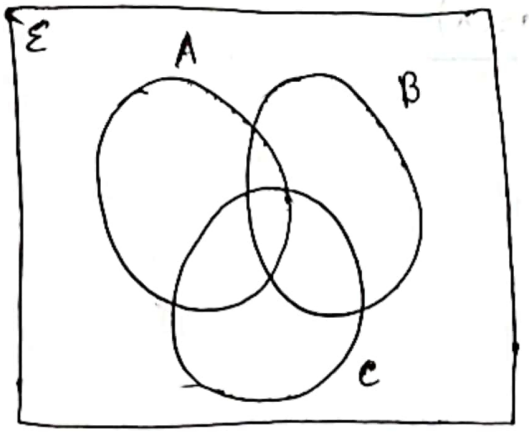
1) All of 120 different vitamin pills contain at least one of the vitamins A,B and C. 24 have A only, 14 have B only, and 22 have C only. If 12 have all the three vitamins and there are x having A and B only, B and C only and A and C only, how many pills contain vitamin A?

2) 100 interviewees interviewed for a position at a five star hotel. From the interviewees, 50 had a bike, 35 had a scooter, 70 had a cycle. 20 of the interviewees had both bike and scooter, 15 had both scooter and cycle, 30 had both bike and cycle and 5 had all three. How many interviewees had none of the three?

3) In a group of 118 people, some are wearing coat, boots or muffler (or a combination of all these), 8 are wearing all three, 14 are wearing just a coat and boots, 6 are wearing just boots and a muffler and 18 are wearing just a coat and muffler. The number wearing only a coat or only boots is x, and the number wearing only a muffler or none of the three items is (x-4). Find x and hence the number of people wearing a coat?

Q4 Shade the following Venn Diagram



a) $C' \cap (A \cap B)$

b) $(A \cup C) \cup B'$

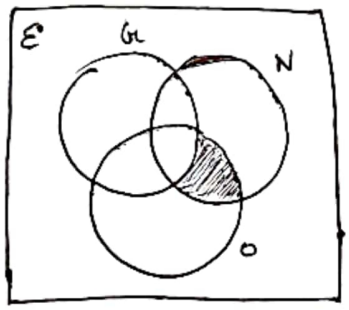
c) $(A \cup C) \cap (B \cap C)$

d) $(A \cup B \cup C)' \cup (B \cap C)$

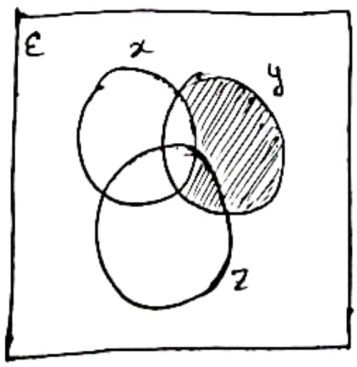
e) $(A \cap B \cap C) \cap (A \cup B \cup C)$

Q5 Describe the shaded region.

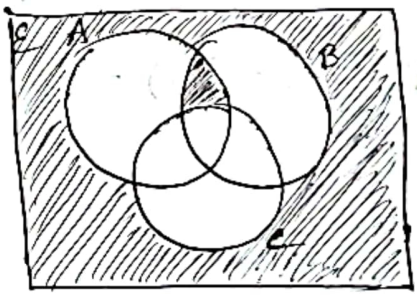
a)



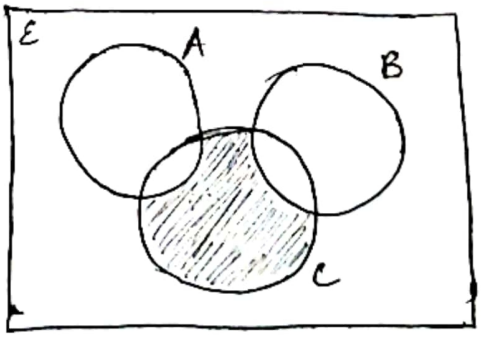
b)



c)



d)



Q6 Find Domain and Range

a) $f: R \to R$, $f(x) = \dfrac{\sin(x) + \cos(x)}{1 - x^2}$

b) $f: R \to R$, $f(x) = \dfrac{1}{x^2 - 2}$

c) $f: R \to R$, $f(x) = \dfrac{1}{1 - x^2}$

d) $f: R \to R$, $f(x) = x^2 - \log(1 + x^2)$

Q7 Find out if the functions are injective, surjective or bijective

a) $f: R \to R$, $f(x) = \dfrac{x^2 + 1}{x^2 + 5}$

b) $f: R \to R$, $f(x) = \dfrac{1}{\log(x) - 1}$

c) $f: R \to R$, $f(x) = x^7 + x^4$

Q8 $U = \{x \in Z : -7 \leq x \leq 7\}$

$A = \{-4, -3, -2, -1, 1, 2, 3, 4\}$

$B = \{-7, -1, 0, 1, 7\}$

a) Express A and B in set builder method

b) Express $A \cap B$ in number line representation

$A \cup B$ and

c) Prove that, $(A \cup B)' = A' \cap B'$ and verify using the given sets.

Q9 $f(x) = \log_2 (7 - 9x)$

Find domain and range of the function and express the points by open set intervals.

Q10

Let $A = \{a, b, c\}$, $B = \{x, y\}$, $C = \{0, 1\}$. Find

a) $A \times B \times C$

b) $C \times B \times A$

c) The power set of A

d) Cardinality of ques (a)

Q11

In Fall 2022 semester, a total of 150 students were enrolled. Out of this, 60 are enrolled in CSE230 and 80 in CSE330 and 30 were not enrolled in any courses.

a) How many students have enrolled in both courses? (Use Inclusion-Exclusion Principle)

b) Represent the information using Venn Diagram

Q12 Express the following set into Set Builder method

$$\left\{\frac{1}{4}, \frac{2}{10}, \frac{4}{28}, \frac{8}{82}, \frac{16}{244}, \frac{32}{730}\right\}$$

Q13 Find domain of the following function:

$$f(x) = \frac{(x-2) \times \sqrt{25-x^2} \times \ln(x+3)}{(2x+5)}$$

Q14 Determine with proof whether $f(g(x))$ is injective or not

$f: \mathbb{R} \to \mathbb{R}$ $f(x) = 4x-5$, $g: \mathbb{R} \to \mathbb{R}$ $g(x) = 7x^2 + 1$

Q15 Suppose, $f(x) = \frac{(3x-1)(5x+2)(7x+11)}{(x-1)(2x+98)}$

If domain of $f(x) = \mathbb{R} - \{a, b\}$, what is the value of $a+b$?