

## Reminders

1. Fix issue with temporary access on MyMathLab
2. 1.1, 1.2, 1.3 was due on Friday 01/28  
(late submission due Friday 02/04, 11:59 pm)  
less 10%
3. Check class notes
4. Study guide for Exam #1 is available on course page  
(see class note on D2L)
5. Exam #1 on 02/15
6. 2.1, 2.2 due 02/04

## Recall

In 2.1 (Some terminologies and symbols in Set Theory)

- A set is a collection of objects called elements
- we denote set by uppercase letters

Example of listing method

$$A = \{1, 2, 3, 4\}$$

we can have a word description of a set  
example

a set of students in math 1010

a set of students in math 1010

Another method to describe a set is the 'Set-builder' notation

example  $\{x \mid x \text{ is an even counting number}\}$

$$\{2, 4, 6, 8, 10, \dots\}$$

The cardinal number of a set denote the number of elements in a set (the cardinality of a set)

Suppose  $A$  is a set,  $n(A)$  to be the cardinal number of set  $A$

A finite set is a set whose cardinal number is a whole number

An infinite set is a set that is not finite

example of an infinite set  $\{2, 4, 6, 8, 10, \dots\}$

Equality of a set

Suppose  $A, B$  are sets we say  $A = B$  if

- (1) every element in set  $A$  is an element in set  $B$
- (2) every element in set  $B$  is an element in set  $A$

Exercise  
Show that

$$A = B \text{ if } A = \{1, 2, 3, 4\}, B = \{2, 4, 1, 3\}$$

### Solution

1. every element in A is in B
2. every element in B is in A

$$\text{So } A = B$$

What does it mean for two sets to be equivalent

### Equivalent Set

Suppose A, B are sets, we say A is equivalent to B

if  $n(A) = n(B)$ .

### Question

Can we give example of sets that are equivalent but not equal

### Answer

$$A = \{1, 2, 3, 4\} \quad B = \{3, 5, 1, 2\}$$

$n(A) = 4$ ,  $n(B) = 4$  so A is equivalent to B

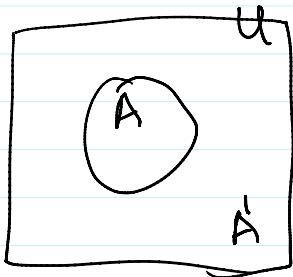
$4 \in A$  but  $4 \notin B$  so A is not equal to B

### Note

If two sets are equal they are also equivalent

### Complement of a Set

Let  $U$  be a universal set, let  $U$  contain another set  $A$



$$A' = \{x \mid x \in U \text{ and } x \notin A\}$$

$$A' = U \setminus A \quad (\text{universal set minus set } A)$$

Example

$$\text{let } U = \{a, b, c, d, e, f, g, h\}$$

$$A = \{a, d, e, f\}$$

$$A' = \{b, c, g, h\}$$

Subset of a Set

Set  $A$  is a subset of set  $B$  if every element in  $A$  is an element in  $B$

$$A \subseteq B$$

Examples

$$1. A = \{1, 2, 6\} , \quad B = \{2, 4, 6, 8\}$$

State true or false  $A \subseteq B$  (False)

$$2. A = \{3, 4, 5, 6\} , \quad B = \{3, 4, 5, 6, 8\}$$

State true or false  $A \subseteq B$  (True)

Re-state the Equality of a set

Let  $A, B$  be sets, we say  $A = B$  if

①  $A \subseteq B$

②  $B \subseteq A$

### Proper Subset

Set  $A$  is a proper subset of set  $B$  if

$$A \subseteq B \text{ and } A \neq B$$

we write  $A \subset B$

### Example

i.  $A = \{5, 6, 7\}$ ,  $B = \{5, 6, 7, 8\}$

Show that  $A \subset B$

### Answer

$$A \subseteq B \quad (\text{every element in } A \text{ is an element in } B)$$

but  $8 \in B$  and  $8 \notin A$  so  $A \neq B$

So  $A \subset B$

### listing all Subsets of a Set

If a set contains  $n$  elements then there are

$2^n$  subsets and  $2^n - 1$  proper subsets

### Example

List all the possible subset of set  $A = \{1, 2, 3\}$

