3 Set Relations

Objectives:
After reading and completing this module, you will be able to do these:
- ✓ Compare sets, using the terms: a) equal and equivalent, b) joint and disjoint.
- ✓ Determine the subsets of a given set.

LESSON PROPER

<u>EQUAL SETS</u>

- Two sets A and B are equal, written as A = B, if and only if they contain exactly the same elements.

Example:

Consider the sets

X = {a, m, y}   Y = {y, m, a}   Z = {l. a. y}   W = {ma, y}

X has 3 elements namely a, m, y in alphabetical order.

Y has 3 elements namely a, m, y in reverse alphabetical order.

X and Y are equal sets.

Elements in both sets need not be of the same order.

X ≠ Z, why?

Because there is an element in X that is not present in Z, and vice-versa.

(m is not an element of Z and l is not an element of X)

Y ≠ W, why?

Because Y has 3 elements namely y, m, a while W has 2 elements namely ma and y.

EQUIVALENT SETS

- Two sets A and B are equivalent, written A ~ B, if and only if they have the same cardinal number;
  that is n(A) = n(B).

Example:

L = {Luzon, Visayas, Mindanao}

M = {red, white, blue}

I = {red, blue, white}

n(L) = 3, n(M) = 3 and n(I) = 3.

Since sets L, M and I have the same cardinal number which is 3, then, sets L, M, and I are equivalent.

Are there equal sets in the given example above? *(Yes, M = I)*

JOINT SETS AND DISJOINT SETS

- Two sets A and B are disjoint sets if and only if they have no common element, otherwise they are joint sets.

Example:

E = {2, 4 6, 8, 10}

O = {1, 3, 5, 7, 11}

A = {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13}

Set E and set O are **disjoint** sets since they have no common element.

Set A and set O are joint sets since they have some common elements. Some elements of set O are also members of set A.

Set E and set A are joint sets since the elements of set O are also members of set A.

SUBSETS

- Given sets A and B, A is a subset of B if every element of A is an element of B. In symbols, we write $A \subseteq B$ (read as " A is a subset of B"). We say that $A \subseteq B$ if and only if, for every $x \in A$, $x \in B$.

Example:

Given: U = {a, b, c, d, e} X = {a, c, e} Y = { a, c, b, e, d}

$X \subseteq Y$

$X \subseteq U$

$Y \subseteq U$

The elements of set X are contained in set Y.
The elements of set X are contained in set U.
The elements of set Y are contained in set U.

PROPER SUBSET

- If $A \subset B$ and $A \neq B$, we say that A is a proper subset of B, denoted by $A \subset B$. The symbol $A \subset B$ means that every element of A belongs to B and B contains at least one element not found in A.

Example:

1.) Given: K = { 8, 12, 16} L = {8, 12, 16, 20} M = {8, 12, 16, 20, 22, 23}

$K \subseteq L$
All elements of K are contained in set L. L contains an element (20) not found in K.

$K \subseteq M$ All elements of K are contained in set M. M contains elements not found in K.

$L \subseteq M$ All elements of L are contained in set M. M contains elements not found in K.

2.) If C = {a, b, c}, name all subsets of C.

Solution:

{a} {b} {c} {a, b} {a, c} {b, c} {a, b, c} { }

NUMBER OF SUBSETS

- The number of subsets of any given set may be determined by the formula 2^n, where n denotes the cardinality of the number of elements of the set.

Example

Sets	Cardinality	Subsets	Number of Subsets
{1}	1	{ }, {1}	2
{0, 1}	2	{ }, {0}, {1}, {0, 1}	4
{2, 4, 6}	3	{2}, {4}, {6}, {2, 4}, {2, 6}, {4, 6}, {2, 4, 6}, { }	8
	n		2^n