

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE  
OF BACHELOR OF ARTS, BACHELOR OF SCIENCE (AGRICULTURAL  
EDUCATION), BACHELOR OF SCIENCE (NATURAL RESOURCE MANAGEMENT),  
BACHELOR OF SCIENCE (TOURISM), BACHELOR OF SCIENCE (AGRICULTURE),  
NURSING UPGRADING, HORT, FOOD SCIENCE, NURSING, BIOMEDICAL &  
BACHELOR OF SCIENCE ENVIRONMENTAL SCIENCE

MATH 100: GENERAL MATHEMATICS

STREAMS: "AS ABOVE"

TIME: 2 HOURS

DAY/DATE: FRIDAY 07/12/2018

2.30 P.M. – 4.30 P.M.

INSTRUCTIONS:

- Answer question ONE and any other TWO questions
- All workings must be clearly shown
- Adhere to all instructions on your answer booklet
- Do not write on the question paper

QUESTION ONE (30 MARKS)

(a) Solve the equation

$$\frac{2x}{7} - \frac{1-2x}{3} = \frac{4}{7}$$

[2

marks]

(b) Show that  $\frac{2 \times (3^{n+1}) + 7(3^{n-1})}{3^{n+2} - 2 \times \left(\frac{1}{3}\right)^{1-n}} = 1$

[4 marks]

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- (c) Given that data;  
23, 27, 32, 38, 40 [3 marks]

Find the:

- (i) Mean square deviation (variance)  
(ii) Coefficient of variation
- (d) Name the properties of real numbers that justify each statement:
- (i)  $4(50) = 4(50)$  [1 mark]  
(ii)  $3(10+7) = 3 \times 10 + 3 \times 7$  [1 mark]  
(iii)  $a + (-a) = 0$  [1 mark]  
(iv)  $-22 - (4+6) = (-22-4) - 6$  [1 mark]

- (e) If  $f(x) = x + \frac{1}{5}$ , and  $g(x) = \frac{1}{4}x + 3$

- (i)  $(f+g)(1)$  [3 marks]  
(ii)  $(2f(x) - 3g(x))$  [2 marks]

- (f) Solve the following quadratic equation using the method of completing the square:  
 $2x^2 + 3x - 4 = 0$  [4 marks]

- (g) (i) Find  $\frac{dy}{dx}$  given that  $y = \frac{x^4 - 6}{3x + 4}$  [3

marks]

- (ii) Factorize each of the following expressions:  
 $3px - qy + 3qx - py$  [1 mark]  
 $a^2 - 4ap - 4p + a$  [1 mark]

- (h) Solve the following equation: [3 marks]  
 $9^{x+2} + 3^{2x+3} = 270$

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**QUESTION TWO (20 MARKS)**

- (a) The data below shows the mass of 32 Apes of ages 1 to 8 years in the Animal Orphanage at the Tsavo National Park in the December 2017

|             |         |         |         |         |         |         |
|-------------|---------|---------|---------|---------|---------|---------|
| Mass (kg)   | 10 – 15 | 15 – 20 | 20 – 25 | 25 - 30 | 30 – 35 | 40 – 45 |
| No. of Apes | 1       | 6       | 10      | 9       | 4       | 2       |

Calculate:

- (i) Mean [4 marks]  
(ii) Standard deviation [3 marks]  
(iii) Mode [2 marks]
- (b) For the curve  $y = x^2 + 3x - 5$  find the following at the point  $x = 1$  : [4 marks]  
(i) The equation of the tangent to the curve  
(ii) The equation of the normal to the curve
- (c) Find the value of  $n$  given that when  $f(x) = x^5 + 4x^4 - 6x^2 + nx + 2$  is divided by  $x + 2$  the remainder is 6. [3

marks]

- (d) Simplify:  $243 \cdot (27)^{\frac{-4}{3}}$

[1 mark]

