

SECTION 8.1 – SET THEORY

Terminology

Set – a collection of objects

Element – the members of a set

Symbols: \in - is an element of \notin - is not an element of

Empty set – a set with no elements Symbol: \emptyset

Equal sets – sets that contain *exactly* the same elements

Set-builder notation – $\{x|x \text{ has property } P\}$

SEE EXAMPLE 1

Universal set – a set that contains all objects being discussed

Subset – A is a subset of B if every element of A is an element of B

Symbols: \subseteq - is a subset of $\not\subseteq$ - is not a subset of

SEE EXAMPLES 2, 3, & 4

Complement of a set – the set of all elements of the universal set which do not belong to another set Symbol: A' - the complement of set A

SEE EXAMPLE 5

Intersection of sets – the set of all elements belonging to all sets Symbol: \cap

Union of sets – the set of all elements belonging to either set or both sets

Symbol: \cup

Disjoint sets – sets that have no elements in common

SEE EXAMPLES 6 & 7

Example 1:

List the elements belonging to each set:

- a) $\{x|x \text{ is a natural number less than } 5\}$
- b) $\{x|x \text{ is a state that borders Louisiana}\}$

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Example 2:

True or False?

a) $\{3, 4, 5\} \subseteq \{2, 3, 4, 6\}$

b) $\{3, 4, 5, 6\} \subseteq \{2, 3, 4, 5, 6, 7, 8\}$

NOTE: $\emptyset \subseteq A$ and $A \subseteq A$

Example 3:

List all possible subsets for each set.

a) $\{7, 8\}$

b) $\{a, b, c\}$

NOTE: A set of n elements has 2^n subsets.

Example 4:

Find the number of subsets for each of the following:

a) $\{3, 4, 5, 6, 7\}$

b) $\{x \mid x \text{ is a day of the week}\}$

c) \emptyset

Example 5:

Let the Universal Set $U = \{1, 2, 3, 4, 5, 6, 7\}$, $A = \{1, 3, 5, 7\}$, and $B = \{3, 4, 6\}$. Find:

a) A'

b) B'

c) \emptyset'

d) U'

Example 6:

a) $\{9, 15, 25, 36\} \cap \{15, 20, 25, 30, 35\}$

b) $\{x \mid x \text{ is a teenager}\} \cap \{x \mid x \text{ is a senior citizen}\}$

Example 7:

a) $\{1, 2, 5, 9, 14\} \cup \{1, 3, 4, 8\}$

b) $\{t, s, c, d\} \cup \{s, c, b\}$