

NAME:..... INDEX NO.
SIGNATURE:

121/2
MATHEMATICS
Paper 2
March/April, 2011
Time: 2 ½ Hours

MOKASA JOINT EVALUATION EXAMINATION

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

121/2

Mathematics

Paper 2

March/April, 2011

Instructions To Candidates

- Write your *name*, *index number*, *Signature* and write date of examination in the spaces provided
- The paper contains two sections. Section I and Section II.
- Answer **ALL** the questions in section I and any Five questions in section II.
- Answers and working must be written on the question paper in the spaces provided below each question.
- Marks may be given for correct working even if the answer is wrong.
- Non programmable silent electronic calculators and KNEC mathematical table may be used, except where stated otherwise.

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

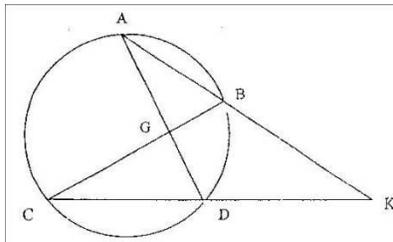
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This paper consists of 4 printed pages.

1. a) Expand $(1 + 2x)^4$ in ascending powers of x (2mks)
 b) Use your expansion to find the value $(1^{1/5})^4$. (2mks)
2. Triangle ABC is such that $AB = 12\text{cm}$, $AC = 10.1\text{ cm}$ and angle $CAB = 30^\circ$. Find the percentage error in its area.
3. Three quantities P, Q and R are such that P varies directly as the square of Q and inversely as the square root of R. Q is increased in the ratio 3:2 and R is decreased in the ratio 3:5. Determine the percentage change in P. (3mks)
4. Solve for x in $\log_2 x + \log_2 (x-30) = 6$ (3mks)
5. In what proportion should grade A sugar costing Kshs. 120 per kilogram and grade B sugar costing Kshs. 200 per kilogram be mixed to produce a blend worth Kshs. 150 per kilogram? (3mks)

6. Simplify $\frac{x^2 - xy}{y^2 + xy - 2x^2}$
7. Solve the equation: $2 \sin^2 3\theta = \frac{1}{2}$, for $0^\circ \leq \theta \leq 270^\circ$ (4mks)

8. Mr. Lochap earns a monthly salary of Kshs. 42000. He lives in a company house for which he pays a nominal rent of Kshs. 3000. Determine his taxable income. (3mks)
- 9.

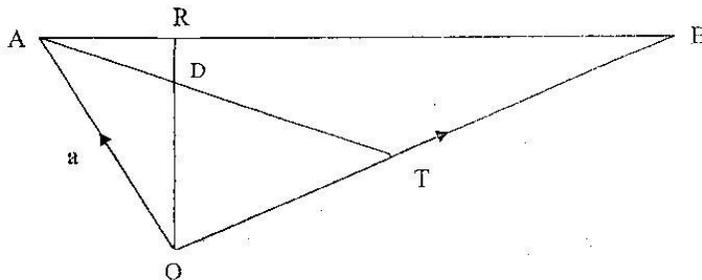


The figure above shows a circle in which chords AD and BC intersect at G. AB and CD extended meet at K. given that $KB = 5\text{cm}$, $KC = 15\text{cm}$ and $KD = 7\text{cm}$, determine the length of KA.

10. A plane figure of area 50cm^2 is transformed by matrix $\begin{pmatrix} 1 & 3 \\ 3 & -7 \end{pmatrix}$ and then by the matrix $\begin{pmatrix} 3 & -1 \\ 0 & 4 \end{pmatrix}$. Find the area of the final image. (3mks)
11. A (3,6) is a point on the circumference of a circle whose centre is at B(3,3). Find the equation of this circle, giving your answer in the form; (3mks)
12. Make Q, the subject of the formula $T = P \sqrt{Q/Q-1}$ (3mks)
13. The probability that a day is rainy is $\frac{1}{4}$. The probability that a teacher carries an umbrella on a rainy day is $\frac{1}{7}$ and that he carries an umbrella on a non-rainy day is $\frac{2}{7}$. Find the probability that a teacher carries an umbrella.
14. Gary deposited Kshs. 150,000 in a savings account for 3 years. Find the total interest he earned in the 3 years period if interest was compounded quarterly at a rate of 12% p.a. (3mks)
15. A tank can be filled by tap A in 20 minutes. Both taps are turned on at the same time and then after 10 minutes tap B is turned off. Starting with an empty tank find the time taken to fill the tank. (3mks)
16. Triangle ABC shown below is mapped on triangle A'B'C' by a positive quarter turn about the point (0, -2). Draw the image triangle A'B'C' on the same set of axes and state the co-ordinates of its vertices.

