

NAME.....INDEX NO.....

SCHOOL.....CLASS.....SIGNATURE.....

121/2 MATHEMATICS
PAPER II
JULY/AUGUST 2013
TIME: 2 HOURS 30 MINUTES

**LARI DISTRICT MOCK EXAMINATIONS
KENYA CERTIFICATE OF SECONDARY EXAMINATION
MATHEMATICS
PAPER II**

INSTRUCTIONS TO CANDIDATES.

- (i) Write your name and index number in the spaces provided.
- (ii) This paper contains TWO sections. Section I and Section II.
- (iii) Answer ALL the questions in SECTION I and any FIVE questions from SECTION II.
- (iv) All answers and working must be written on the question paper in the spaces provided below each question.
- (v) Non-programmable silent electronic calculators and KNEC mathematical tables may be use 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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SECTION I (50 MARKS)

1. Without using tables or calculators, evaluate $\sqrt{\frac{\log 4096}{1 + \frac{1}{2} \log 0.16 + \frac{1}{3} \log 8}}$ (3 marks)

2. Given that $4x^2 - 32x - 20 + k$ is a perfect square, find K. (3 marks)

3. a) Expand $\left(x + \frac{2}{x}\right)^4$ fully hence state the constant term of the expression. (1MK)

b) By getting a suitable substitute for x in (a) above, use your expansion to evaluate $(10.2)^4$ correct to three significant figures. (3MKS)

4. Given that $2 \cos(2x - 30^\circ) = \frac{-6}{5}$ find x where $90^\circ \leq x \leq 360^\circ$ (3mks)

5. Make h the subject of the formula in the following equation. (3MKS)

$$m = \frac{1+rh}{1-h}$$

6. Simplify the following, leaving your answer in surd form. (3MKS)

$$\frac{4}{\sqrt{5}+\sqrt{2}} - \frac{3}{\sqrt{5}-\sqrt{2}}$$

7. Under a transformation whose matrix is $T = \begin{pmatrix} x-2 & -2 \\ x & x \end{pmatrix}$.

A figure whose area is 2.5cm^2 is mapped onto a figure whose area is 10cm^2 . Find two possible values of x and hence write down two possible matrices for T . (3MKS)

8. The n th term of a geometric progression is given by $5 \times 2^{2-n}$.

a) Write down the first four terms of the G.P. (1MK)

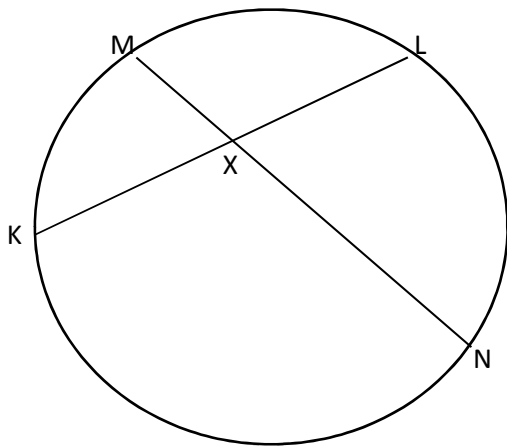
b) Calculate the sum of the first six terms of this series. (2MK)

9. Solve the following simultaneous equation (4mks)

$$\begin{aligned}\log_{10}(x + y) &= 0 \\ 2\log_{10} x &= \log_{10}(y + 1)\end{aligned}$$

10. Determine the equation of the tangent to the circle with equation $(x-3)^2 + (y-5)^2 = 5$ at the point (6, 7). (4MK)

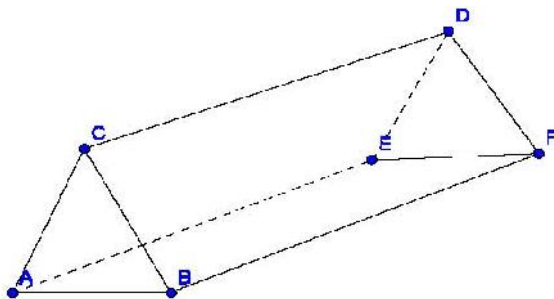
14. In the following figure, $MN=8\text{cm}$, $MX=2\text{cm}$, $KL=8\text{cm}$ and $LX=t\text{ cm}$. Calculate two possible values of t . (4MKS)



12. The volume of a cylinder is given by $V = \pi r^2 h$. Find the percentage change in V if r increases by 8% and h decreases by 12%. (4MKS)

13. A trader deals in two types of rice; rice A and rice B. Type A rice costs Kshs. 400 per bag and type B costs Kshs. 350 per bag. The trader mixes 30 bags of type A with 50 bags of type B. If he sells the mixture at a profit of 20%, calculate the selling price of one bag of the mixture. (3MKS)

