<u>Exercise - Sets and Relations</u>

Construct sets

$$A = \{a, b, a + b, a + c, b + c, a + b + c\}$$

and

$$B = \{a, c, a - b, a - c, b - a, b - c, c - a, c - b\}$$

where a, b c are last three digits of your student enrollment number. For instance, sutdent's enrollment number is 25IT**<u>15</u>**, then $a = 1, b = 5$ and $c = a + 1 = 5 + 1 = 6$

1. Find
   a. $A \cup B$
   b. $A \cap B$
   c. $A - B$
   d. $B - A$
   e. A^c and B^c
2. Prove De-Morgan's law using above sets
3. Define a relation $\mathcal{R}$ from A to B by:
   $$(x, y) \in \mathbb{R} \iff x + y \text{ is even}$$

   List all ordered pairs in $\mathcal{R}$.

4. Consider the **identity relation** I_A on set A.

   - Write all ordered pairs of I_A.
   - Is it reflexive, symmetric, and transitive?

5. Define relation $\mathcal{R}$ from set A to B by:

   $$(x, y) \in \mathcal{R} \iff x > y$$

Find $\mathcal{R}$ and determine whether it is **antisymmetric**.

6. Suppose relation $\mathcal{R}$ from A to B is defined by:

$$(x, y) \in T \iff x = y + a$$

- Find $\mathcal{R}$.
- Write the inverse relation $\mathcal{R}^{\{-1\}}$.

7. On set B, define relation $\mathcal{R}$ by:

$$(x, y) \in E \iff (x - y) \text{ is divisible by } (a + b)$$

- Show that EE is an **equivalence relation**.
- Find the **equivalence classes** of each element of BB.