CADT
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វិទ្យាស្ថានបច្ចេកវិទ្យាឌីជីថល
Institute of Digital Technology

Introduction to Set

Hello everyone, what do you think about sets?
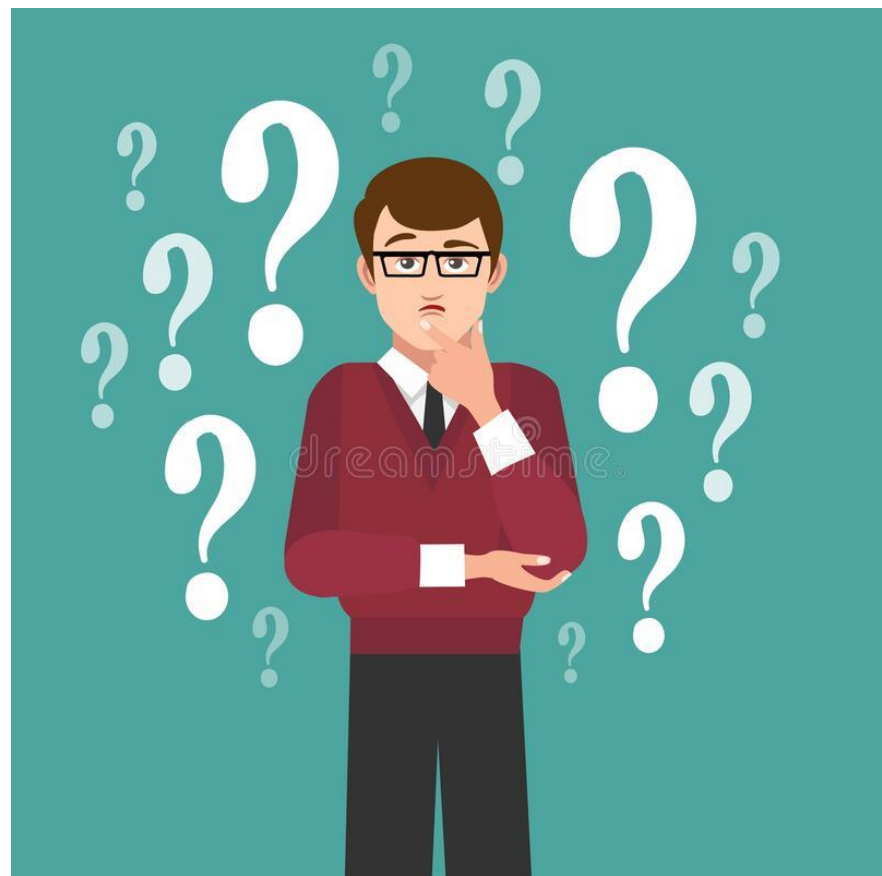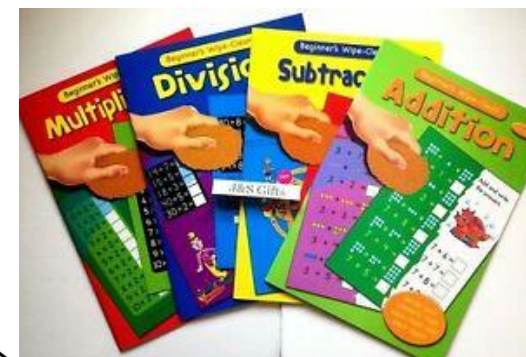
What is exactly SETS ?

SETS can be formed of anything that can be well-defined or distinct.

What is well-defined or distinct means?

Example : A set of numbers from 1 to 9

$\{1,2,3,4,5,6,7,8,9\}$

A set of provinces in Cambodia.
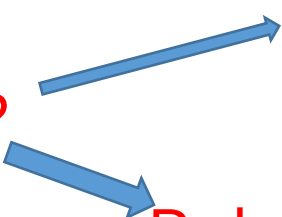
A set of days in a week.

A set of handsome boys.

A set of good teachers.

How do we representation of set ?
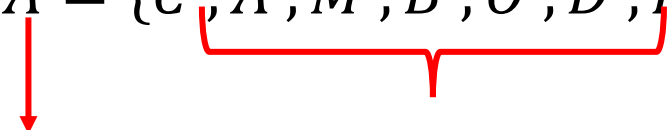
List Method or Roster Method

Rule Method or Set of Builder Method

What is a roster method means?

A set A is a set of all the letters in the word CAMBODIA.

We let $A = \{C, A, M, B, O, D, I, A\}$

Name of Set   Element

Notice : the element of set can not be repeat so it happen only one time.

