

Name:

Adm.No:.....

Index No.

121/2

MATHEMATICS

Paper 2

MAY 2015

2 ½ Hours

ALLIANCE HIGH SCHOOL PRE-TRIAL-2015

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the space provided at the top of this page.
2. The paper contains **TWO** sections; section I and section II
3. Answer all the questions in section I and **ANY FIVE** questions from section II
4. Show all the steps in your calculations; giving your answers at each stage in the spaces provided below each question.
5. Marks may be given for correct working even if the answer is wrong.
6. Non-programmable silent electronic calculators and KNEC mathematical tables maybe used.

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

*This paper consists of 13 printed pages
Candidates should check the question paper to ensure that all the printed
pages are printed as indicated and no questions are missing*

SECTION 1 (50 MARKS)

1. Solve for x in the equation

$$2 (\log x)^2 - 3 \log x + 1 = 0$$

(3 marks)

2. A quantity Y varies partly as X and partly inversely as the square of x. Given that $y = 3$, when $x = 1$ and that $y = 5$ when $x = \frac{1}{2}$. Find y when $x = 1 \frac{1}{2}$. (4 marks)

3. Without using a calculator or mathematical table, express $\frac{\sin 60^\circ}{1 - \cos 30^\circ}$ (3marks)
In surd form and simplify

4. Kanini deposited sh. 24,000 in a fixed account for a period of 24 months. The bank pays compound interest on quarterly basis. At the end of this period, Kanini's account had Ksh.64, 200. Determine the rate of which interest is paid annum. (3 marks)

5. Make x the subject in

$$y + x^2 = (x + t)(x + y)$$

(3 marks)

6. Find the inverse of matrix

$$\begin{bmatrix} 2 & 5 \\ 3 & 4 \end{bmatrix}$$

Hence solve the simultaneous equations.

$$2x + 5y = 9$$

$$4y + 3x = 3$$

(3 marks)

7. Find the area enclosed between the curve $y = x^2$ and the line $y = 3x + 4$. (4 marks)

8. AB is the diameter of the circle. Given that A (2, -3) and B (4, -7). Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$ (3 marks)

9. Use binomial expansion to expand $(2 - 0.5x)^5$ up to the third term. Hence use your expansion to evaluate $(1.95)^5$ to 4 s.f. (3 marks)

10. The equation of a curve is $y = 4 + 3x - x^2$. Find the equation of the normal drawn to the curve at the point P (3, -5). Leave your answer in the form $y = mx + c$. (3 marks)

11. Evaluate $\int_{-3}^2 (x-3)(x-2)(x+2)$ (2marks)

12. A routine assessment test was done by seven students and the scores were as follows: 20, 18, 9, 12, 23, 16, 14. Calculate the standard deviation of the data. (3marks)

13.

Mrs. Mutua earns a basic salary of sh. 19,800 per month and a house allowance of sh. 13,500 per month.

Monthly taxable income in Kshs.	Rate of tax in shs. Per £
0 – 10,164	2
10,165 – 19,740	3
19,741 – 29,316	4
29,317 – 38,892	5
Over 38,892	6

Use the monthly tax rates above to calculate:-
The tax payable before relief.

(4 marks)

14. A particle is projected from rest and its speed was recorded as shown in the table below.

Time (secs)	0	5	10	15	20	25	30	35
Speed m/s	0	2.1	5.3	5.1	6.8	6.7	4.7	2.6

Use the trapezoidal rule to estimate the distance covered by the particle within the 35 seconds.

(3 marks)

15. The radius of a cylinder was found to be 14.0cm and its height 15.5cm. Find the percentage error in its volume correct to 4 significant figures. (Take $\pi = \frac{22}{7}$) (3 marks)

16. The coordinates of A, B and C are (2, -3), (-1, 3) and (6, 4) respectively. Find the coordinates of A'B'C' the image of A, B, C under a transformation by the matrix

$$\begin{bmatrix} 2 & -3 \\ -1 & 1 \end{bmatrix}$$

(3 marks)

SECTION II (50MARKS)

17. A farmer has two tractors A and B. The tractors, working together can plough a farm in $2\frac{1}{2}$ hrs. One day, the tractors started to plough the farm together. After 1 hr 10 mins, tractor B broke down but A continued alone and completed the job after a further 4hrs. Find:

(a) The fraction of the job done by the tractors, working together for one hour. (1 mark)

(b) The fraction of the job done by tractor A after B broke down. (3 marks)

(c) The time each tractor working alone would have taken to plough the farm. (6 marks)

18. An aeroplane leaves town P (40°N , 155°W) to town Q (40°N , 25°E) using the shortest route at a speed of 300 knots. (Take $\pi = 3.142$ and $R = 6370\text{km}$)

(a) Calculate

(i) The distance between P and Q in nautical miles. (2 marks)

(ii) The time taken to travel from town P to Q. (2 marks)

(b) From Q the plane flies westwards along the latitude to town S (40°N , 15°W). Calculate the distance QS in km. (3 marks)

(c) If the plane took off from Q at 3.20pm at the same speed, at what time did the plane land at S? (3 marks)

19. Koech a prominent businessman at Eldoret has two vehicles, a pick up and a canter which he uses to carry as many bags of maize as possible to Kitale. He wishes to limit the number of trips to 13 or less. For each trip in the pickup he uses 40 litres of petrol and 1 litre of oil. For each trip in the canter he uses 20 litres of petrol and 3 litres of oil. He has available only 480 litres of petrol and 18 litres of oil. If he makes X trips in the pick up and y trips in the canter

