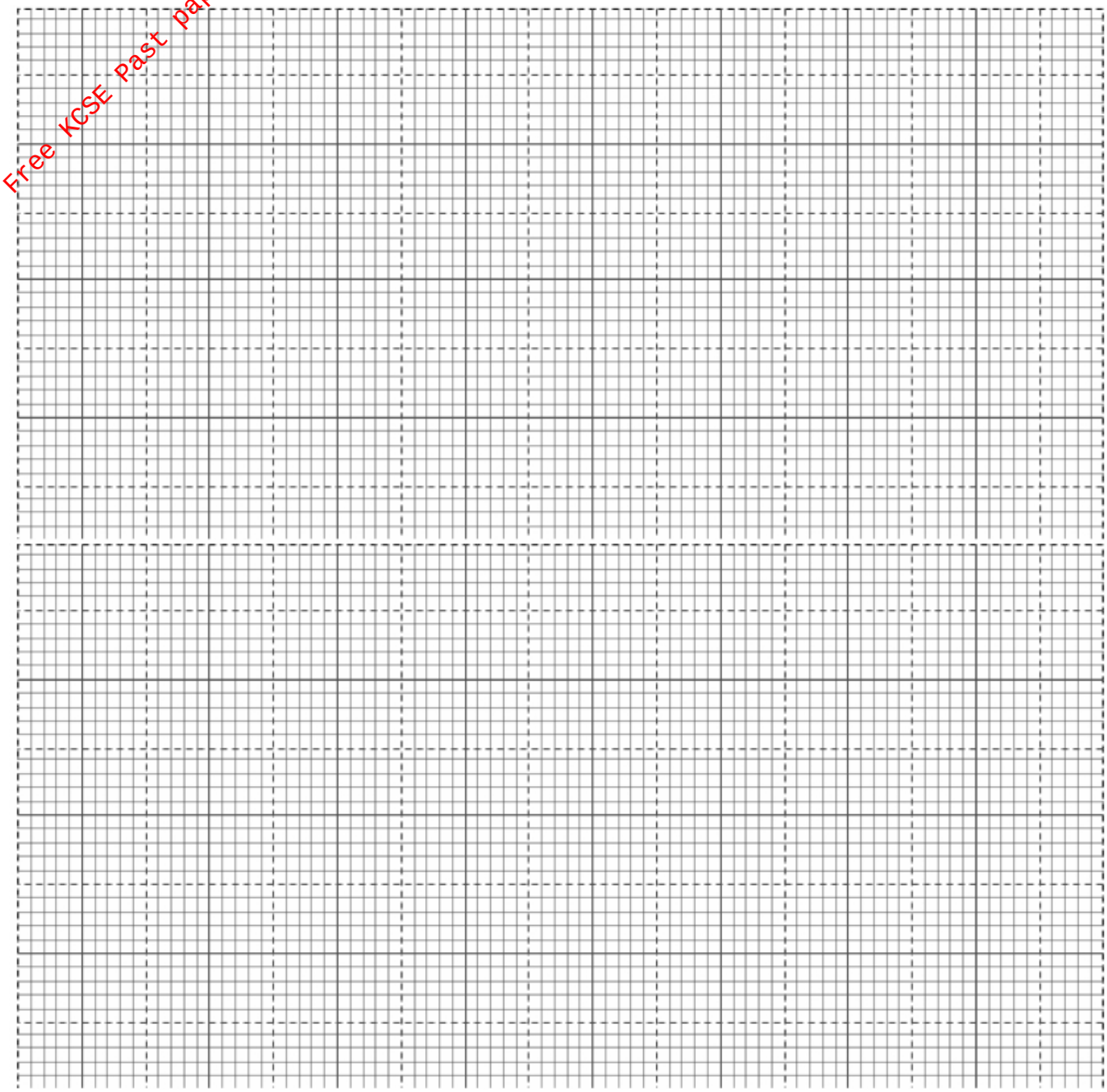
Answer only five questions from this section

17. (a) Complete the table given below by filling the blank spaces.

