Name ..... Index No. .....

Candidates signature .....

Date .....

121/2

MATHEMATICS
Paper 2

July/August 2016

Time 2½ hours

NTIMA, NYAKI AND MUNICIPALITY CLUSTER EVALUATION - 2016

Kenya Certificate of Secondary Education

MATHEMATICS

Paper - 121/2

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INSTRUCTIONS TO CANDIDATES

1. Write your name and Index number in the spaces above.
2. Sign and write the date of the examination in the spaces provided above.
3. This paper contains two sections. Section I and II.
4. Answer all questions in section I and ONLY five in section II.
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculations giving your answer at each stage in the spaces provided below each question.
7. Marks may be awarded for correct working even if the answer is wrong.
8. Non-programmable silent calculators may be used and KNEC Mathematical tables may be used, except where stated otherwise.
9. Candidates should check the questions paper to ascertain that all the pages are printed as indicated and that no questions are missing.

EXAMINER'S USE ONLY

This paper consists of 15 printed pages
Candidates should check the question paper to ensure that all the printed pages are printed as indicated and no questions are missing.

Section I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
Marks																	

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

SECTION 1 (50 MARKS)
Answer all the questions in this section in the spaces provided.

1. Use logarithms to 4d.p to evaluate the following. (4 marks)

$$\left(\frac{14.21 \times 0.013}{212.5}\right)^{\frac{1}{3}}$$

2. The base and perpendicular height of a triangle are measured as 8.2cm and 6.3cm respectively. Calculate the percentage error in calculating the area correct to 3d.p. (3 marks)

3. Make y the subject of the formula. (3 marks)

$$B = \sqrt[3]{\frac{2y+3}{4y-5}}$$

4. Solve for x given (3 marks)

$$Log_4 48 + Log_4 24 - 2Log_4 x = \frac{5}{2}$$

5. A quantity P is partly constant and partly varies as the square of Q. Given that P=10 when Q=2 and P=15 when Q=3. Write down the equation connecting P and Q. (3 marks)

6. Solve the θ in the range $-90° \leq \theta \leq 90°$ given $3\text{Cos}(\theta + 10) = 2$. (3 marks)

7. a) Expand. $(1 - 2x)^6$ (2 marks)

b) Use the first 3 terms of your expansion in (a) above to estimate the value of $(0.98)^6$ (2 marks)

8. Determine the radius and coordinates of the centre of a circle whose equation is . (3 marks)
$2x^2 - 16y + 2y^2 + 12x + 18 = 0$

9. Mr. Guantai bought a new car for shs 800,000. After 5 years he sold it through a second hand car dealer who charged a commission of 4% for the sale of the car. If Mr. Guantai received shs 480,000. Calculate the annual rate of depreciation of the car as a percentage to the nearest whole number.
(3 marks)

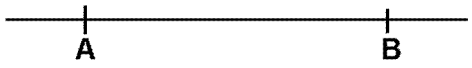
10. Simplify the following. (3 marks)

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

11. Two taps A and B can fill a water bath in 8 minutes and 10 minutes respectively. Tap A is opened for 2 minutes then closed. Tap B is later opened for one minute then closed. How long will the two taps take running together to fill the remaining part of the water bath? (3 marks)

12. On line AB 4cm long, construct and show the locus of P such that $\angle APB = 60°$. (3 marks)

13. The position vectors of A and B are $-3\mathbf{i} - 2\mathbf{j} - \mathbf{k}$ and $4\mathbf{i} - \mathbf{j} + 3\mathbf{k}$ respectively. Express AB as a column vector hence calculate its length leaving your answer to 2d.p. (3 marks)



14. Use squares and reciprocal tables to work out. (3 marks)

$$\frac{16}{0.064} + (0.036)^2$$

15. The function of a curve is given by $y = 3x^2 + 4x + 2$ find the equation of a tangent to this curve at the point (2, 22) (3 marks)

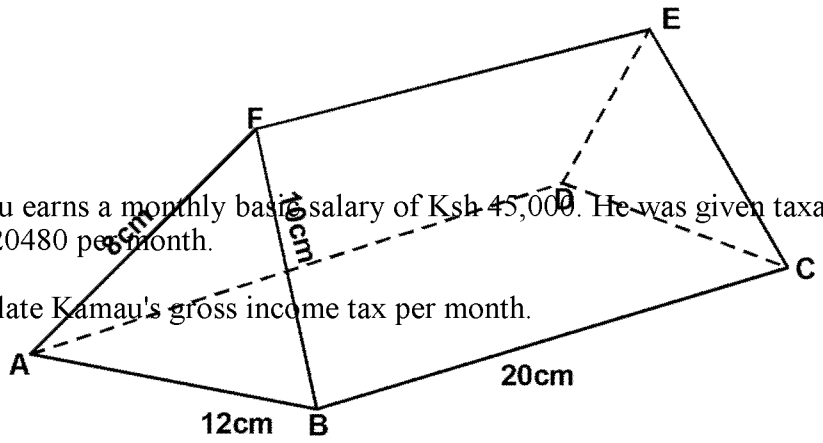
16. The figure below shows a triangular prism with dimensions as shown below.

