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1920/104
MATHEMATICS
 November 2013
 Time: 3 hours

Signature: _____

Date: _____



THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN INFORMATION TECHNOLOGY

MATHEMATICS

3 hours

For Examiner's Use Only

Section	Question	Maximum score	Candidates score
A	1-10	40	
B	11	15	
	12	15	
	13	15	
	14	15	
	15	15	
Total score			

This paper consists of 13 printed pages.

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

SECTION A (40 MARKS)

Answer *ALL* questions in this section in the spaces provided.

1. Differentiate between *primary data* and *secondary data* as used in statistics. (4 marks)

2. (a) Convert the following hexadecimal number to its binary equivalent.
AC2 (2 marks)

(b) Evaluate the following expression involving permutation.
 $Y = {}^{10}P_4 \times {}^{10}P_6$ (2 marks)

3. (a) List the stages involved in a statistical analysis process. (2 marks)

(b) Outline **three** characteristics of a *binomial distribution* as used in statistics. (3 marks)

4. Explain each of the following terms as used in statistics:
(a) arithmetic mean; (2 marks)

(b) harmonic mean. (2 marks)



5. Explain two properties of *standard deviation* as a measure of dispersion. (4 marks)

6. Describe each of the following computer coding systems:
- (a) American Standard Code for Information Interchange; (2 marks)

- (b) Binary Coded Decimal. (2 marks)

7. (a) State the binomial theorem as used in mathematics. (2 marks)

- (b) Expand the following expression using the binomial theorem;
 $(x+2y)^4$ (3 marks)



8. Figure 1 shows three different curves that describe the levels of Kurtosis. Use it to answer the question that follows.

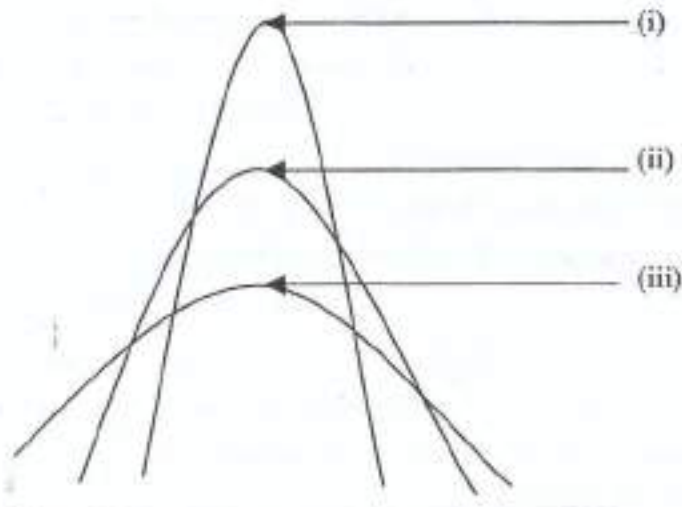


Figure 1

Identify each of the curves labelled (i), (ii) and (iii).

(3 marks)

9. The probability that Angeline does her homework is $\frac{3}{4}$. The probability that her teacher checks the homework is $\frac{5}{6}$. Use a probability tree to determine the probability that Angeline does not do her homework and the teacher does not check.

(3 marks)

