

MATH 210 FINITE MATHEMATICS

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6.1 Sets and Counting

Definition 1

Set:

Definition 2

Elements:

Example 1

$$A = \{m, a, t, h\}$$

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Definition 3: Element of

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Definition 4: Not an Element of

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Definition 5: Set Builder Notation

A rule that is given that describes the property an object x must satisfy

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Definition 6: Set Equality

Which sets are equal?

Definition 7: Subset

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Definition 8: Proper Subset

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Example 2

Let $A = \{1, 2, 3\}$, $B = \{3, 1, 2\}$, and $C = \{1, 2, 3, 4\}$

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Definition 9: Empty Set

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Example 3

List all subsets of $A = \{2, 1, 0\}$

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Definition 10: Universal Set

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Example 4

Suppose we are discussing the lower case letters of the alphabet.

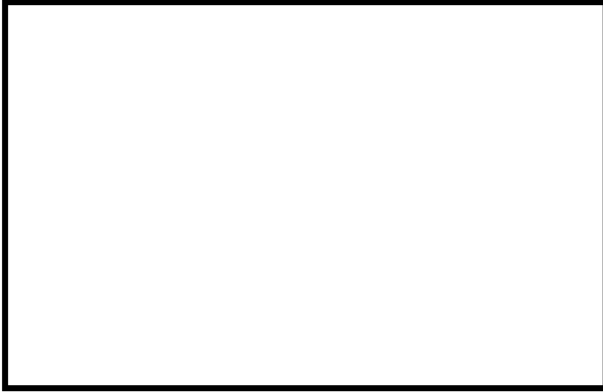
Venn Diagram

1. A Venn Diagram can be used to visually represent sets
2. The universal set, U , is represented by a rectangle
3. Subsets of U are regions inside the rectangle

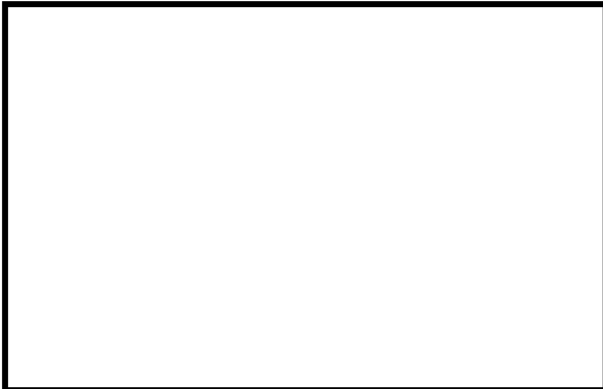


Definition 11: Set Union

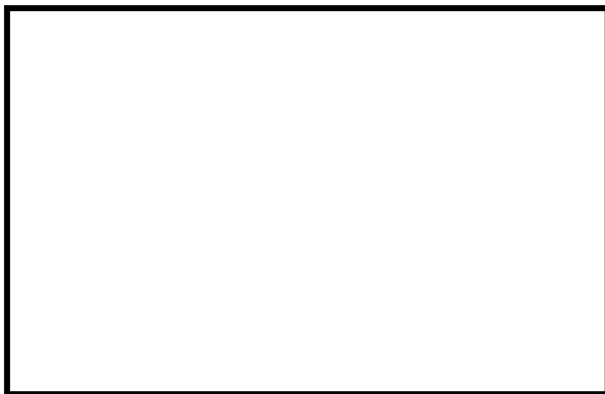
Let A and B be sets.

**Definition 12: Set Intersection**

Let A and B be sets.

**Example 5**

- $U = \{m, a, t, h, r, u, l, e, s\}$
- $A = \{m, a, t, h\}$
- $B = \{a, h, u, e\}$

Definition 13: Complement of a Set**Example 6**

Let $U = \{m, a, t, h, r, u, l, e, s\}$ and $A = \{m, a, r, s, h\}$

Definition 14: Set Complementation

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Definition 15: Disjoint Sets

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Example 7

Let $A = \{1, 3, 5, 7\}$, $B = \{2, 4, 6, 8\}$ and $C = \{0, 1, 5, 9\}$

Which sets are disjoint?

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Definition 16: Set Operations

- Commutative Law

- Associative Laws

- Distributive Laws

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Definition 17: DeMorgan's Laws

Example 8

Let A , B , and C be subsets of a universal set U . Shade the following

1. $A \cup B \cup C^c$



2. $A \cap B \cap C$



3. $(A \cup B)^c \cap C$

**Example 9**

Given the sets $U = \{1, 2, 3, 4, 5, 6, 7\}$, $A = \{1, 2, 5, 7\}$, $B = \{3, 4, 5\}$, and $C = \{1, 7\}$.

Find

1. B^c

2. $(A \cup C) \cap B$

3. $C^c \cap (A \cup B)^c$

4. $A \cup A^c$

Example 10

Let U denote the set of all cars in a dealer's log

$$A = \{x \in U \mid x \text{ is equipped with automatic transmission}\}$$

$$B = \{x \in U \mid x \text{ is equipped with air conditioning}\}$$

$$C = \{x \in U \mid x \text{ is equipped with side air bags}\}$$

Find an expression in terms of A , B , and C

1. The set of all cars with at least one of the given options
2. Set of all cars with exactly one of the given options
3. The set of all cars with automatic transmission and side air bags but no air conditioning