14. The figure below shows a triangular prism ABCDEF. If given that AB = 12 cm, AE = 20cm, AC = ED = BC = FD = 10cm, calculate the angle between plane ADB and the base. (3MK)



15. A point R (2, 2) is mapped onto R^1 (8, 2) by a shear matrix, x-axis being invariant. Find the shear factor hence or otherwise, write down the shear matrix. (3mks)

16. An investor invested his money in a bank that gives compound interest of 12% p.a compounded quarterly. If he invested Kshs 16800 for 2 years and then withdraws all the money at the end of the 2 years, how much interest does he get? (3MKS)

SECTION II (50 MARKS)

17. A particle moves in a straight line. It passes through the point O at $t=0$ seconds with a velocity of 1 m/s . The acceleration $a\text{ m/s}^2$ of the particle at t seconds after passing through O is given by $a = 6t - 4$.

a) Express velocity V of the particle at time t seconds in terms of t . (3MKS)

b) Calculate the velocity of the particle at $t = 3$ seconds. (2MKS)

c) Calculate the distance covered by the particle between $t = 2$ and $t = 4$ seconds. (3MKS)

d) The times when the particle is momentarily at rest. (2MKS)

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

(2mks)

x	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
4cos2x	4.00		2.00	0	-2.00	-3.46	-4.00	-3.46	-2.00	0	2.00		4.00
2sin(2x+30°)	1.00	1.73	2.00	1.73		0	-1.00	-1.73	-2.00	-1.73		0	1.00

(b) On the grid provided draw on the same axes, the graph of $y = 4 \cos 2x$ and

$y = 2 \sin(2x + 30^\circ)$ for $0^\circ \leq x \leq 180^\circ$. Take the scale: 1 cm for 15° on the x-axis and 2cm for 1 unit on the y-axis (5mks)

(c) From your graph

(i) State the amplitude of $y = 4 \cos 2x$

(1mk)

(ii) Finds the period of $y = 2 \sin(2x + 30^\circ)$

(1mk)

(d) Use your graph to solve $4 \cos 2x - 2 \sin(2x + 30^\circ) = 0$

(1mk)

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19. A rectangle OABC has vertices O(0,0), A(2,0), B(2,3) and C(0,3). $O^1A^1B^1C^1$ is the image of OABC under a translation $T = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$. $O^{11}A^{11}B^{11}C^{11}$ is the image of $O^1A^1B^1C^1$ under a

transformation given by the matrix $M = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

a) Draw the rectangles OABC, $O^1A^1B^1C^1$ and $O^{11}A^{11}B^{11}C^{11}$ on the grid provided. (6MKS)

b) Use your diagram to find the centre of rotation which maps OABC onto $O^{11}A^{11}B^{11}C^{11}$.

(2MKS)

c) Find the co-ordinates of $O^{111}A^{111}B^{111}C^{111}$ the image of $O^1A^1B^1C^1$ under a reflection in the line $y = -x$ (2MKS)

20. A metallic disc is in the shape of a regular polygon of side 16cm and interior angle 150° . The disc is 10mm thick and is made of metal whose density is 8.5 g / cm^3 .

a) Determine the number of sides of the polygon. (2MS)

b) Calculate to the nearest whole number:

i. The area of the polygon (4MS)

ii. The volume of the disc (2MS)

iii. The mass of the disc in kg (2MS)

21. The frequency distribution of marks of 110 students is given in the table below.

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
f	2	5	9	12	25	37	11	6	2	1

(a) Draw an Ogive to illustrate the data (4mks)

(b) From your graph estimate

(i) The median mark (1mk)

(ii) The interquartile range (2mks)

(iii) The pass mark, if 68% of the students are to pass (3mks)

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22. The positions of two towns A and B on the Earth's surface are $(36^\circ N, 49^\circ E)$ and $(36^\circ N, 131^\circ W)$ respectively.

a) Find the difference in longitude between towns A and B. (2MKS)

b) Given that the radius of Earth is 6370km, calculate the distance between towns A and B.

(3MKS)

c) Another town C is 840 km due east of town B and on the same latitude as towns A and B. Find the longitude of town C. (3MKS)

d) What is the time difference between towns A and B and towns A and C to the nearest minute?

