Problem 1. Describe the following sets using bar notation – like we learnt in class; e.g. Even numbers = \{x \in \mathbb{Z} \mid 2 \text{ divides } x\}.

1. \(A\) is the set of all integers divisible by 13.
2. \(B = \{\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \cdots\}\).
3. \(C = \{4, 9, 25, 49, 121, \cdots\}\), i.e. the set of squares of Primes.

Problem 2. Prove \(A = B\).

1. \(A = \{x \in \mathbb{Z} \mid x^2 = x\}\). \(B = \{x \in \mathbb{Q} \mid x^2 = x\}\).
2. \(A = \{x \in \mathbb{Z} \mid 12 \text{ divides } x\}\). \(B = \{x \in \mathbb{Z} \mid 3 \text{ divides } x \text{ and } 4 \text{ divides } x\}\)

Problem 3. Compute the following sets.

- \(P(\emptyset)\)
- \(P(P(\emptyset))\)
- \(P(P(\emptyset)))\)

Problem 4. Using Venn diagrams, prove \(|A \cup B| = |A| + |B| - |A \cap B|\).

Problem 5. The symmetric difference operator is defined as follows:
\(A \Delta B = (A\setminus B) \cup (B\setminus A)\).

1. Show \(A \Delta \emptyset = A\) and \(A \Delta A = \emptyset\).
2. Show that if \(A\) and \(B\) are disjoint, then \(|A \Delta B| = |A\setminus B| + |B\setminus A|\).

Problem 6. Prove that \(A \cap (B \Delta C) = (A \cap B) \Delta (A \cap C)\).