(a) Write down three inequalities (apart from $x \geq 0$ and $y \geq 0$) to represent the condition above. (3 marks)

(b) Represent the inequalities graphically and shade the unwanted regions. (4 marks)

(c) If the pick up carries 10 bags in each trip and the canter carries 35 bags each trip. Use your graph to determine the number of trips each vehicle should make in order to transport the maximum number of bags. (3 marks)

20. A curve is represented by the function $y = \frac{1}{3}x^3 + x^2 - 3x + 2$

a) Find dy/dx (1mark)

b) Determine the value of y at the turning point of the curve $y = \frac{1}{3}x^3 + x^2 - 3x + 2$ (5marks)

c) On the graph paper provided, sketch the curve in (b) above. (4marks)

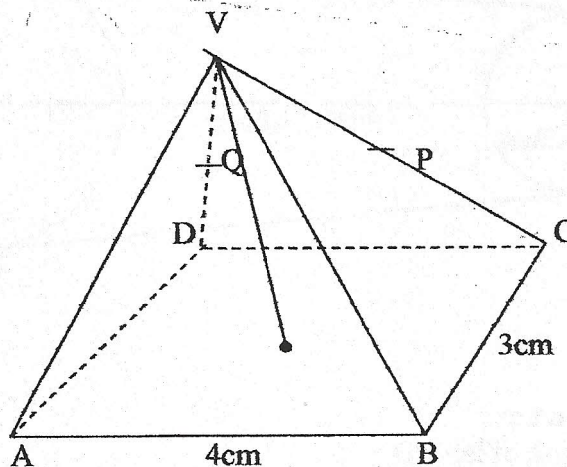
21. a) The starting salary of a salesman is Ksh. 30,000 per annum and he is given annual increment of Ksh. 2000. Find the number of years required for the total salary to amount to Ksh. 492,000. (4 marks)

b) The numbers 8, x and 2 form the first three terms of a geometric progression (GP).

i) Find the two possible values of x . (2marks)

ii) Find the sum of the first five terms of the GP if its common ratio is negative. (4marks)

22. The diagram below shows a right pyramid $VABCD$ with V as vertex. The base of the pyramid is rectangle $ABCD$ with $AB = 4\text{cm}$ and $BC = 3\text{cm}$. The height of the pyramid is 6cm



(a) Calculate:-

(i) the length of the projection of VA on the plane.

(3 marks)

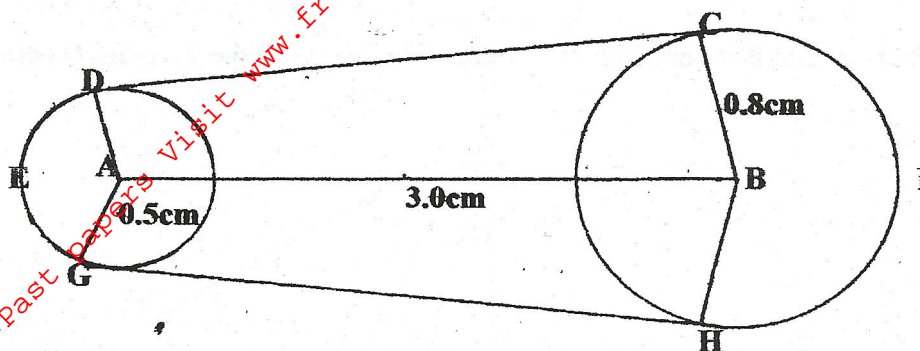
(ii) the angle between the face VAB and the base.

(3 marks)

(iii) P is the mid point of VC and Q is the mid-point of VD . Find the angle between the planes VAB and $ABPQ$.

(4 marks)

23. The diagram below shows a design model of a race course drawn to scale of 1:5000,000. It consists of two circles centre A and B radii 0.5cm and 0.8cm respectively and the distance between their centres is 3.0cm



Calculate in km:

- (i) The length of leg CD

(2mks)

- (ii) The length of the leg DEG ($\pi=3.142$)

(2mks)

- (iii) The length of the leg HIC ($\pi=3.142$)

(2mks)

- (iv) During a race, the course is manned by race officials placed 500m apart and each is paid Kshs.2300/= per day. How much is needed to pay race officials for one day even

(4mks)

24. Complete the table below for $y = \sin x$ and $y = \sin (x + 45^\circ)$

X°	0	45	90	135	180	225	270	315	360
$(x + 45)^\circ$	45		135	180			315		
$\sin (x + 45)^\circ$			0.71		-0.71		-0.71		
$\sin x^\circ$	0			0.71			-1.00		0

- (a) Using a scale of 1 cm to represent 45° on the x-axis and 1 cm to represent 0.5 units on the y-axis, draw on the same axes the graphs of $y = \sin (x + 45)^\circ$ and $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.
(6 marks)

- (b) From your graph, find:-

- (i) the amplitude of the waves.
(ii) the period

(1 mark)

(1 mark)

- (iii) the transformation that maps $y = \sin x$ onto $y = \sin (x + 45)^\circ$

(1 mark)

- (c) Use your graph to solve the equation

$$\sin (x + 45^\circ) - \sin x = 0$$

(1 mark)