NAME…… **INDEX NO**……..……..

SCHOOL…… **CANDIDATE'S SIGNATURE**……

121/2 **DATE**……
MATHEMATICS
PAPER 2
JUNE 2014
TIME: 2½ HOURS

COMA JOINT EXAM 2014

Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

1. *Write your name, index number and school in the spaces provided above.*
2. *Sign and Write the date of examination in the spaces provided above.*
3. *This paper consists of two Sections; Section **I** and Section **II**.*
4. *Answer all the questions in Section **I** and any **FIVE** questions from Section **II**.*
5. *All answers and working must be written on the question paper in the spaces provided below each question.*
6. *Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.*
7. *Non-programmable silent electronic calculators and **KNEC** Mathematical tables may be used unless stated otherwise.*

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

SECTION I: (50 MARKS)

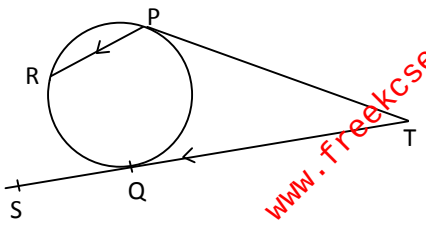
*Answer **all** questions in this section*:

1. A pyramid block has a square base whose side is exactly 7.5cm. Its height measured to the nearest millimeter is 3.5cm. Find the percentage error in calculating its volume correct to 3 decimal places. (3 marks)

2. A blend of juice is made from pineapple and passion. The cost of two limes of pineapple is 120/= and three limes of passion is 270/=. In what ratio should the juice be mixed such that by selling the mixture at 84/= per lime a profit of 20% is realized? (3 marks)

3. Solve for χ in $(\log_2 \chi)^2 + \log_2 8 = \log_2 \chi^4$. (3 marks)

4. In the figure shown **below**, angle PTS = 54° and PT and ST are tangents to the circle and that PR is parallel to TS.



Giving reasons; find the values of angles:

(i) PRQ. (2 marks)

(ii) RQS. (2 marks)

5. Given that tan 15° = $2+\sqrt{3}$, find without using tables or a calculator, in the form $a+2\sqrt{c}$, the value of tan 75°. (3 marks)

6. Make P the subject of the formula:

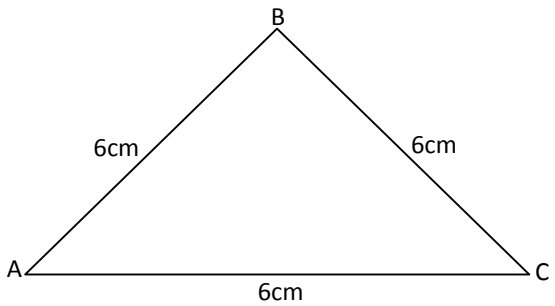
$$i=\left[\frac{1}{mp^3}-A^2\right]B$$ (3 marks)

7. Expand $\left(3-\frac{1}{2}i\right)^5$ up to the 5th team. Hence use the expansion to evaluate $(3.25)^5$ correct to 4 decimal places. (4 marks)

8. A commercial plot is valued at shs.500,000. The plot depreciates at a rate of 10% per six months for a period of 2 years. It then appreciates at a rate of 4% per quarter yearly for three years. Find the value of the plot after 5 years to nearest shillings. (3 marks)

9. The equation of a curve is $y = \chi^3 - 3\chi^2 + K\chi + 2$ and a normal is $9y + \chi = 18$. If they intersect at $\chi = 0$; Find the value of K. (3 marks)

10. The figure **below** drawn to scale represents a field in the shape of an equilateral triangle of sides 120m. (4 marks)



Mr. Mutai wants to plant some tea seedlings in the field. The seedling must be at most 90m from A and nearer to B than to C. If no seedling is to be more than 60m from BC, show by shading, the exact region where the seedling may be planted within the triangle.

11. The product of the digits in a two digit number is 24. Four times the ten digit exceeds the unit digit by 10. Calculate the number. (3 marks)

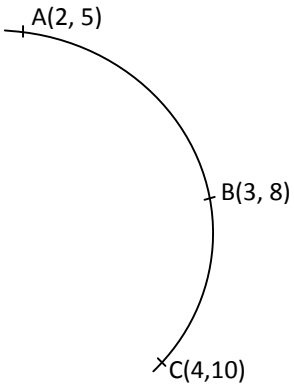
12. Solve for χ in the equation $\sin^2(3\chi + 30°) = \frac{3}{4}$ for $0° \leq \chi \leq 180°$. (3 marks)

13. A Kenya airways plane flies from point P(40°N, 45°W) to a point Q(35°N, 45°W), then to point T(35°N, 135°E). Find the shortest distance between Q and T in nautical miles. (2 marks)

14. The position vectors of points A and B are $2\underset{\sim}{i} - \underset{\sim}{j} + 4\underset{\sim}{K}$ and $4\underset{\sim}{i} + 3\underset{\sim}{j}$ respectively. If point R is the mid-point of $\overrightarrow{AB}$. Find the magnitude of $\overrightarrow{AR}$. (3 mark)

15. Water flows through a pipe whose cross sectional radius is 3.5cm at a rate of 3m/min. Calculate how long it will take the pipe to fill a 22000 line Kcm tank. (2 marks)

16. The figure **below** shows an arc of a circle through three points A, B and C.



Calculate the co-ordinates of the centre of the circle. (4 marks)

SECTION II

*Answer any **five** questions*.

