



MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (BIOLOGY)

SMA 100: MATHEMATICS FOR SCIENCE

DATE: 24/2/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) Define the following terms
- i. Symmetrical difference
 - ii. Absolute complement
 - iii. Relative complement
 - iv. Conditional equation
 - v. Geometric progression (5 marks)
- b) Solve for y $\frac{4y-4}{10y+2} = \frac{2y-18}{5y+6}$ (4 marks)
- c) The 6th term of a G.P is 27, and the common ratio is 3. Write the first five terms of the progression. (4 marks)
- d) Solve the inequality $|2x - 18| \leq 12$ and plot the graph (4 marks)
- e) Solve the following quadratic equation by quadratic formula.

$$3x^2 - 9x - 10 = 0 \quad (3 \text{ marks})$$

- f) How many terms of the progression $-1, 1, 3, 5, \dots$ must be used if we want the sum to be 360. (4 marks)
- g) Solve the equation $2\tan \theta = 4\sin \theta$, for value of θ from 0° to 360° (3 marks)
- h) suppose a die was tossed 2 times what is the probability of getting
- 6 in two occasions
 - A sum of 9
 - A sum of 7 or 8 (3 marks)

QUESTION TWO (20 MARKS)

- a) Simplify $\frac{1}{\sqrt{x^2-a^2}}$ when $x = a \operatorname{cosec} \theta$ (5 marks)
- b) Solve the equation $1 + \cos \theta = 2\sin^2 \theta$, for the values of θ from 0° to 360° (5 marks)
- c) Sketch the graph of $y = 3\sin 2(x - \frac{\pi}{4})$ for $0 \leq x \leq 2\pi$. Find its wavelength and amplitude (5 marks)
- d) A man who works five days a week can travel to work on foot, by bicycle or by bus. In how many ways can he arrange a week's travelling to work? (5 marks)

QUESTION THREE (20 MARKS)

- a) Solve for x , $5^{2x} - 3 = 1.2$ (5 marks)
- b) If $\log_3(2x + 4) = \log_3 4 + 2$ solve for x (5 marks)
- c) Simplify $\frac{11!}{9!7!} + \frac{12!}{10!6!} + \frac{13!}{11!5!}$ (3 marks)
- d) Determine the value of x for which the following form an AP.
 $2x + 1, x + 4, 4x + 5$ (3 marks)
- e) The first term of A.P is 4, the last term is 36 and the sum is 500. Find the number of terms and the common difference. (4 marks)

QUESTION FOUR (20 MARKS)

- a) In a class of 200 students ,80 students study statistics ,60 study chemistry and 30 study both chemistry and statistics. If a student is selected at random,find the probability that he studies
- chemistry and not statistics
 - statistics and not chemistry
 - statistics or chemistry
 - neither chemistry nor statistics (8 marks)
- b) For the following grouped data find the
- Median
 - Mode
 - Mean (12 marks)

class	frequency
20-30	8
30-40	7
40-50	10
50-60	5

QUESTION FIVE (20 MARKS)

- a) Solve the following equation by quadratic formula.
 $px^2 - (2p + q) + (p + q) = 0$ (4 marks)
- b) Solve the inequality and represent it graphically $|6x - 14| \geq 12$ (4 marks)
- c) Solve for x , $8^{2x} - 2 = 6.2$ (4 marks)
- d) i) Solve each of the following logarithmic equation
 $\log_2(x - 1) + \log_2 x = 5$ (3 marks)
- ii) Evaluate
 $5\sqrt{\frac{12.6x2.14}{13.62+657}}$ (5 marks)