

NAME.....INDEX NO.....ADM NO.....
CANDIDATE'S SIGN.....DATE.....
SCHOOL.....

MOKASA JOINT EXAMINATIONS

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

121/2
MATHEMATICS
PAPER 2
MARCH/APRIL 2016
TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

- 1) Write **your name** and **index number** in the spaces provided above.
- 2) Sign and write the date of examination in the spaces provided above.
- 3) This paper consists of two section **I** and **II**.
- 4) Answer **ALL** questions in section **I** and only **five** questions from section **II**.
- 5) Answers and working must be written on the question paper in the spaces provided below each question.
- 6) Marks may be given for correct working even if the answer is wrong.
- 7) Non-programmable electronic calculators may be 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

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SECTION A- 50 MARKS

1. Use logarithm tables to evaluate: (4 marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. The external and internal diameters of a cement pipe are 20cm and 14cm respectively. Calculate the volume of cement required to prepare 1.4m long. Give your answer in cm^3 . (3 marks)

3. Make h the subject of the formula (3 marks)

$$\frac{E}{X} = \sqrt{\frac{h - 0.5}{I - h}}$$

4. Solve for x in the equation $2 \sin^2 x - 1 = \cos^2 x + \sin x$ for $0^\circ \leq x \leq 360^\circ$

5. The points $A(-4,1)$ and $B(-2,5)$ are the end points of a diameter of a circle. Determine the coordinates of the centre of the circle, hence calculate the equation in the form:

$$x^2 + y^2 + 2ax + 2by + c + d = 0$$

6. Solve the quadratic equation $3x^2 - 4x = 2$ (3 marks)

7. Evaluate by rationalizing the denominator and leaving your answer in surd form. (3 marks)

$$\frac{\sqrt{8}}{1 + \cos 45^\circ}$$

8. Expand $(2 + 3x)^6$ up to the term x^2 . Hence use your expansion to estimate $(2.09)^6$ (3 marks)

9. Two quantities M and N are such that M varies partly as N and partly as the square of N. Determine the relationship between M and N given that when M is 1050, N = 10 and when M = 2200, N = 20. (3 marks)

10. A dealer has two types of grades of tea, A and B. Grade A costs sh 140 per kg. Grade B costs sh. 160 per kg. If the dealer mixes A and B in the ratio 3:5 to make a brand of tea which he sells at sh. 180 per kg, calculate the percentage profit that he makes. (3 marks)

11. Onyango bought a refrigerator whose cash price is sh. 84,000 on hire purchase. He made a cash deposit of sh. 20,000 and the 15 monthly instalments of shs. 6,000. Calculate the rate of interest per month. (3 marks)

12. Given that $\mathbf{OA} = 2\mathbf{i} + 5\mathbf{k}$ and $\mathbf{OB} = 7\mathbf{i} - 5\mathbf{j}$. A point T is on AB such that $2\mathbf{AT} = 3\mathbf{TB}$. Calculate the magnitude of \mathbf{OT} to 4 significant figures. (3 marks)

13. Find the sum of A.P having 15 terms, the fourth term being -3.2 and the eight term 8.4
(3 marks)

14. Use matrix methods to solve the following simultaneous equation (4 marks)

15. The volumes of two similar cylinders are 3240cm^3 and 960cm^3 . If the surface area of the larger cylinder was 792cm^2 . find the surface area of the smaller cylinder. (3 marks)

16. Estimate the area bounded by the curve $y = \frac{1}{2}x^2 + 1$, $x = 0$, $x = 3$ and the x-axis using the mid-ordinate rule. Use three strips (3 marks)

SECTION B: (50 marks)

17. The angle of elevation of the top of a flag post from a point P on a level ground is 20° . The angle of elevation of the top of the flag post from another point Q nearer to the flag post and 110m from P is 32° . Q is between P and the flag post.

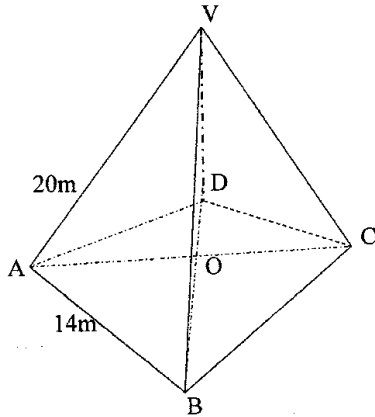
a) Draw a sketch diagram to show the above arrangement (2 marks)

b) calculate correct to 2 d.p

(i) The distance from the point Q to the top of the flag post (5 marks)

(ii) The length of the rope tied from the top of the flag post to the point P on the ground, if 0.5m of the rope is used for tying the knots. (3 marks)

18. The diagram below shows a right pyramid with a square base ABCD and vertex V. O is the centre of the base. $AB = 14\text{m}$, $VA = 20\text{m}$ and N is the midpoint of BC.



Find;

- a) The lengths of BO, VO and VN (3 marks)

- b) The angle between VO and plane VBC (3 marks)

- c) The angle between VB and base ABCD (2 marks)

- d) The angle between VDC and VBC (2 marks)

19. A number of students were asked to cut 30cm lengths of binding wire without measuring. Later 100 pieces were collected and measured correct to the nearest 0.1 cm the data below was collected.

