

Sample paper
Mathematics 1

Answer any five questions including question number one.

Question 01

a. Fill in the blanks with \in , \subseteq , $=$ or \neq . Recall that Z is the set of all integers and ϕ is the empty set.

i. \emptyset ----- $\{1, 3, 7\}$

ii. -5 ----- Z^+

iii. $\{1,3,7\}$ ----- Z

iv. 51 ----- $\{204, 187, 170, \dots\}$

v. 20 ----- $\{4, 8, 12\}$

b. Answer the following questions using the information given.

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

i. Subsets of A

ii. Define set A

iii. $A \cap C$

iv. $A \cup B$

v. $C - B$

vi. A'

vii. $A \cup C'$

viii. $(A \cap B)'$

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 02

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?

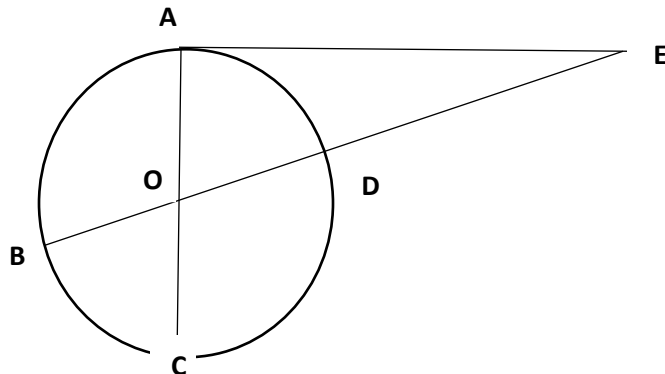
Question 03

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.

- i. Formulate three simultaneous equations.
- ii. Find the amount Mr. A invested in each category by solving the system of equations using matrices.
- iii. 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 04

- 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 05

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 $\log_b x = \frac{1}{\log_x b}$

Question 06

a.

- i. What is the difference between a census and a sample survey?
- ii. What is meant by a statistic?
- iii. What is the difference between a population and a survey?
- iv. Explain quantitative variables using an example.
- v. Explain qualitative variables using an example.

b. Following frequency distribution tables shows the distribution of the Z-Score of G.C.E (A/L) examination of 100 students.

Class Interval (z-Score)	Number of Students
0 - 0.5	40
0.5 - 1.0	30
1.0 - 1.5	10
1.5 - 2.0	15
2.0 – 2.5	5

- i. Draw the histogram using the frequency distribution table.
- ii. Find the mean value of the distribution.
- iii. Find the mode value of the distribution.
- iv. Find the variance.
- v. Find the standard deviation.