X	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
4 Cos 2x	4.00		2.00	0	-2.00	-3.46	-4.00	-3.46	-4.00	-3.46	-2.00		4.00
2 Sin (2x + 30)	1.00	1.73	2.00	1.73		0	-1.00	-1.73	-2.00	-1.73		0	1.00

(2 Marks)

(b) On the grid provided draw the graph of y = 4 Cos 2x and y = 2 Sin $(2x + 30^0)$ for $0^0 \leq x\ 180^0$. Take the scale 1cm for 15^0 on the x – axis and 2cm for 1 unit on the y-axis. (5 Marks)



(c) (i) State the amplitude of y = 4 Cos 2x (1 Mark)

(ii) Find the period of y = 2 Sin $(2x + 30)^0$ (1 Mark)

(d) Use your graph to solve 4 Cos 2x – 2Sin (2x + 30) = 0 (1 Mark)

18. A red and black dice are rolled and the events X, Y and Z are defined as follows.

X = The red die shows a 4

Y – The sum of the scores of the two dice is 6

Z – The black die shows a 3

(a) Find the probability of event X (2 Marks)

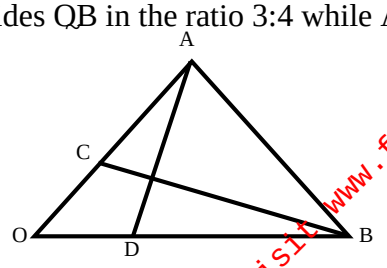
(b) The probability of events X and Z (3 Marks)

(c) Which event is mutually exclusive to X (1 Mark)

(d) Which event is indepedent of X (2 Marks)

(e) The probability of event Y (2 Marks)

19. The diagram given below show triangle OAB. $\underset{\sim}{OA} = \underset{\sim}{a}$, $\underset{\sim}{OB} = \underset{\sim}{b}$. C divides $\underset{\sim}{OA}$ in the ratio 2:3 and D divides $\underset{\sim}{OB}$ in the ratio 3:4 while AD and BC meet at E.



Find interm of $\underset{\sim}{a}$ and $\underset{\sim}{b}$

(a) (i) $\underset{\sim}{OC}$ (2 Marks)

(ii) $\underset{\sim}{CB}$ (4 Marks)

(b) Given that $\underset{\sim}{CE} = m\underset{\sim}{CB}$ and $\underset{\sim}{DE} = n\underset{\sim}{DA}$ where m and n are scalars

(i) Write down two distinct expressions for $\underset{\sim}{OE}$ (2 Marks)

(ii) Hence find the values of m and n (4 Marks)

(iii) Find $\underset{\sim}{OE}$ interms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ only (1 Mark)

20. (a) Using a ruler and pair of compasses only, construct triangle ABC in which AB = 9cm, BC = 8.5cm and angle BAC = 60^0 (3 Marks)

(b) One the same side of AB as C:

(i) Determine the locus of a point P such that $\angle APB = 60^0$ (3 Marks)

(ii) Construct the locus of R such that AR >B 4cm (2 Marks)

(iii) Determine the region T such that $\angle ACT \geq \angle BCT$ (2 Marks)

21. An arithmetic progression has the first term a and the common difference d.

(a) Write down the third, ninth and twenty – fifth terms of the progression. (3 Marks)

(b) The progression is increasing and the third, ninth and twenty-fifth terms form the first three consecutive terms of a geometric progression. If the sum of the seventh term and twice the sixth term of the arithmetic progression is 78.

Calculate

(i) The first term and the common difference (5 Marks)

(ii) The sum of the first nine terms of the arithmetic progression (2 Marks)

22. An aircraft leaves A (60^0N, 13^0W) at 1300 hours and arrives at B (60^0N, 47^0E) at 1700 hrs

(a) Calculate the average speed of the aircraft in knots (3 Marks)

(b) Town C (60^0N, 133^0N) has a helipad. Two helicopters S and T leaves B at the same time. S moves due West to C while T moves due North to C. If the two helicopters are moving at 600 knots. Find

(i) The time taken by S to reach C (2 Marks)