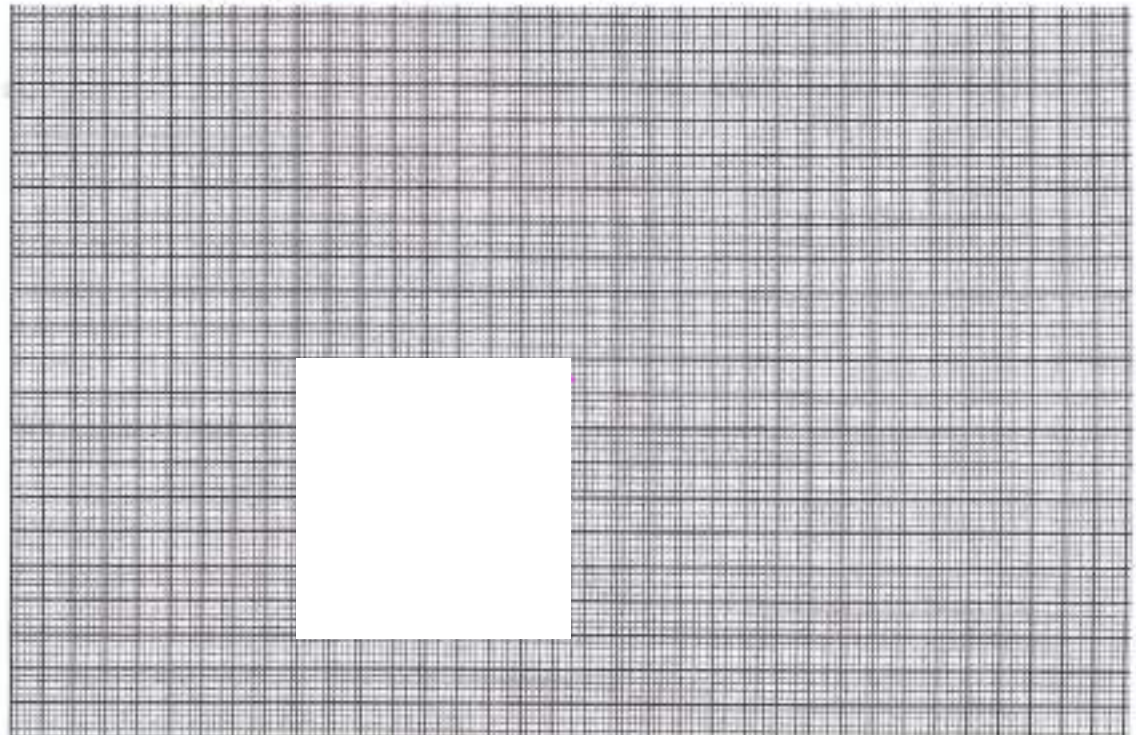


10. Table 1 shows the age distribution of employees in Arimi's Construction Company Ltd. Use it to answer the question that follows;

Age(in years)	No. of employees
15 - 25	80
25 - 35	200
35 - 45	120
45 - 55	60
55 - 65	20

Table 1

Draw a frequency polygon in the grid below to represent this information. (4 marks)



SECTION B (60 MARKS)

Answer any **FOUR** questions in this section in the spaces provided.

11. (a) (i) Define each of the following terms as used in matrices:

I. unity Matrix;

(1 mark)

II. singular Matrix.

(1 marks)

- (ii) Using One's complement, evaluate the following:

$$14_{10} - 6_{10}$$

(2 marks)

- (b) Using Cramer's rule, solve the following simultaneous equation;

$$x + y + z = 2$$

$$x + 2y + z = 3$$

$$x + y + 2z = 1$$

(5 marks)



- (c) John is twice as old as his son Peter. 10 years ago, John was three times as old as Peter. Determine their present ages. (4 marks)

- (d) A line passes through points (4,7) and (-2,1), determine the equation of the line. (2 marks)

12. (a) (i) Given $x = 3$, $y = -5$, $a = -4$ and $b = -7$:

Evaluate: $\sqrt{\frac{6a^2}{x} + \frac{2b^2}{y}}$ (2 marks)

- (ii) Using matrices solve the following set of simultaneous equations:

$$3x + y = 3$$

$$x + 2y = 7$$

(4 marks)



(b) Let $A = \begin{bmatrix} 1 & 2 \\ 1 & 3 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 0 & 2 \end{bmatrix}$

Show that $AB \neq BA$

(3 marks)

- (c) A bag contains 12 marbles of which four are white and eight are black. Three marbles are drawn at random from the bag without replacement. Determine the probability that all the three balls drawn from the bag are black.

