

Sample paper
Mathematics 1

Answer any five questions including question number one.

Question 01

- i. A numerical value used as a summary measure for a sample, such as sample mean, is known as a
 - a. population parameter
 - b. sample parameter
 - c. sample statistic
 - d. population mean
 - e. None of the above answers is correct.

- j. Since the population size is always larger than the sample size, then the sample statistic
 - a. can never be larger than the population parameter
 - b. can never be equal to the population parameter
 - c. can never be zero
 - d. can never be smaller than the population parameter
 - e. None of the above answers is correct.

- k. μ is an example of a
 - a. population parameter
 - b. sample statistic
 - c. population variance
 - d. mode
 - e. None of the above answers is correct.

- l. The mean of a sample is
 - a. always equal to the mean of the population
 - b. always smaller than the mean of the population
 - c. computed by summing the data values and dividing the sum by $(n - 1)$
 - d. computed by summing all the items and dividing the sum by the number of items
 - e. None of the above answers is correct.

- m. The sum of the frequencies for all classes will always equal
- a. one
 - b. the number of classes
 - c. the number of items in the study
 - d. 100
 - e. None of the above answers is correct.
- n. In a five number summary, which of the following is not used for data summarization?
- a. the smallest value
 - b. the largest value
 - c. the median
 - d. the 25th percentile
 - e. the mean
- o. Since the mode is the most frequently occurring data value, it
- a. can never be larger than the mean
 - b. is always larger than the median
 - c. is always larger than the mean
 - d. must have a value of at least two
 - e. None of the above answers is correct.
- p. The difference between the largest and the smallest data values is the
- a. variance
 - b. interquartile range
 - c. range
 - d. coefficient of variation
 - e. None of the above answers is correct.
- q. Which of the following is not a measure of central location?
- a. mean
 - b. median
 - c. variance
 - d. mode
 - e. None of the above answers is correct.

- r. If a data set has an even number of observations, the median
- cannot be determined
 - is the average value of the two middle items
 - must be equal to the mean
 - is the average value of the two middle items after arranging in ascending order

Question 02

Mr. A inherited Rs. 25,000 and invested part of it in a savings account, part in municipal bonds, and part in a fixed deposit. After one year, he received a total of Rs. 1,620 in simple interest from the three investments. The savings account paid 6% annually, the bonds paid 7% annually, and the fixed deposit paid 8% annually. There was Rs. 6,000 more invested in the bonds than the fixed deposit.

- Formulate three simultaneous equations.
- Find the amount Mr. A invested in each category by solving the system of equations using matrices.
- If $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ Find AB and the inverse matrix of it.

Question 03

- a. Answer the following questions using the information given.

$$\Omega = \{2,4,6,8,10,12,14\} \quad A = \{2\} \quad B = \{6,12\}, \quad C = \{10,12,14\}$$

- Subsets of A
- Define set A
- $A \cap C$
- $A \cup B$
- $C - B$
- A'
- $A \cup C'$
- $(A \cap B)'$

(1*8 = 8 marks)

- b. Write down two properties a function should satisfy.

- c. There are 59 students in a school and they are asked to join with clubs and societies at school. Each student can join up for a minimum of one and a maximum of three clubs. The three clubs to choose from are the drama club, the dancing club, and the gavel club. A total of 22 students sign up for the drama club, 27 students for the

dancing club, and 28 students for the gavel club. If 6 students sign up for exactly two clubs, how many students sign up for all three clubs?

Question 04

a. Verify the type of the following propositional logics

- i. $(p \Rightarrow q) \vee (q \Rightarrow p)$
- ii. $((p \vee \sim q) \wedge r) \leftrightarrow (\sim(p \wedge r) \vee q)$
- iii. $\sim p \Rightarrow q \vee r$

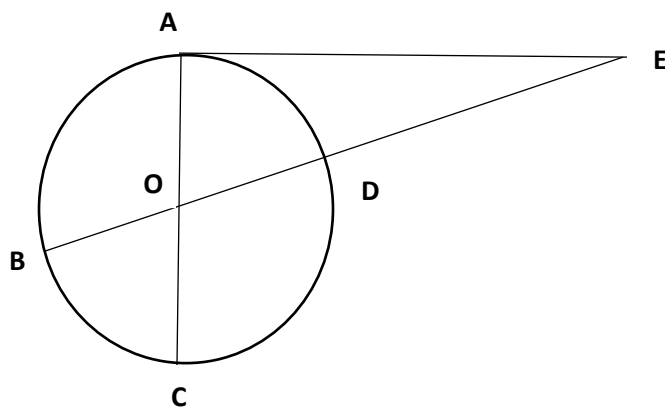
b. Draw truth tables for $p \rightarrow (q \wedge \sim q)$ and $\sim p$. Are they logically equivalent?

Question 05

a. Find all points of intersections of the circle $x^2 + 2x + y^2 + 4y = -1$ and the line $x - y = 1$

b. Find the area of the triangle enclosed by the x - axis and the lines $y = x$ and $y = -2x + 3$.

c. In the figure below points A, B, C and D are on a circle. AE is a tangent to the circle. O is the intersection point of AC and BD. Coordinates of A and D are (2,4) and (2.5,8) respectively. If $AO:OC=1:3$ and $O(3,5)$, Find the equation of the circle and the line equation of the tangent AE.



Question 06

a. Evaluate the following:

I. $\log_7 5$

II. $\log_5 0.008 \log_8 0.125$

III. Solve the following equation $2\log_3(x + 10) - \log_3 2x = 2$
(4 marks)

IV. Solve the equation $4^{2x} - 12(4^x) + 36 = 0$. Find the value of x for three decimal places.

b. Show that $\log_y x = \frac{\log_a x}{\log_a y}$