- (e) Evaluate:  $\log\left(\frac{3}{5}\right)^{\frac{4}{7}} - \log\left(\frac{5}{3}\right)$  . [3

marks]

**QUESTION THREE (20 MARKS)**

- (a) Draw a cumulative frequency curve for the data provided below: [2 marks]

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|                 |         |         |         |         |         |
|-----------------|---------|---------|---------|---------|---------|
| Age (years)     | 15 – 19 | 20 – 24 | 25 – 29 | 30 – 34 | 35 – 39 |
| No. of students | 4       | 7       | 13      | 10      | 6       |

From the graph, answer the question below:

- (i) Estimate the quartile deviation of the age of students [2 marks]
- (ii) Estimate the 45<sup>th</sup> percentile of the age of students [1 mark]
- (iii) Find the middle 30% of the age of students [3 marks]
- (iv) Find the percentage of the students who were between 23 and 30 years of age

[1 mark]

- (b) (i) The expression  $x^3 + kx^2 - 2x - 4$  is fully divisible by  $(x+1)$   
Find the value of  $k$  [3 marks]

marks]

- (ii) Simplify  $(64)^{\frac{5}{6}}$  using the laws of indices [2 marks]

- (c) Evaluate  $\frac{dy}{dx}$  given that:

- (i)  $y = (3x^2 + 4)^{\frac{1}{2}}$  [3 marks]

- (ii) Differentiate from the first principles  $y = \sqrt{2x^2 + 4x}$  [3 marks]

**QUESTION FOUR (20 MARKS)**

- (a) Given  $f(x) = 2x + x^2$  and  $g(x) = 4x + 3$ , evaluate:

- (i)  $f(g(-2))$  [2 marks]

- (ii)  $f(2x) + g(2)$  [2 marks]

marks]

(iii)  $f^{-1}(1)$  [2 marks]

marks]

(b) Solve for  $x$  in the following equation:

(i)  $\log(x+1) + \log\left(\frac{x}{2}\right) = \log(x+3)$  [3 marks]

(ii)  $4^{x+1} \cdot \left(\frac{1}{32}\right)^{2-x} = 16^{x-\frac{1}{2}}$  [3 marks]

(c) For the following function, determine the nature of the turning points: [2 marks]

$$y = 2x + 4 - 3x^2$$

(d) Evaluate the following without using a calculator: [3 marks]

(i)  $\left(\frac{64}{0.125}\right)^{\frac{1}{3}}$

(ii)  $\left(\frac{8}{27}\right)^{\frac{2}{3}}$

(e) Find  $h \circ f$  and  $f \circ h$  given  $h(x) = 2x$  and  $f(x) = (x/2) + 1$  [3 marks]

**QUESTION FIVE (20 MARKS)**

(a) The weights of fifty cartons of cooking fat are given below:

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 34 | 38 | 30 | 31 | 37 | 43 | 38 | 37 | 32 | 40 |
| 41 | 34 | 37 | 36 | 32 | 38 | 41 | 35 | 37 | 38 |
| 35 | 37 | 32 | 40 | 39 | 31 | 33 | 37 | 37 | 43 |
| 34 | 35 | 39 | 41 | 37 | 38 | 38 | 41 | 43 | 30 |
| 32 | 36 | 32 | 35 | 38 | 34 | 38 | 37 | 34 | 36 |

(i) Write down a grouped frequency table (beginning with class 30-32) [2 marks]

(ii) Calculate: Median, 60<sup>th</sup> percentile and quartile deviation [6 marks]

(iii) Draw a histogram and a frequency polygon on the same axes [4 marks]

(b) (i) State the Factor Theorem [1 mark]

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(ii) Use the long division method to show that  $x^3+4x^2+x-6$  is divisible by

$$(x+2)$$

[2

marks]

(iii) Confirm your results in (i) above using the Factor Theorem [2 marks]

(iv) Hence, solve  $x^3+4x^2+x-6=0$  [3 marks]

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