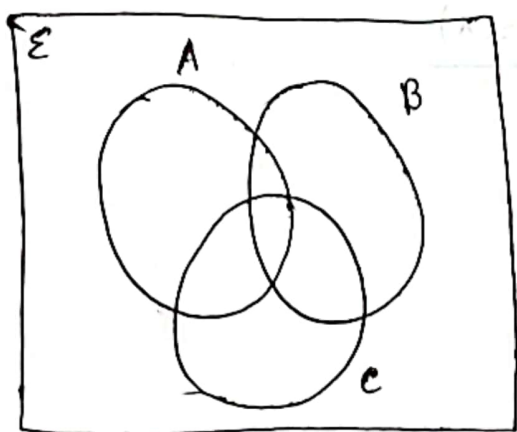


1) All of 120 different vitamin pills contain at least one of the vitamins x, y and z . 24 have A only, 14 have B only, and 22 have C only. If 12 have all the three vitamins and there are x having A and B only, B and C only and A and C only, how many pills contain vitamin X?

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

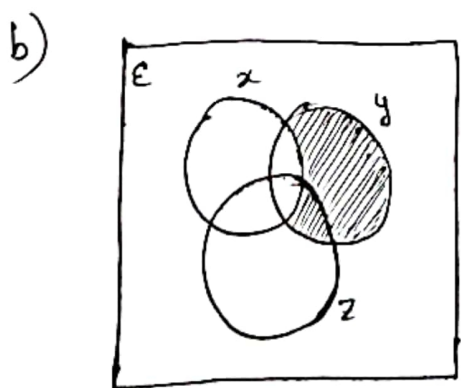
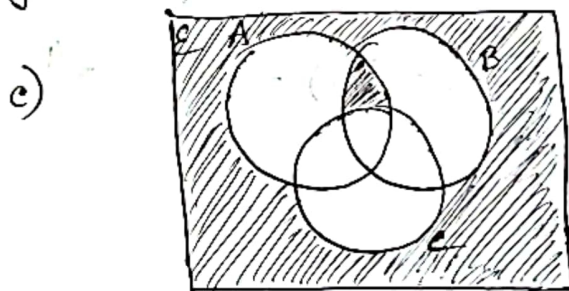
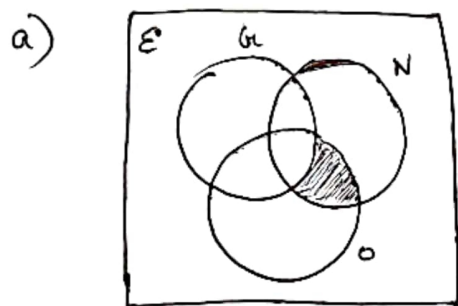
3) In a group of 118 people, some are wearing coat, boots or muffler (or a combination of all these), 8 are wearing all three, 14 are wearing just a coat and boots, 6 are wearing just boots and a muffler and 18 are wearing just a coat and muffler. The number wearing only a coat or only boots is x , and 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

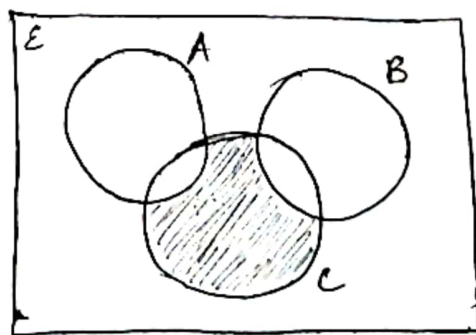


- $C' \cap (A \cap B)$
- $(A \cup C) \cup B'$
- $(A \cup C) \cap (B \cap C)$
- $(A \cup B \cup C)' \cup (B \cap C)$
- $(A \cap B \cap C) \cap (A \cup B \cup C)$

Q5 Describe the shaded region



d)



Q6 Find Domain and Range

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

b) $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = \frac{1}{x^2 - 2}$

c) $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = \frac{1}{1 - x^2}$

d) $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = x^2 - \log(1 + x^2)$

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

a) $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = \frac{x^2 + 1}{x^2 + 5}$

b) $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = \frac{1}{\log(x) - 1}$

c) $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = x^7 + x^4$

Q8

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

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

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

- Express A and B in set builder method.
- Express $A \cap B$ in number line representation
 $A \cup B$ and
- 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

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

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 $a+b$?