1. What is the difference between subset and real subset?

2. A={13,27,21,90,115} and B={21,115,20}
   Is B a real subset of A or not? Show reasons for your answer.

3. C={10,20,30,40,50} and D={f,g,h,i}
   Prove,|C X D|=|C|.|D|

4. A company consists of 150 employees where 80 have laptops,110 have cell phones,125 students have iPods,62 students have both a laptop and a cell phone,58 students have both a laptop and iPod,98 students have both a cell phone and an iPod,50 students have all three items.

   a)Construct venn diagram.

   b) How many students have just a cell phone?

   c) How many students have none of the mentioned items?

   d) How many students have an iPod and laptop but not a cellphone?

5. 14 people only play football,5 people play both football and basketball while 30 people are playing one sport.What is the percentage of people playing basketball?
6. Find set builder notation of A

   a) A={p,q,r,s}

   b)A={0,3,6,9,12}

   c)A={-4,-3,-2,-1,0,1,2}

   d)A={2,4,8,16,32}

   e)A={red,green,yellow}

7. Draw the Venn diagrams for each of these combinations of the sets A, B, and C.

a. $A \cap (B \cup C)$

b. $A' \cap B' \cap C'$

c. $(A - B) \cup (A - C) \cup (B - C)$

8. Suppose that A is the set of sophomores at your school and B is the set of students in discrete mathematics at your school. Express each of these sets in terms of A and B.

   a) the set of sophomores taking discrete mathematics in your school

   b) the set of sophomores at your school who are not taking discrete mathematics

   c) the set of students at your school who either are sophomores or are taking discrete mathematics.

9. Find the domain of the following functions and represent them using the

   (i) Set builder format, (ii) Intervals, and (iii) Number line

   a. $f(x) = \sqrt{}(3X^2 - X + 2)$

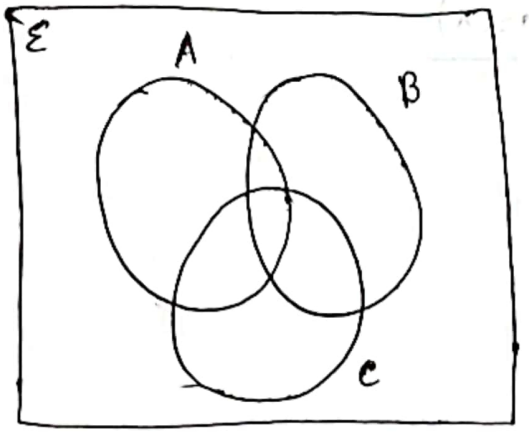
   b. $g(x) = \frac{5x+3}{1-X-2X^2}$

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

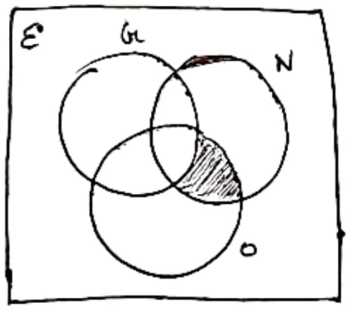
c) $(A \cup C) \cap (B \cap C)$

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

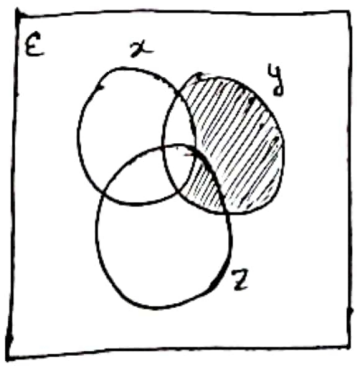
e) $(A \cap B \cap C) \cap (A \cup B \cup C)$

Q5 Describe the shaded region.

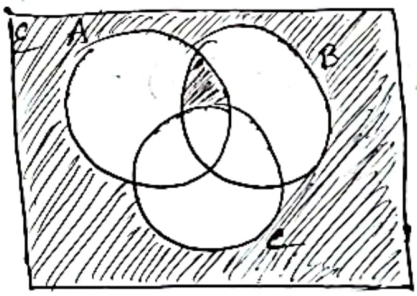
a)



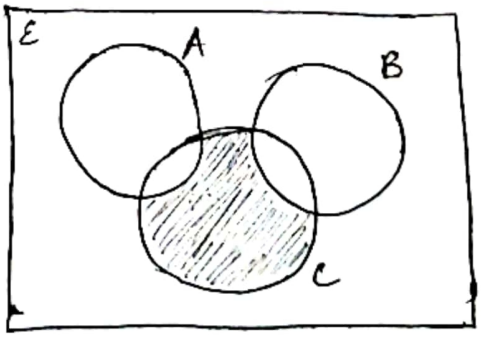
b)



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 $a+b$?

Set:

1. Write the expression in set builder notation. Also provide the number line.
$(-10,3] \cap [-5, 5)$

2. A = {1, 3,5} B = {red, green}
Find out the power sets of set A and B. Also write down the cartesian product of A and B. What's the cardinality of this cartesian product?

3. Use set builder notation to establish the first De Morgan law
$A' \cap B' = (A \cup B)'$

4. A travel group has 105 travelers. Of them, 50 travelers already visited India, 30 Nepal, 20 Bhutan, 6 both India and Nepal, 1 both India and Bhutan, 5 Nepal and Bhutan, and one of them visited all the 3 countries. How many people have not visited any place yet?

Function:

5. Is the relation given by the following set of ordered pairs a function?
{ (1,2), (5,6), (8, 6), (7,2), (9,2), (8,6) }. Explain your reasoning.

6. For $f(x) = cos(4x - 1)$, find the range of f(x). What should be the domain of f(x)?

7. Find the domain of $f(x) = log\,(x^2 - 3)$

8. A student writes the following for the function $f(x) = \frac{x-2}{x^2 - 8x+8}$:

" The domain of f(x) is $(-\infty, -4) \cup (-4 , +\infty)$ "
Is this correct? If not, what is the correct domain of f(x) ?