



Murang'a University College

(A Constituent College of Jomo Kenyatta University of Agriculture and Technology)
University Examination

School of Pure and Applied Sciences

**Supplementary/Special Examination for the degree of;
Bachelor of Science in Mathematics & Computer Science,
Bachelor of Science in Information Technology,
Bachelor of Science in Applied Statistics with Programming,
Bachelor of Science in Mathematics & Economics,
Bachelor of Science in Software Engineering - Year ONE
AMM 2103/SMA 2104 MATHEMATICS FOR SCIENCE.**

Date: June/July 2016

2 Hours

INSTRUCTIONS: Attempt Question **One** and any other **Two** Question.

Question One (30 Marks)

- (a) If $3^x \times 9^{2y} = 27$ and $2^x \times 4^{-y} = \frac{1}{8}$, calculate the values of x and y .
(5 Marks)
- (b) Solve the equation $2x = \sqrt{x+3}$.
(5 Marks)
- (c) Suppose that 7 people enter a swim meet. Assuming that there are no ties, in how many ways could the gold, silver, and bronze medals be awarded?
(5 Marks)
- (d) Prove that $\frac{\tan^2\theta+2}{1+\tan^2\theta} = 1 + \cos^2\theta$.
(5 Marks)
- (e) Find the sum to infinity of a GP with first term -10 and common ratio 0.1.
(3 Marks)
- (f) Calculate $P(A \cup B)$ if it is given that $P(A) = 1/3$ and $P(B|A^C) = 1/4$.
(5 Marks)

(g) Define the following terms:

(i) Sample spaces **(1 Mark)**

(ii) Events **(1 Mark)**

Question Two (20 Marks)

a) Simplify

(i) $a^{\frac{1}{3}} \times a^{\frac{2}{5}} \div a^{\frac{1}{2}}$ **(2 Marks)**

(ii) $\sqrt[3]{a} \div \sqrt[5]{a^2} \times (a^{-1})^{\frac{1}{2}}$. **(3 Marks)**

(b) Solve the equation $2^{2x+3} + 2^{x+3} = 1 + 2^x$. **(10 Marks)**

(c) A central angle in a circle of radius 5 m cuts off an arc of length 2 m. What is the measure of the angle in radians? What is the measure in degrees? **(5 Marks)**

Question Three (20 Marks)

(a) Solve the quadratic equations below by completing the square:

(i) $t^2 - 10t + 34 = 0$; **(5 Marks)**

(ii) $4u^2 - 8u + 5 = 0$. **(5 Marks)**

(b) (i) Find the remainder when $2x^3 - 5x^2 + x - 3$ is divided by $x - 1$. **(3 Marks)**

(ii) Find the remainder when $x^4 + 4x^2 + 3x - 7$ is divided by $x + 3$. **(3 Marks)**

(iii) Find the remainder for $(x^3 - 5x^2 + 6x - 4) \div (x - 2)$. **(4 Marks)**

Question Four (20 Marks)

(a) (i) If you have 6 New Year greeting cards and you want to send them to 4 of your friends, in how many ways can this be done?

(3 Marks)

(ii) In a box, there are 5 black pens, 3 white pens and 4 red pens. In how many ways can 2 black pens, 2 white pens and 2 red pens be chosen?

(3 Marks)

(b) (i) A traffic inspector has counted the number of automobiles passing a certain point in 100 successive 20-minute time periods. The observations are listed below.

23	20	16	18	30	22	26	15	5	18
14	17	11	37	21	6	10	20	22	25
19	19	19	20	12	23	24	17	18	16
27	16	28	26	15	29	19	35	20	17
12	30	21	22	20	15	18	16	23	24
15	24	28	19	24	22	17	19	8	18
17	18	23	21	25	19	20	22	21	21
16	20	19	11	23	17	23	13	17	26
26	14	15	16	27	18	21	24	33	20
21	27	18	22	17	20	14	21	22	19

Construct a histogram for the traffic data. **(9 Marks)**

(ii) The following data give the time in months from hire to promotion to manager for a random sample of 25 software engineers from all software engineers employed by a large telecommunications firm.

5	7	229	453	12	14	18	14	14	483
22	21	25	23	24	34	37	34	49	64
47	67	69	192	125					

Calculate the variance for this sample. **(5 Marks)**

Question Five (20 Marks)

- (a) (i) Find the general term of the GP

$$16, 8, 4, 2, 1, 0.5, 0.25, 0.125, \dots$$

(3 Marks)

- (ii) A GP has third term 12 and fifth term 48. Find the first term and the common ratio. **(7 Marks)**

- (b) (i) A homeowner has just installed 20 light bulbs in a new home. Suppose that each has a probability 0.2 of functioning more than three months. What is the probability that at least five of these function more than three months? **(5 Marks)**

- (ii) From (b) (i) above what is the average number of bulbs the homeowner has to replace in three months? **(5 Marks)**