Calculate the angle between plane BCEF and ABCD. (3 marks)

SECTION II (50 MARKS)

Answer ONLY FIVE questions from this section in the spaces provided.

17. The table below shows income tax rates.



Kamau earns a monthly basic salary of Ksh 45,000. He was given taxable allowances amounting to Ksh 20480 per month.

a) Calculate Kamau's gross income tax per month. (4 marks)

b) Kamau is entitled to a personal tax relief of sh 1162 per month. Determine his net income per month. (2 marks)

Monthly taxable pay in sh	Rate of tax in sh per k£
1 - 17400	2
17401 - 34600	3
34601 - 51800	4
51801 - 69000	5
69001 and above	6

c) Kamau received a 50% increase on his basic salary. Calculate the corresponding percentage increase on his income tax. (4 marks)

18. The table below shows the marks scored in a maths test by form four students in a certain school.

a) State the modal class and the modal frequency. (2 marks)

b) By using the assumed mean of 44.5, calculate the

i) mean (3 marks)

ii) variance (3 marks)

Marks	20-29	30-39	40-49	50-59	60-69	70-79
No. of students	2	5	10	12	8	3

iii) Standard deviation. (2 marks)

19. The positions of airport P and Q are (60°N, 45°W) and (60°N, k°E) respectively. It takes a plane 5 hrs to travel due East from P to Q at an average speed of 600knots. By taking R = 6370km and $\pi = {}^{22}/_{7}$

a) Calculate the value of k. (3 marks)

b) The local time at P is 10.45am. What is the local time at Q when the plane reaches there. (4 marks)

c) Find the distance PQ measured along a circle of latitude to the nearest km. (3 marks)

20. a) Complete the table below for the function $y=-2x^2 + 3x + 4$ for the range $-2 \leq x \leq 3.5$ by filling in the blank spaces.

b) Use the values from the table above to plot the graph of $y = -2x^2 + 3x + 4$ (3 marks)

c) Use your graph to

i) solve the equation $-2x^2 + 3x + 4 = x + 2$ (3 marks)

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5
y		-5		2	4	5	5	4		-1		-10

ii) determine the ranges of values of x which satisfy the inequality. (2 marks)

$-2x^2 + 3x + 4 \leq -2$

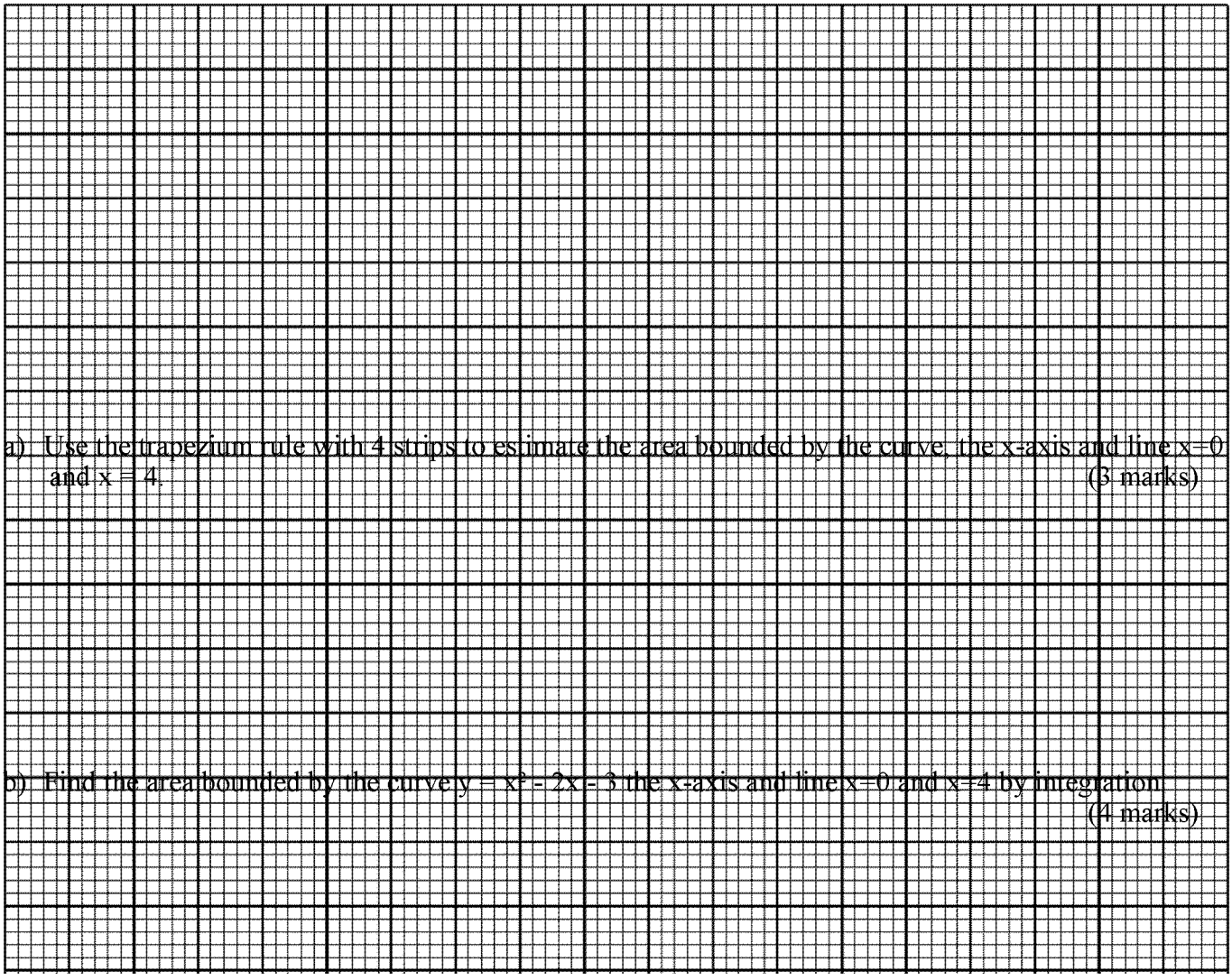
21. A farmer intends to keep goats and cows in his farm. The total number of goats and cows must not exceed 60. The cost of keeping one goat is shs 50 per day while that of a cow is shs 200 per day. The farmer can afford only shs 4,000 per day for animal keeping. The farmer has to have at least 10goats and at least 4 cows. By taking x to be the number of goats and y to be the number of cows.