(2MKS)

23. Mr Mulei saved Kshs. 2,000 during the first year of employment. In each subsequent year, he saved 15% more than the previous year, until he retired.

a) How much did he save in the third year? (1MK)

b) How much did he save in the 4th year? (1MK)

c) Find the common ratio between the savings in the two consecutive years? (1MK)

d) How many years did he take to save Kshs. 58,000 to the nearest 1d.p? (3MK)

e) How much had he saved after 20 years of service to the nearest 1d.P? (3MK)

f) If he had save equal amounts per year in the 20 years of service, how much would he have to save per year to the nearest 1d.p? (1MK)

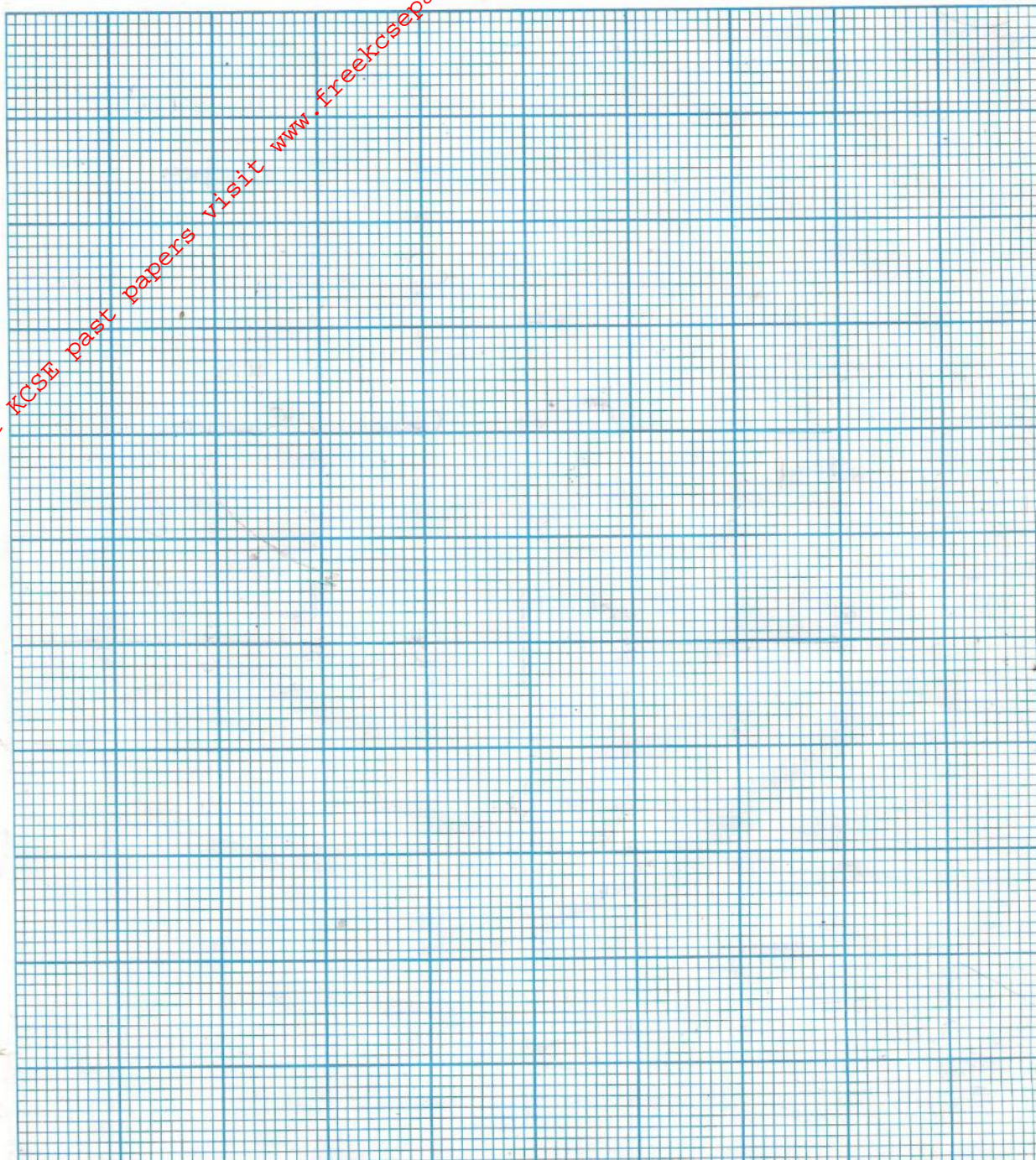
24. A chemist has an order for 15 dozen vitamin pills S and 10 dozen iron pills C. While making these two types of pills to fill the orders, he decides to make more of each for “off the street” customers. Past sales records indicate that the number of Cs should exceed twice the number of Ss. On the other hand, evidence in the record gives the chemist confidence that at most 20 dozen more pills in total than those ordered can be sold.

a) Acting on the above information, form all the inequalities by letting x be the number of dozen of S pills made and y the number of dozen of C pills made. (3MKS)

b) Represent these inequalities in the grid below. (4MKS)

c) It costs Kshs 36 per dozen to make the S-type pills and Kshs 48 per dozen to make the C-type pills. Using a search line determine, how many of each type of pills should be made so that the total production costs will be as low as possible. Also, what will that cost be? (3MKS)

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