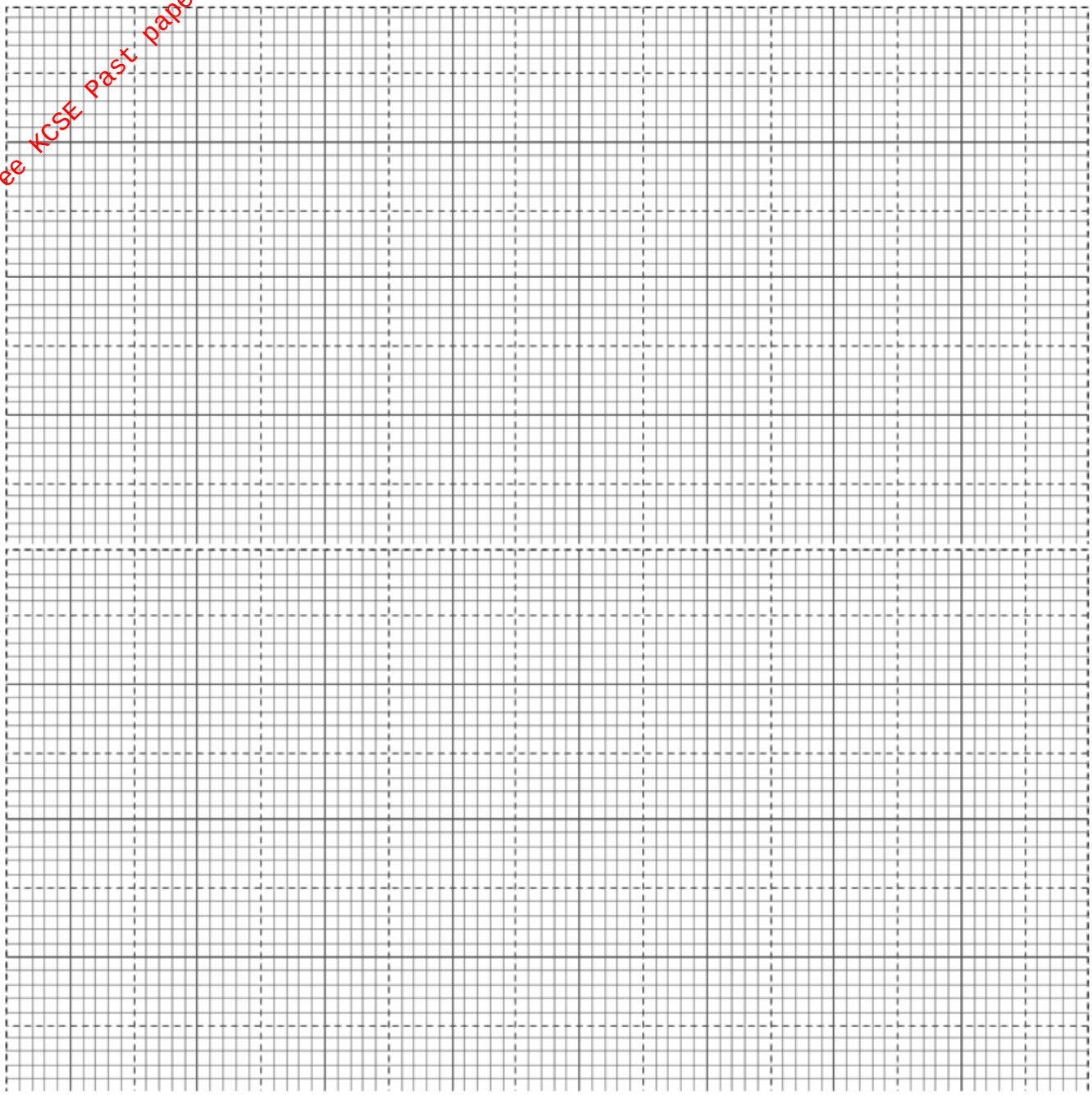
(ii) The time taken by T to reach C (2 Marks)

(c) The local time at a town D (23^0N, 5^0W) is 1000 hours. What is the local time at B. (3 Marks)

23. A firm has a fleet of vans and trucks. Each van can carry 9 crates and 3 cartons. Each truck can carry 4 crates and 10 cartons. The firm has to deliver not more than 36 crates and at least 30 cartons.

(a) If x vans and y trucks are available to make the delivery. Write down inequalities to represent the above information. (4 Marks)

(b) Use the grid provided, to represent the inequalities in (a) above (4 Marks)



(c) Given that the cost of using a truck is four times that of using a van, determine the number of vehicles that may give minimum cost (2 Marks)

24. (a) Sketch the graph of $y = x^2 + 5$ (2 Marks)

(b) Using the mid-ordinate rule, with six strips, estimate the area enclosed by the curve, x-axis, y – axis and the line x = 3. (4 Marks)

(c) Find the exact area by integration (2 Marks)

(d) Calculate the percentage error made when the two methods above are used (2 Marks)