

# Discrete Structures

IIIT Hyderabad

Monsoon 2020

*Tutorial 2*

September 21, 2020

## 1 Questions

- Question 0
- Question 1
- Question 2

# Question 0

If  $|A| = m$  and  $|B| = n$  and  $A$  and  $B$  are not mutually disjoint. Let

$$\mathcal{P}_i(S) = \mathcal{P}(\mathcal{P}(\mathcal{P} \dots \mathcal{P}(S))) \text{ } i \text{ times}$$

Comment on the value of  $|\mathcal{P}_4(A - B) - \mathcal{P}_2(A - B)|$ .

**1.1** Prove the following using basic set identities -

- ①  $((A - B) - (B - C))' = A' \cup B$
- ②  $(A \cap (A - B)) \cup (A' \cup B)' = A - B$
- ③  $A \cup (B - C) = (A \cup B) - (C - A)$
- ④  $A \Delta (B \Delta C) = (A \Delta B) \Delta C$

**1.2** Prove the following using element of argument -

- ①  $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$
- ②  $(A \times B) \cup (C \times D) \subseteq (A \cup C) \times (B \cup D)$   
\* [ When equal? ]

## Question 2

To answer please visit the link (or click here): [tinyurl.com/dstut2](https://tinyurl.com/dstut2)

**2.1:** Odd one out (ONLY ONE)

- ❶  $\{(a, b) | (a^2 = 1) \wedge (b^2 = 4)\}$
- ❷  $\{-1, -2, 2, 4\}$
- ❸  $(\{-1, 1\} \times \{-2, 2\}) - \phi$
- ❹  $(\{-1, 1\} \times \{-2, 2\}) \cup \phi$

**2.2:** Select the false statements:

- ❶  $\mathcal{P}(A \times B) = \mathcal{P}(A) \times \mathcal{P}(B)$
- ❷  $\mathcal{P}(A \cap B) = \mathcal{P}(A) \cap \mathcal{P}(B)$
- ❸  $\mathcal{P}(A \cup B) = \mathcal{P}(A) \cup \mathcal{P}(B)$
- ❹  $\mathcal{P}(A - B) = \mathcal{P}(A) - \mathcal{P}(B)$

**2.3:** Find number of primes between 40-100 using PRT.

**2.4:**  $|U| = 20, |A| = 10, |B| = 5, |C| = 5, |A \cap B| = 2, |A \cap C| = 4, |B \cap C| = 1, |A \cap B \cap C| = 1.$

- ❶  $|A \cap B' \cap C|$
- ❷  $|((A - B) \times C)|$
- ❸  $|(A \Delta B) \cup (B \Delta C)|$

**2.5:** Use inclusion exclusion principle to find numbers less than 1000 divisible by none of 2, 3 or 5.