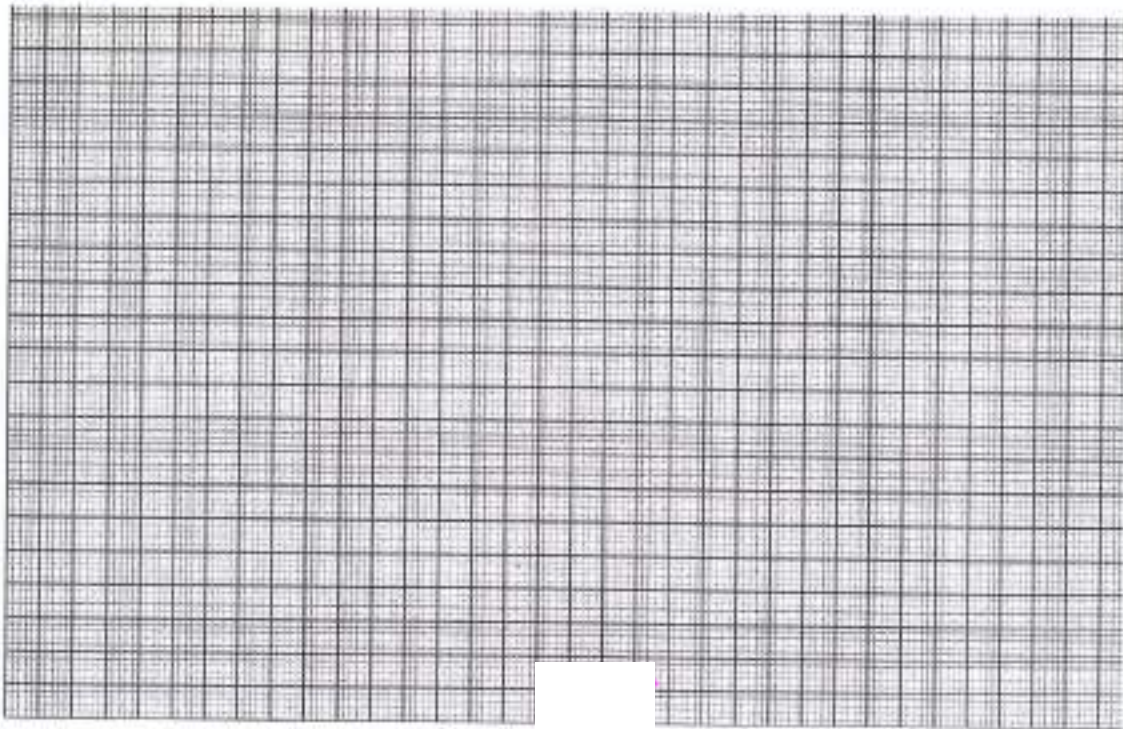
(3 marks)



- (d) Using the graph of $y = x^2 + 5x + 4$ for $-7 \leq x \leq 3$, solve the following equation:

$$x^2 + 5x + 4 = 0$$

(3 marks)



13. (a) Outline **four** emerging trends in mathematical research. (4 marks)

- (b) A research was conducted and the findings showed that everyone in the doctor's room was suffering from either a cold or Pneumonia. Assuming that 13 people had a cold, 8 had pneumonia and 5 had both:

- (i) Use a Venn diagram to represent this information;



- (ii) Determine the total number of people in the doctor's room. (6 marks)

- (c) Convert 376_8 to its Hexadecimal equivalent. (3 marks)

- (d) Differentiate between *finite* and *infinite* sets as used in set theory. (2 marks)

14. (a) Let $S = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$ and $T = \begin{bmatrix} 5 & 0 \\ -6 & 7 \end{bmatrix}$

Given that $X = 5S - 2T$

Determine the value of X. (3 marks)



$$5x + 7 < 3(x + 1).$$

(2 marks)

(ii) Determine the values of a , b , c , and d given that:

$$3 \begin{bmatrix} a & b \\ c & d \end{bmatrix} + 4 \begin{bmatrix} 1 & -1 \\ -3 & -2 \end{bmatrix} = 2 \begin{bmatrix} 1 & 0 \\ 5 & 3 \end{bmatrix} \quad (3 \text{ marks})$$

(3 marks)



- (d) Table 2 shows a record of four teams A,B,C and D after a hockey season. Use it to answer the question that follows.

	Win	Tie	Loss
A	5	5	2
B	3	5	4
C	6	3	3
D	2	3	7

Table 2

Two point systems, X and Y are suggested as ways of ranking the teams.

	System X	System Y
Win	4	2
Tie	1	1
Loss	0	0

Use matrices to determine the points' scored by each team using of the systems, X and Y. (4 marks)

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page or a sheet of stationery. There is no handwriting or other markings on the page.

15. (a) Let:

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

$$A = \{3, 5, 7, 9, 11\}$$

$$B = \{2, 3, 5, 7, 11\}$$

$$C = \{2, 3, 6, 12\}$$

Determine: $(A \cup B) \cap \bar{C}$

(3 marks)

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- (b) (i) The probability that Collins hits a target if he shoots is $\frac{1}{5}$.
Determine the expected number of times he will hit the target if he shoots a 100 times. (2 marks)

- (ii) Determine the binomial expansion of the following expression up to the 4th term; $(1 - y)^5$ (2 marks)

- (c) Using the Gaussian elimination method, solve the following simultaneous equations. (5 marks)

$$z - 3x - 2y = 6$$

$$2z - 4x + 2y = 18$$

$$-3z + 8x + 9y = -9$$

- (d) A box contains one white ball and five black balls. Four draws are made at random with replacement from the box. Determine the probability that the white ball is picked exactly 3 times. (3 marks)