a) Write down all inequalities to represents the information given above. (4 marks)

b) Represent the inequalities above on the grid below by shading the unwanted region (4 marks)

c) Given that each goat gives a maximum profit of shs 2000 and each cow gives a maximum profit of shs 15,000 upon sale, determine the number of goats and cows that the farmer can keep to obtain maximum profit. (2 marks)

22. The figure below is a sketch of a curve whose equations is $y = x^2 - 2x - 3$



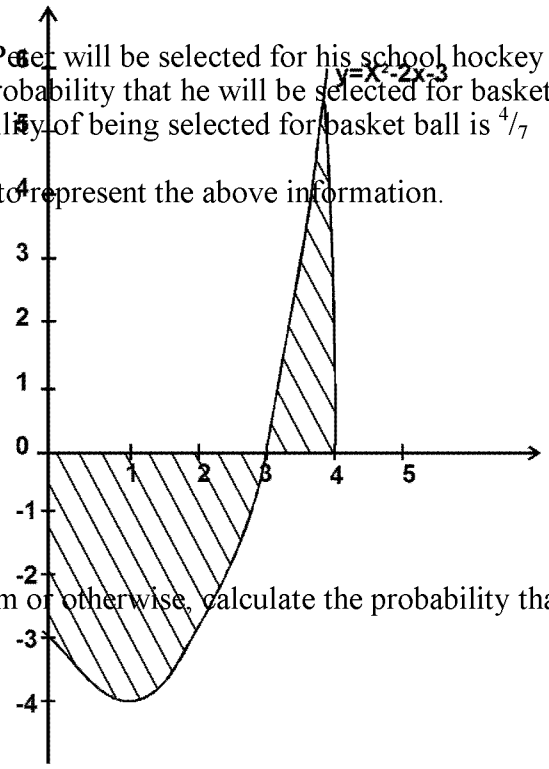
a) Use the trapezium rule with 4 strips to estimate the area bounded by the curve, the x-axis and line x=0 and x = 4. (3 marks)

b) Find the area bounded by the curve $y = x^2 - 2x - 3$ the x-axis and line x=0 and x=4 by integration. (4 marks)

c) Assuming that the area determined by integration to be the actual area, calculate the percentage error in using the trapezium rule. (3 marks)

23. a) The probability that Peter will be selected for his school hockey team is $^1/_3$. If he is selected for the hockey team, then the probability that he will be selected for basketball is $^1/_4$. If he is not selected for hockey, then the probability of being selected for basket ball is $^4/_7$

i) Draw a tree diagram to represent the above information. (2 marks)



ii) Using the tree diagram or otherwise, calculate the probability that Peter is selected for at least one of the teams. (3 marks)

b) A coin is biased such that it shows a tail with a probability of $^1/_3$. The same coin is tossed three times. Find the probability of obtaining.

i) two nails on the first two tosses. (1 mark)

ii) a head, a tail and a head in that order. (1 mark)

iii) two heads and one tail. (3 marks)

24. Three consecutive terms of a G.P are y + 2, y - 2 and y - 5

a) the value of *y*. (3 marks)

b) the common ratio (1 mark)

c) If y + 2 is the third term of the G.P, find
i) the first term giving your answer as a fraction. (3 marks)

ii) the sum of the first five terms correct to 2 decimal places. (3 marks)