

Name: _____ Index No: _____ / _____

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Candidate's Signature: _____

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MATHEMATICS

June/July 2014

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**CARPENTRY AND JOINERY CRAFT CERTIFICATE
MASONRY CRAFT CERTIFICATE
PLUMBING CRAFT CERTIFICATE
ROAD CONSTRUCTION CRAFT CERTIFICATE**

MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.

Sign and write the date of the examination in the spaces provided above.

You should have a Mathematical table/ pocket calculator for this examination.

Answer any FIVE of the following EIGHT questions.

All questions carry equal marks.

Maximum marks for each part of a question are as shown.

Candidates should answer the questions in English.

For Examiner's Use Only

Question	1	2	3	4	5	6	7	8	TOTAL SCORE
Candidate's Score									

This paper consists of 16 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) Evaluate the following expressions without using tables or calculators:

(i) $\frac{9^{\frac{1}{2}} \times 27^{-0.5}}{3^{-\frac{1}{3}} \times 3^{\frac{2}{3}}}$

(ii) $\frac{\log 125 - \log 25 + \frac{1}{2} \log 625}{4 \log 25}$

(6 marks)

- (b) Solve the equations:

(i) $\log_x x - 4 \log_x 3 + 3 = 0$

(ii) $2(2^{2x}) - 5(2^x) + 2 = 0$

(10 marks)

- (c) Given that:

$$\left(P + \frac{q}{V}\right)V - b = RT$$

Make "p" the subject of the formula.

(4 marks)

2. (a) Plot the graph of $y = 2x^2 - 6x + 1$ for $-1 \leq x \leq 4$ and use the graph to solve the equation:

(i) $2x^2 - 6x + 1 = 0$

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

(15 marks)

- (b) On the same axes of the graph in (a) above, plot $y - 5 = -4x$. Hence find the equation whose roots are the intersection of the two graphs. (5 marks)

3. (a) Use infinite series to express 0.81 in the form $\frac{a}{b}$ where a and b are integers. (4 marks)

- (b) The product and the sum of the 3rd and 5th terms of the geometric progression are 81 and -18 respectively. Find the first term and the common ratio. (8 marks)

- (c) Use Simpson's rule with five ordinates to estimate the area enclosed by the curve $y = 3x^2 + 6$, the ordinates $x = 1$ and $x = 5$ and the x-axis. (8 marks)

4. (a) Evaluate x and y in the equation:

$$\begin{pmatrix} x-1 & 3 \\ 4 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ x+2 \end{pmatrix} \quad (8 \text{ marks})$$

- (b) Use inverse matrix to solve the equation:

$$\begin{aligned} 4x - 18 &= 3y \\ 1 + x + 2y &= 0 \end{aligned}$$

(6 marks)

- (c) Given the matrices:

$$A = \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & -2 \\ 1 & -3 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & -2 \\ 1 & -1 \end{pmatrix}$$

Show that $A(B + C) = AB + AC$. (6 marks)

5. (a) If $\sin A = \frac{1}{3}$ and A is obtuse. Find $\cos A$ and $\tan^2 A$. Hence the value of $\sec^2 A$. (8 marks)

- (b) Solve the trigonometric equation:

$$3\sec^2 \theta - 5\tan \theta - 4 = 0 \quad \text{for } 0^\circ \leq \theta \leq 360^\circ. \quad (7 \text{ marks})$$

- (c) Prove the identity:

$$\frac{2\sin \theta}{\sin^2 \theta + \cos \theta - 1} = \frac{2\tan \theta (1 + \cos \theta)}{\sin^2 \theta}. \quad (5 \text{ marks})$$

6. (a) The roof of a building is shaped like the frustum of a pyramid. The dimensions of the base and the top are 45 m x 45 m and 5m x 5m respectively. If the perpendicular height of the roof is 6 m. Calculate the:

- (i) surface area of the roof;
(ii) volume enclosed by the roof.

(14 marks)

- (b) A floor of a kitchen measuring 3.20 m x 3.00 m is to be finished with marble effect floor tiles each measuring 330 mm x 330 mm which are sold in packets containing nine tiles a packet.
- Calculate the number of packets required for the floor if there will be 15% allowance for wastage.
 - Calculate the total cost if a packet costs Kshs. 890.00.
- (6 marks)

7. (a) The probability of a student taking Road Construction to pass is $\frac{3}{5}$. If he passes, the probability of being employed is $\frac{2}{3}$ but if he does not pass the probability of being employed is $\frac{1}{8}$. Find the probability that:
- the student passes and is employed.
 - the student will be employed.
- (6 marks)
- (b) An architect consultant company employs four architect directors, 16 project architects, 20 architect assistants, 10 technicians and 6 administration staff. Represent the data as:
- vertical bar chart;
 - pie chart.
- (8 marks)
- (c) The following table shows the compressive strength of class B engineering bricks.

Compressive strength N/mm^2	34 - 37	38 - 41	42 - 45	46 - 49	50 - 53	54 - 57	58 - 61
Frequency	2	3	15	20	13	10	2

Draw a histogram and use it to estimate the modal value. (6 marks)

8. (a) If $a = \underline{i} - 3\underline{j}$, $b = -2\underline{i} + 5\underline{j}$ and $c = 3\underline{i} - \underline{j}$, evaluate:
- $|4a + 2b - 3c|$;
 - $|a - b|$.
- (6 marks)