Length l (cm)	28.0 – 28.4	28.5 – 28.9	29.0 – 29.4	29.5 – 29.9	30.0 – 30.4	30.5 – 30.9	31.0 – 31.4	31.5 – 31.9
Frequency	5	8	30	X	10	20	10	4

a) i) Calculate the value of x (1 mark)

ii) State the modal class (1 mark)

b) Using 29.7 as a working mean calculate;
i) the mean (4 marks)

ii) the standard deviation (4 marks)

20. A transformation represented by matrix $\begin{bmatrix} 2 & 1 \\ 1 & -2 \end{bmatrix}$

Maps A(0,0), B(2,0), C(2,3) and D(0,3) onto A¹B¹C¹ and D¹ respectively

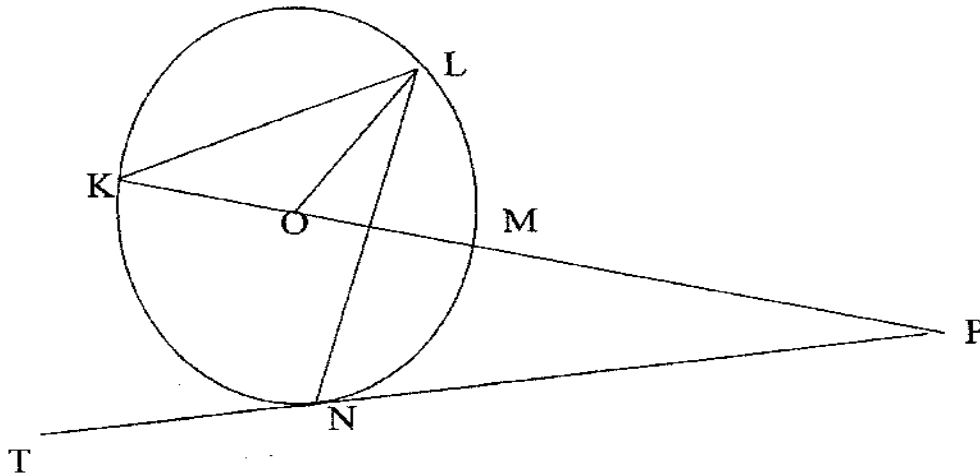
a) Draw ABCD and its image A¹B¹C¹D¹

(4 marks)

b) A transformation represented by $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$ maps A¹B¹C¹D¹ on A¹¹B¹¹C¹¹D¹¹. Plot A¹¹B¹¹C¹¹D¹¹ on the same graph. (3 marks)

c) Determine the matrix of a single transformation that maps A¹¹B¹¹C¹¹D¹¹ onto ABCD (3 marks)

21. In the figure K, L, M and N are points on the circumference of a circle centre O. The points K, O, M and P lie on a straight line.



PT is a tangent to the circle at N. Given that $\angle MKN = 40^\circ$, find the values of the following angles stating reasons.

- a) $\angle MLN$ (2 marks)
- b) $\angle OLN$ (2 marks)
- c) $\angle LNP$ (2 marks)
- d) $\angle MPN$ (2 marks)
- e) $\angle KLM$ (2 marks)

22. The position of 3 cities P, Q and R are $(15^{\circ}, 20^{\circ}\text{W})$ $(50^{\circ}\text{N}, 20^{\circ}\text{W})$ and $(50^{\circ}, 60^{\circ}\text{E})$ respectively.

a) Find the distance in nautical miles between:

(i) Cities p and Q (2 marks)

(ii) Cities P and R, via city Q (3 marks)

b) A plane left city P at 0250h and flew to city Q where it stopped for 3 hours then flew on to city R, maintaining a ground speed of 900 knots throughout.

(i) The local time city R when the plane left city P (3 marks)

(ii) The local time (t the nearest minute) at city R when the plane landed at R. (2 marks)

23. The table below is for function $y = x^3 - 7x + 6$ for the range $-3 \leq x \leq 3$.

X	-3	-2	-1.5	-1	0	1	1.5	2	3
Y									

a) Complete the table above. (2 marks)

b) Draw the graph of the function $y = x^3 - 7x + 6$ for the range $-3 \leq x \leq 3$ (3 marks)

c) Use the graph above to estimate the roots of the following;

(i) $x^3 = 7x - 6$ (1 mark)

(ii) $-x^3 + 8x - 2 = 0$ (2 marks)

d) By drawing a tangent, estimate the gradient of the curve $y = x^3 - 7x + 6$ at $x = -2$ (2 marks)

24. a) The acceleration of a particle t seconds after passing a fixed point P is given by $a = 3t - 3$.
Given that the velocity of the particle when $t = 2$ is 5 m/s, find;

(i) Its velocity when $t = 4$ seconds (3 marks)

(ii) Its displacement at this time (3 marks)

(iii) find the exact area bounded by the graph $x = 9y - y^3$ and the y-axis(4 marks)