SECTION II (50 MARKS)

17. A plane S flies from a point P (40°N , 45°W) and then onto a point T (35°N , 135°E).
- Given that the radius of the Earth is 6370km, find the distance from P to Q in Km. (2mks)
 - Find in nm;
 - The shortest distance between Q and T. (2mks)
 - The longest distance between Q and T (to the nearest tens) (2mks)
 - Find the difference in time taken when S flies along the shortest and the longest routes if its speed is 420 knots. (4mks)
18. The figure below is a triangle OAB, where $\vec{OA} = \mathbf{a}$, and $\vec{OB} = \mathbf{b}$. A point R divides AB in the ratio 2:5 and a point T divides OB in the ratio 1:3. OR and AT intersect at D.

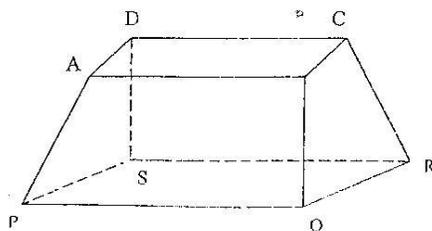


- Find in terms of \mathbf{a} and \mathbf{b}
 - \vec{BT}
 - \vec{OR}
 - \vec{AT}
 - Given that $AD = kAT$ and $RD = hRO$ where k and h are scalars. Find the values of k and h , hence express \vec{AD} in terms of \mathbf{a} and \mathbf{b} . (5mks)
19. a) The point A' , B' and C' are images of triangle ABC with vertices at A (4, 4), B (0, 2) and C (-2, 4) respectively under a transformation represented by matrix

$$M = \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix} \quad \text{Write down the co-ordinates of triangle } A'B'C'. \quad (3\text{mks})$$

- Triangle $A''B''C''$ is the image of triangle $A'B'C'$ under another transformation whose matrix is $N = \begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$. Determine the co-ordinates of $A''B''C''$ (3mks)
- Transformation M followed by N can be replaced by a single transformation P. Determine the matrix for P. (2mks)
- A plane figure whose area is 20cm^2 undergoes two transformations represented by the matrices M followed by N. Find the area of its image. (2mks)

20. In the figure below, the square PQRS of side 18cm is the horizontal base of a right pyramid cut by a plane ABCD (parallel to the base) such that $AP = 6\text{cm}$ and the side of the square ABCD is 12cm.



Calculate:

- a) The height of the pyramid (3mks)
- b) The angle PA makes with the horizontal (2mks)
- c) The angle the plane PQBA makes with the horizontal (2mks)
- d) The total surface area of the frustrum PQRSDABC (3mks)

21. The table below shows the values of the variables x and y obtained from an experiment. Variable x and y are by the equation

$Y = PK^{(x-1)}$, where P and K are constants.

x	1	2	3	4	5	6
y	4.0	5.7	8.7	13.2	20.0	28.8

- a) Plot log y against (x+1), using a scale of 2cm to 1 unit on the (x+1) –axis and 2cm to 0.2 units on the log y-axis and hence draw the line of best fit.

22.

- a) Construct triangle PQR such that PQ=7.5cm, the ratio of $\angle QPR : \angle PQR = 5:3$ and $\angle QRP = 60^\circ$ (4mks)
- b) Construct the locus of a point S, on the same side as R which moves such that $\angle PSQ = 75^\circ$ (3mks)
- c) Construct the locus of a point T which moves such that it is always equidistant from lines PQ and PR and produce it to intersect the locus of S at M (1mk)
- d) By dropping a perpendicular from M onto PQ at N, measure MN and hence calculate the area of triangle PMQ. (2mks)

24. A juice vendor makes two types of juice, Type A and Type B. type A requires 400g of avocado juice, 100g of pawpaw juice and 400g of mango juice. Type V requires 500g of avocado, 500g of pawpaw and 100g of mango juice.

The vendor has less than 40kg of avocado juice, more than 1 kg of pawpaw juice and utmost 800g of mango juice available. The vendor makes a profit of sh. 10 on type A juice and sh. 20 on type B juice.

- a) Form all the possible inequalities from the above information (4mks)
- b) Draw a graph of your inequalities shading the unwanted region (4mks)
- c) Determine the minimum profit realized (2mks)
- d) An industrialist has 450 litres of a chemical which is 70% pure. He mixes with a chemical of the same type but 90% pure so as to obtain a mixture which is 75% pure. Find the amount of the 90% pure chemical