

Well-Defined and Distinct • Well-defined means: Every object either belongs to the set or does not belong, without personal opinion affecting it. - The set of interesting movies — The set of tall students in a class - The set of prime numbers • 'Distinct' means no repetition. • {1,2,2,3} = {1,2,3}

Representations of Sets • Roster Form: A = {2, 4, 6} • Set-builder Form: $B = \{x \mid x \text{ is even and } x < 10\}$

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Quiz 1: Identify Sets • Which of the following are sets? • 1. The set of all nice people • 2. The letters in 'APPLE' • 3. Set of largest planets

Types of Sets

• Empty Set (Ø)

• Singleton Set

• Finite and Infinite Sets

• Equal Sets

• Subsets and Power Set

• Universal Set

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Equal and Equivalent Sets • Equal: A = B if all elements same. • Equivalent: A and B have same number of elements. • Brans Prolect, Assistant Professor, Vignum's Foundation for Science, Tachnology and Research

Question

• A = { x : x^2 - 3x + 2 = 0 }

• B = {2, 1}

• C = {1, 2, 2, 1, 6/3}

• Are A, B, C sets?

• Are A, B, C related?

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Subset and Superset • A⊆B: Every element of A is in B • A⊂B: A is a proper subset • A⊇B: A is a superset of B Dibbaru Palzah, Aslistant Professor, Vagnan's Foundation for Science, 19

Quiz 2: True or False

• 1. $\{1,2\} \subseteq \{1,2,3\}$ • 2. $\{5\} = \{5,5\}$ • 3. $\emptyset \subseteq \{a,b\}$

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Power Set • P(A): Set of all subsets • $A = \{1, 2\} \rightarrow P(A) = \{\emptyset, \{1\}, \{2\}, \{1, 2\}\}$ D Shanu Protect, Assistant Professor, Vignan's Foundation for Science, Technology and Research

Cardinality

• Number of elements in a set

• $n(\{a,b,c\}) = 3$ • $n(\emptyset) = 0$ D Sharu Pralash, Assistant Professor, Vignor's Cardinalism for Science, Technology and Benearch

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Universal Set • Set that contains all objects under discussion • Denoted by U • A⊆U always

Venn Diagrams

• Visual representation of sets
• Circles inside a rectangle (Universal Set)

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Union (A U B) • All elements in A or B or both • Venn: shaded all circles Dibbaro Proketh, Assistant Professor, Vignar's Foundation for Science, Technology and Research

Intersection (A ∩ B)

• Common elements in A and B
• Venn: shaded overlapping area

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Difference (A – B) • Elements in A but not in B • Venn: shaded A excluding overlap Distant Protestor, Vignatis Foundation for Science, Technology and Research

Complement (A')

• Elements in Universal Set but not in A

• Venn: shaded outside A

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Symmetric Difference (A △ B) • Elements in A or B but not in both • (A − B) U (B − A) D Bhane Probath, Addition Professor, Vignan's Foundation for Science, Technology and Research

Quiz 3: Set Operations

• Given A = {1,2,3}, B = {3,4,5}:

• 1. A U B = ?

• 2. A ∩ B = ?

• 3. A - B = ?

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De Morgan's Laws • (A ∪ B)' = A' ∩ B' • (A ∩ B)' = A' ∪ B' Definition Principle. Definition Principle. Definition of Science. Technology and Research 21

Visual: De Morgan's Law

• Use Venn diagrams to verify laws visually

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Cartesian Product (A × B) • Set of ordered pairs (a, b) • A = {1,2}, B = {x,y} → A × B = {(1,x),(1,y),(2,x),(2,y)} Defiant Prikach, Assistant Professor, Vignam's Foundation for Science, Technology and Research

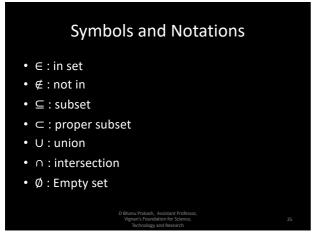
Quiz 4: Product & Cardinality

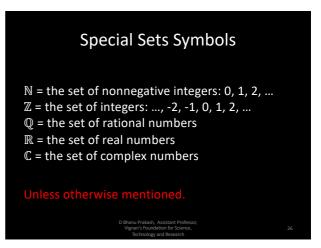
• 1. If A has 3 elements, B has 2 elements, how many in A × B?

• 2. Is A × B = B × A?

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Think & Solve $\text{ • Let A} = \{x \in \mathbb{N} \mid x < 10 \text{ and } x \text{ divisible by 3}\}, \\ \text{ • B} = \{x \in \mathbb{N} \mid x < 10 \text{ and } x \text{ divisible by 2}\} \\ \text{ • Find A} \cap B$ $\text{ • Distant Polach, Assistant Professor, } \\ \text{ Wignar's Foundation for Science, } \\ \text{ Technology and Research}$

Final Quiz In a class: - 25 students like math - 20 like physics - 10 like both How many like only math?

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Final Quiz 1. Can Ø be a subset of every set? 2. Is {a,b} = {b,a,a}? 3. What is P({Ø})?

Summary

- Understand elements, representations
- Master symbols & Venn diagrams
- Practice De Morgan and set operations
- Use symbols for operations and relationships.
- Visual tools: Venn Diagrams, Power Sets.
- Set theory is foundational in logic and math.

D Bhanu Prakash, Assistant Professor Vignan's Foundation for Science,

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