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Elphinstone College, Mumbai - 32

FYIT Semester-1

Discrete Maths Unit-1

Question Bank

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1. If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$. Find $A \cap (B \cup C)$.
2. If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$, $C = \{5, 6, 7, 8\}$. Find $A \cup B \cup C$.
3. If set $A = \{1, 3, 5\}$, $B = \{2, 4, 6\}$ and $C = \{0, 2, 4, 6, 8\}$. Then write the universal set for all three sets.

”Mathematics is not about numbers, equations, computations, or algorithms: it is about understanding.” - William Paul Thurston

4. Write the subsets of $\{1, 2, 3\}$.
5. In a class of 40 students, 22 play hockey, 26 play basketball, and 14 play both. How many students do not play either of the games?
6. For sets $A = \{x \mid x \text{ is an integer, } 1 \leq x \leq 6\}$ and $B = \{x \mid x \text{ is an even integer, } 2 \leq x \leq 8\}$, find the set $A - B$.

”The essence of mathematics is not to make simple things complicated, but to make complicated things simple.” - S. Gudder

7. Given sets $X = \{a, b, c, d\}$ and $Y = \{b, d, e, f\}$, find the symmetric difference of X and Y (denoted as $X \Delta Y$).
8. A survey of 100 students found that 70 students like pizza, 75 like burgers, and 60 like both. How many students like neither pizza nor burgers?
9. If set $M = \{x \mid x \text{ is a prime number less than } 20\}$ and set $N = \{x \mid x \text{ is an odd number less than } 10\}$, what is $M \cap N$?

”Do not worry about your difficulties in Mathematics. I can assure you mine are still greater.” - Albert Einstein

10. Find the power set of $Z = \{2, 7, 9\}$ and a total number of elements.
11. Prove or Disprove: $A \setminus (B \cap C) = (A \setminus B) \cap (A \setminus C)$
12. Define Boolean Algebra and its properties.

”Mathematics is the most beautiful and most powerful creation of the human spirit.” - Stefan Banach

13. Find Converse, Inverse and Contrapositive of the following statements:

- a. If the weather is sunny, then I will go to school.
- b. If $3y - 2 = 10$, then $x = 1$.
- c. If there is rainy weather, then I will go outside to enjoy it.

14. Check the validity of the following argument:

$$\begin{array}{l} P \\ P \rightarrow Q \\ \therefore Q \end{array}$$

15. Prove Using Truth Table:

- (i) $\neg(P \wedge Q) \equiv \neg P \vee \neg Q$
- (ii) $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$

”Mathematics is not about calculations, but concepts.” - W.T. Gowers

16. Determine if $q \rightarrow (p \vee q)$ is a tautology.

17. Test if $(p \vee q) \wedge \neg p \wedge \neg q$ is a tautology.

18. If $A = \{1, 3, 5\}$ and $B = \{2, 3\}$,

- Find $A \times B$

”Mathematics is the art of giving the same name to different things.” - Henri Poincaré

19. Let $f : \{1, 3, 5, 7, 9\} \rightarrow \mathbb{R}$

$$f(x) = x^2 + 2$$

Find Domain and Range of f .

20. Let $f : \{1, 2, 3, 4, 5\} \rightarrow \{1, 2, \dots, 125\}$

$$f(x) = x^3 + 1$$

Find Domain and Range of f .

21. If $|A| = 5$, $|B| = 2$, $|C| = 3$

Find $|A \times B|$, $|P(C)|$, $|C \times B|$, $|P(A) \times P(A)|$.

”Pure mathematics is, in its way, the poetry of logical ideas.” - Albert Einstein