



**Murang'a University College**

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

**School of Pure and Applied Sciences**

**End of Semester Examination for the Bridging Certificate in Mathematics**  
**SBM 0104: PROBABILITY AND STATISTICS.**

Date: May 2015

2 Hours

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

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**Question One (30 Marks)**

- (a) Find the sample space for rolling two dice. **(5 Marks)**
- (b) Use a tree diagram to find the sample space for the gender of three children in a family. Use  $B$  for boy and  $G$  for girl. **(5 Marks)**
- (c) The distribution of ages of CEOs is as follows:

Age	Frequency
21-30	1
31-40	8
41-50	27
51-60	29
61-70	24
71-up	11

If a CEO is selected at random, find the probability that his or her age is

- (i) Between 31 and 40 **(2 Marks)**
- (ii) Under 31 **(1 Mark)**

(iii) Over 30 and under 51 **(1 Mark)**

(iv) Under 31 or over 60. **(1 Mark)**

(d) In a study of water pollution, a sample of mussels was taken and lead concentration (milligrams per gram dry weight) was measured from each one. The following data were obtained:

$$\{113.0, 140.5, 163.3, 185.7, 202.5, 207.2\}$$

Calculate the

(i) mean  $\bar{x}$  **(2 Marks)**

(ii) variance  $s^2$  **(2 Marks)**

(iii) standard deviation  $s$ . **(1 Mark)**

(e) The density function of a random variable  $X$  is given by

$$f(x) = \begin{cases} \frac{1}{2}x & 0 < x < 2 \\ 0 & \text{otherwise.} \end{cases}$$

Find the expected value of  $X$ . **(5 Marks)**

(f) Let  $X$  and  $Y$  be the random independent events of rolling a fair die. Compute the

(i) expected value of  $X + Y$ . **(3 Marks)**

(ii) variance of  $X + Y$ . **(2 Marks)**

### Question Two **(20 Marks)**

(a) If two dice are rolled one time, find the probability of getting these results.

(i) A sum of 6 **(1 Mark)**

(ii) Doubles **(2 Marks)**

(iii) A sum of 7 or 11 **(3 Marks)**

(iv) A sum greater than 9 **(2 Marks)**

(v) A sum less than or equal to 4. **(2 Marks)**

- (b) A couple has three children. Find each probability.
- (i) All boys (1 Mark)
  - (ii) All girls or all boys (4 Marks)
  - (iii) Exactly two boys or two girls (3 Marks)
  - (iv) At least one child of each gender. (2 Marks)

**Question Three (20 Marks)**

- (a) The Bargain Auto Mall has these cars in stock.

	SUV	Compact	Mid-sized
Foreign	20	50	20
Domestic	65	100	45

If a car is selected at random, find the probability that it is

- (i) Domestic (3 Marks)
  - (ii) Foreign and mid-sized (3 Marks)
  - (iii) Domestic or an SUV. (4 Marks)
- (b) The following are the activity values (micromoles per minute per gram of tissue) of a certain enzyme measured in the normal gastric tissue of 35 patients with gastric carcinoma:

0.360 1.189 0.614 0.788 0.273 2.464 0.571  
 1.827 0.537 0.374 0.449 0.262 0.448 0.971  
 0.372 0.898 0.411 0.348 1.925 0.550 0.622  
 0.610 0.319 0.406 0.413 0.767 0.385 0.674  
 0.521 0.603 0.533 0.662 1.177 0.307 1.499

Calculate the

- (i) mean  $\bar{x}$  (4 Marks)
- (ii) variance  $s^2$  (4 Marks)
- (iii) standard deviation  $s$ . (2 Marks)

**Question Four (20 Marks)**

- (a) Eighty students in a school cafeteria were asked if they favored a ban on smoking in the cafeteria. The results of the survey are shown in the table.

Class	Favor	Oppose	No opinion
Freshman	15	27	8
Sophomore	23	5	2

If a student is selected at random, find these probabilities.

- (i) Given that the student is a freshman, he or she opposes the ban. **(5 Marks)**
- (ii) Given that the student favors the ban, the student is a sophomore. **(5 Marks)**
- (b) (i) Suppose that a game is to be played with a single die assumed fair. In this game a player wins \$20 if a 2 turns up; \$40 if a 4 turns up; loses \$30 if a 6 turns up; while the player neither wins nor loses if any other face turns up. Find the expected sum of money to be won. **(5 Marks)**
- (ii) Find the variance of the game played in (i) above. **(5 Marks)**

**Question Five (20 Marks)**

- (a) (i) Find the constant  $c$  such that the function

$$f(x) = \begin{cases} cx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$

is a density function. **(5 Marks)**

- (ii) From (i) above find  $P(1 < X < 2)$ . **(5 Marks)**
- (b) The table below gives the values of serum cholesterol levels for 1067 U.S. men aged 25 to 34 years.

Cholesterol Level (mg/100 mL)	Number of Men
80-119	13
120-159	150
160-199	442
200-239	299
240-279	115
280-319	34
320-399	14
Total	1067

- (i) Plot the histogram, frequency polygon, and cumulative frequency graph. **(8 Marks)**
- (ii) Find, approximately, the median using your cumulative frequency graph. **(2 Marks)**