**Department of Mathematics**
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# Discrete Mathematics

## Yarmouk University

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# Chapter Two

# SET THEORY

# Section 2.2
# **Set Rational**

Definition:
If A and B are two sets, we say that A **contained** in B if **every elements** of A is also **an element** of B.

In symbols: $A \subset B$ called A is **a subset** of B.

Example:
A = { 1, 2. 3 }
B = { 0, 1, 2, 3, 4 }
$A \subset B$ but $B \not\subset A$

NOTE:
To prove that $A \subset B$ we must prove that if x is an element of A, then x must be an element of B.

Question 1
A = { x : x is an even integer }
B = { x : x is an integer divisible by 6 }
C = { x : x is an integer divisible by 2 or 3 }
D = { x : x is an integer divisible by 2 and 3 }

1. IS $A \subset B$ ? NO, $2 \in A$ but $2 \notin B$
2. IS $B \subset C$ ? YES.

PROOF:
B = { x : x is an integer divisible by 6 }
Let x be an element of B then ( x/6 = n) → ( x = 6 n ).
X = 6 n → for some integer n.
X = 2 ( 3 n )
X / 2 = 2 / ( 2( 3 n ) )
x/2 = 3n
∴ x divisible by 2
∴ x is an element of C

3. $C \subset B$ ? NO → $2 \in C$ but $2 \notin B$

4. B $\subset$ D ? YES ( true)

PROOF:

Let x be an element of D

x/2 = n x/3 = m

2n = x 3m = x

2n =3m

n = 3m/2

$\rightarrow$ m = 2y

But 3m = x

x = 6y

**NOTES:**

- A = B if **every element** of A is **an element** of B and **every element** of B is **an element** of A.
- A $\subset$ B **every element** of A is **an element** of B
- B $\subset$ A **every element** of B is **an element** of A
- A = B **IFF** A $\subset$ B AND B $\subset$ A
- If A $\subset$ B and A $\neq$ B, then A is called **a proper subset** of B

To show that A is not contained in B we need only to show one element of A is not element of B

A = { 1, 2, 3 }

B = { 1, 2, 4 }

3 $\in$ A and 3 $\notin$ B $\rightarrow$ A $\not\subset$ B