Chapter 2 Set Theory

Section 2.1: Sets and Subsets

A set is a collection of items, referred to as the elements of the set.

Example 1: ***A*** **= Northwest States = {*WI, MN, ND, MT, ID, WA*}**

The set represent group of states in which each state is an element that is included in the set.

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$ID \in A$; also $MN, ND \in A$

But $IN \notin A$ *(Indiana is not an element of set A)*

Example 2: **If** $A = \{a, c, d, e, f\}$ **and**

$B = \{b, c, d\}$; $C = \{a, b, d\}$; $D = \{a, b, d, g\}$

$B \subseteq A$; B **contained** by A, or B is **subset** of A.

(each element of B is included in A)

$C \subseteq A$; but $D \not\subseteq A$ because g is not included in A

Important note: which of the following is correct and why?:

a) $b, c \in A$
b) $b, c \subseteq A$
c) $\{b, c\} \subseteq A$
d) $\{b, c\} \in A$

Set-Builder Notation:

Example 3: **I = { *x* | *x* is an integer between 2 and 8} = {2, 3, 4, 5, 6, 7, 8}.**
The vertical line | is read "such as"

Example 4: **I = { *x* | *x* is even and 1 < x < 10} = {2, 4, 6, 8}**

# of Subsets:

Example 5: **If** ***A* = { *A, B*}** **;** **(*Art and Biology)***
How many decisions can be made regarding taking any of the above courses?

Example 6: **If** ***A* = { *A, B, C*}** **;** **(*Art, Biology and Computer)***
How many decisions can be made regarding taking any of the above courses?

# of elements	# of subsets	Example	Subsets
1	2	A = {a}	{a}, {∅}
2	4	A = {a, b}	{a}, {b}, {a, b}, {∅}
3	8	A = {a, b, c}	{a}, {b}, {c} , {a, b}, {a, c}, {b, c}, {a, b, c}, {∅}
4			
5			
6			
7			
8			
n			

Cardinality: the number of elements in a set.

Example 7: If $A = \{a, b, c\}$; $n(A) = 3$

Universal Set U : The overall set where all other sets are substes of it.

Example 8: U = {IUPUI students} with the following subsets:

B = { Business students}

F = {Fresmen students}

R = {Resident students}

S = {Senior students}

All of the above are substets of the universal set U.

Complement of a set: *(*what is missing from a subset compared to the universal set*)*

Example 9: $U = \{a, b, c, d, e, f, g, h\}$; $A = \{a, c, f\}$, $B = \{b, c, g, h\}$

Both sets A and B are subsets of the universal set U where:

$A' = \{b, d, e, g, h\}$, the elements missing from A

$B' = \{a, d, e, f\}$, the elements missing from B