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Name: _____ Index No: _____/_____

1301/311, 1305/311,
1304/311, 1309/311
MATHEMATICS
June/July 2012
Time: 3 hours

Candidate's Signature: _____

Date: _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

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

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 the following for this examination:
Drawing instruments.
*Answer any **FIVE** of the following **EIGHT** questions.*
All questions carry equal marks.
Maximum marks for each part of a question are as shown.
*Answer **ALL** the questions in the spaces provided on this question paper.*

For Examiner's Use Only

Question Number	1	2	3	4	5	6	7	8	Total
Marks									

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.

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1. (a) Simplify the following giving the answer with positive indices.

(i) $\sqrt{\dfrac{72a^3b^{-2}}{2a^3b^{-6}}}$ (ii) $\left(\dfrac{18}{32}\right)^{-3/5}$

(8 marks)

(b) Solve for x in the following equations.

(i) $\log x - \log(2x - 1) = 1$

(ii) $\log_2 x + \log_2 y = 3$
$2\log_2(x + y) = 5$

(12 marks)

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2. (a) (i) Make C the subject of the formula

$$z = \sqrt{R^2 + \left(wl - \frac{1}{wc}\right)^2}$$

(ii) Determine the value of C in (i) when z = 50, L = 10, R = 2 and w = 20.

(7 marks)

(b) (i) As a result of inflation a trader increases prices in the ratio of 19:7. Determine the price of a radio marked at Kshs.4570.

(ii) A mixture of copper, tin and phosporus is done in the ratio by mass 185:14:1. Find the mass of copper in the mixture of mass 27.2 kg.

(6 marks)

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(c) A quantity y is inversely proportional to the cube of d. When y = 5, d = 0.05. Find the value of d when y = 20. (7 marks)

3. (a) A solid right pyramid on a square base of side 5cm has the slant side of length 14 cm. Find correct to 2 places of decimal its
   (i) vertical height
   (ii) Surface area (11 marks)

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(b) Figure 1 shows a liquid in a test tube in the shape of a cylinder with a hemispherical bottom. The radius is 2 cm and the height is 11 cm.

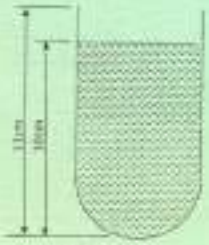

Figure 1

If the height of the liquid in the tube is 10 cm measured from its lowest point, calculate.

(i) the volume of the liquid

(ii) the mass of the liquid given that the density of liquid is 0.8 gcm^{-3}. (9 marks)

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4. Plot the graph of $y = 4x^2 + 4x - 3$ for values of x between $x = -3$ to $x = 2$.
Use the graph to solve the equations:

(i) $4x^2 + 4x - 3 = 0$
(ii) $4x^2 + 4x - 7 = 0$
(iii) $4x^2 + 3x - 5 = 0$

(20 marks)

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5. (a) Given the matrices

$$A = \begin{pmatrix} 5 & -2 \\ 2 & -3 \end{pmatrix} \qquad B = \begin{pmatrix} -2 & 2 \\ 2 & 3 \end{pmatrix}$$

Find

(i) A + B

(ii) $(AB)^T$

(4 marks)

(b) Use matrix method to solve the following simultaneous equations.

$3x - 2y = 8$

$x - 5y = 7$

(9 marks)

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(c) The sum of two numbers is 9 and the sum of their squares is 53. Find the numbers. (7 marks)

6. (a) Given that x is an acute angle and $\cos x = \frac{2}{\sqrt{5}}$. Find without using tables or calculator.
(i) sin x
(ii) tan (90 - x) (3 marks)

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(b) Solve the following trigonometric equation.

$4 \sin^2 \theta + 4 \cos \theta = 1$ for $0° \leq \theta \leq 360°$. (6 marks)

(c) An employee earns a basic salary of Kshs.40,000 and is entitled to a house allowance of Kshs.20,000 and travelling allowance of Kshs.5,000.
The table below shows a monthly income tax rates

Monthly taxable pay K£	Rate of tax Kshs per k£
1 - 342	2
343 - 684	3
685 - 1026	4
1027 - 1368	5
1369 - 1710	6
over 1710	7

The employee is entitled to a personal tax relief of Ksh.220. The following deductions are made from his salary per month.

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Car loan	Kshs.8,000
Health insurance fund	Kshs.3,000
Retirement Benefit fund	Kshs.1,800

Calculate his net monthly salary. (11 marks)

7. (a) Figure 2 shows triangle OAB. P divides AB in the ratio 7:4.

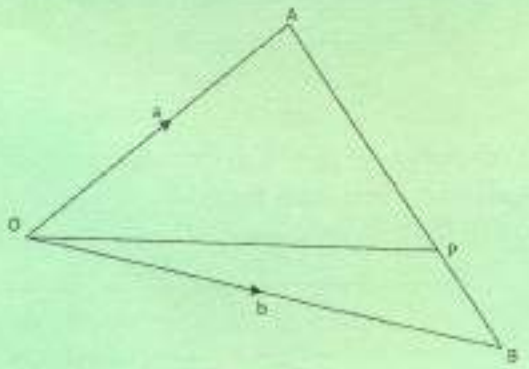

Figure 2

Given that, $\underset{\sim}{OA} = \underset{\sim}{a}$ *and* $\underset{\sim}{OB} = \underset{\sim}{b}$ express OP in terms of $\underset{\sim}{a}$ *and* $\underset{\sim}{b}$. (6 marks)

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(b) Figure 3 shows a system of forces acting on a particle.

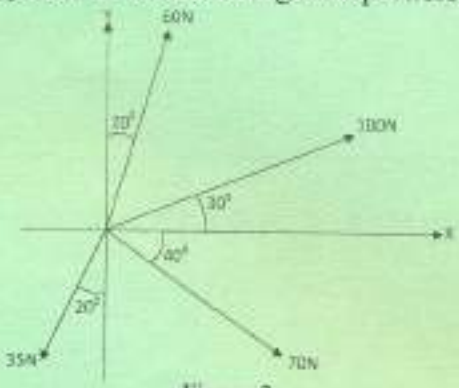

Figure 3

Use the method of resolution of forces to calculate:

(i) the magnitude of the resultant force.

(ii) the direction of the resultant force. (14 marks)

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8. (a) The production in a certain factory depends entirely on the operation of two engines A and B.
The probability of engine A failing is 0.2.
The probability of engine B failing is 0.1
Calculate the probability that:
(i) both engines are working;
(ii) there is no production in the factory;
(iii) only one engine is working. (9 marks)

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(b) The number of accidents that took place in a certain town in August 2011 was recorded as shown in table 1.

Table 1

No. of accidents	2-5	6-9	10-13	14-17	18-21
No. of days	3	6	11	10	4

Determine

(i) the mean number of accidents per day.

(ii) the median

(iii) the modal class

(11 marks)