17. (a) Fill the table below using the following function $y = 3 + 4\chi - 2\chi^2$ for $-3 \leq \times \leq 5$. (2 marks)

χ	-3	-2	-1	0	1	2	3	4	5
$-2\chi^2$	-18			0		-8			-50
4χ			-4		4		12		
3									
y									

(b) On the grid provided, draw the graph of the function $y = 3 + 4\chi - 2\chi^2$ for $-3 \leq \times \leq 5$. (3 marks)

GRAPH

(c) Using your graph; estimate the roots of the equations:-

(i) $3 + 4\chi = 2\chi^2$. (2 marks)

(ii) $2\chi^2 - 3\chi - 6 = 0$. (2 marks)

(d) State the y – co-ordinate of the maximum turning point. (1 mark)

18. (a) P, Q and R are three quantities such that P varies directly as the square of Q and inversely as the square root of R.

(i) Given that P = 12 when Q = 24 and R = 36, find P when Q =27 and R = 121. (3 marks)

(ii) If Q increases by 10% and R decreases by 25%, find the percentage increase in P. (4 marks)

(b) If Q is inversely proportional to the square root of P and P = 4 when Q = 3. Calculate the value of P when Q = 8. (3 marks)

19. Every morning during class time, Brenda either reads a novel or solves Mathematics questions. The probability that she reads a novel is $\frac{4}{5}$. If she reads a novel, there is a probability of $\frac{3}{7}$ that she will fall asleep. If she solves Math's questions there is a probability of $\frac{1}{2}$ that she will fall asleep. Sometimes the teacher on duty enters Brenda's classroom. When Brenda is asked whether she had been a sleep, there is a probability of $\frac{1}{5}$ that she will admit that she had been asleep and a probability of $\frac{3}{5}$ that she will claim to have been asleep.

Using a tree diagram;

Find the probability that

(i) She sleeps and admits it. (2 marks)

(ii) She sleeps and does not admit. (2 marks)

(iii) She does not sheep but claims to have been asleep. (2 marks)

(iv) She does not sleep and says that she has not been a slept. (2 marks)

(v) She sleeps and admits and changes her mind. (2 marks)

20. The table **below** shows the distribution of marks scored by 50 students of Afraha high.

Marks	11 - 20	21 - 30	31 -40	41 – 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100
No. of students	2	3	5	6	12	10	6	4	2

Calculate:-

(a) interquartile range. (3 marks)

(b) Mean mark. (3 marks)

(c) Standard deviation (4 marks)

21. Two quantities P and r are connected by the equation $P = Kr^n$. Where k and n are constants.The table of values of P and r is given **below**.

P	1.2	1.5	2.0	2.5	3.5	4.5
r	1.58	2.25	3.39	4.774	7.86	11.5

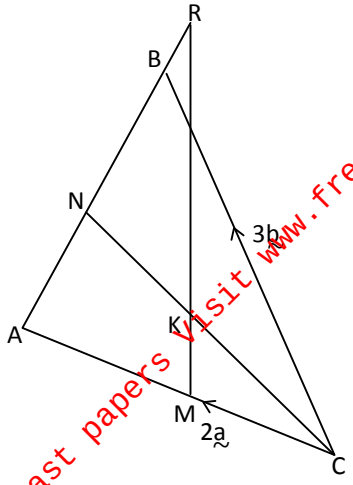
(a) State the linear equation connecting P and r. (1mark)

(b) (i) Using a suitable scale, draw a suitable line graph from the above data on the grid provided. (5 marks)

(ii) Using your graph, estimate the values of K and n. (3 marks)

(c) Find the relation connecting P and r. (1 mark)

22.



The diagram **above** shows triangle ABC, such that $\overrightarrow{CA}$ = 2$\underset{\sim}{a}$ and $\overrightarrow{CB}$ = 3$\underset{\sim}{b}$. M is the midpoint of $\overrightarrow{CA}$ N is a point on AB such that 2 AN = NB and R is a point on AB produced such that 2 AR = 5RB. If K is the point of intersection of MR and CN,

(a) Express in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

(i)	AB.	(1 mark)
(ii)	CN.	(2 marks)
(iii)	BR.	(1 mark)
(iv)	MR.	(2 marks)
(v)	CK.	(2 marks)

(b) Find the ratio CK: KN. (2 marks)

23. The product of the first three terms of geometric progression is 729. If the first term is a and the common ratio is r.

(a) Express r in terms of a. (2 marks)

(b) Given the sum of the three terms is 39.

(i) Find the values of a and r and hence write down two possible sequences each up to the 4^{th} term. (6 marks)

(ii) Find the product of the 10^{th} term of the two sequences. (2 marks)

24. The velocity of a particle, Vm/s, moving in a straight line after t seconds is given by:-

$V = 3t^2 - 3t - 6$ Find:-

(i) the acceleration of the particle after 2 seconds. (2 marks)

(ii) the distance covered by the particle between t = 1 and t = 4 seconds. (3 marks)

(iii) the time when the particle is momentarily at rest. (2 marks)

(iv) The maximum velocity attained by the particle. (3 marks)