Now we get $A = \{C, A, M, B, O, D, I\}$

And the cardinal of A is equal 7 we write $n(A) = 7$

A set of Natural numbers $: \mathbb{N} = \{1, 2, 3, 4, 5, \dots\dots\dots\}$

A set of integer numbers $: \mathbb{Z} = \{\dots\dots, -2, -1, 0, 1, 2, \dots\dots\}$

A set of whole numbers : $W = \{0, 1, 2, 3, 4, 5, \dots\dots\}$

A set of prime numbers : $P = \{1, 2, 3, 5, 7, 11, 17, \dots\dots\}$

And all the sets above we call roster method or roster form (List method)

What is Rule method or Set of Builder Method ?

Example : A set of whole numbers between from 0 to 1 000 000

$A = \{x \mid x \in W , \ 0 < x < 1\,000\,000 \}$

Between from 1 to 1000 000

Belong to

Such that

Name of Set
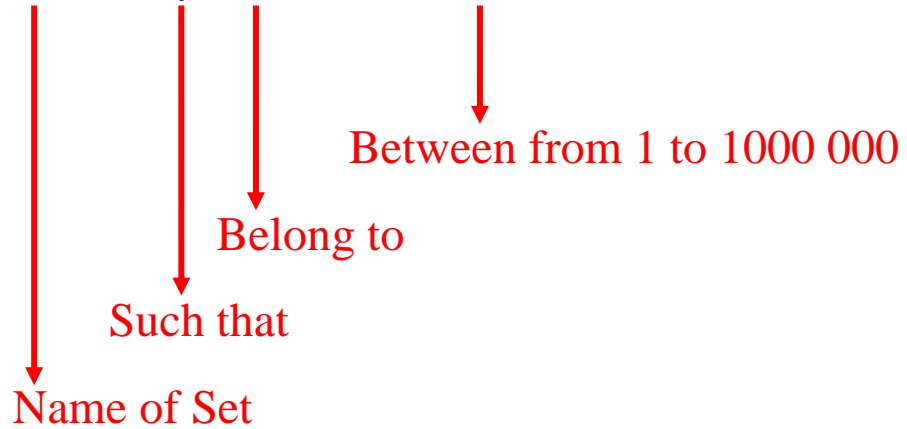
Example : A set of odd numbers between from 1 to 2022

$A = \{2x + 1 \mid x \in \mathbb{N} , \ 1 \le x \le 1010 \}$

How a many are there types of sets?

There are 12 types of sets

1. **Empty set**

2. **Singleton set**

3. **Finite set**

4. **Infinite set**

5. **Equal sets**

6. **Equivalent sets**

7. **Universal set**

8. **Subset**

9. **Proper subset**

10. **Superset**

11. **Proper superset**

12. **Power set**

1. Empty set

Empty set is set with no element and the symbol of empty set is {   }

Empty set let by $E = \{\ \ \} \ or \ E = \emptyset$

Cardinality empty set is $n(E) = 0$

2. Singleton set

Singleton set is a set with one element

Singleton set let by $S = \{1\}$

Cardinality Singleton set is $n(S) = 1$

3. Finite set

Finite set is set with limited elements

Finite set let by $A = \{1, 2, 3, 4, 5\}$

Cardinality finite set is $n(A) = 5$

4. Infinite set

infinite set is a set with unlimited elements

Infinite set let by $\mathbb{N} = \{1, 2, 3, 4, 5, \ldots\ldots\}$

Cardinality infinite set is $n(\mathbb{N}) = \infty$

5. Equal set

Equal sets are sets with the same elements

$$A = \{1\,,2\,,3\,,4\,,5\,\} \text{ and } B = \{x \mid x \in \mathbb{N}\,,1 \leq x \leq 5\}$$

$$B = \{x \mid x \in \mathbb{N}\,,1 \leq x \leq 5\} = \{1\,,2\,,3\,,4\,,5\,\}$$

6. Equivalent set

Equivalent sets have different elements but have the same number of elements.

$$A = \{1\,,2\,,3\,,4\,,5\,\} \text{ and } B = \{2x \mid x \in \mathbb{N}\,,1 \leq x \leq 5\}$$

$$B = \{2x \mid x \in \mathbb{N}\,,1 \leq x \leq 5\} = \{2\,,4\,,6\,,8\,,10\,\} \text{ and } n(A) = 5\,, \; n(B) = 5$$

So $A \approx B$

7. Universal set

Universal set is the set containing all elements and of which all other sets are subsets.

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

$$A = \{1, 3, 5, 7, 9\}$$

$$B = \{2, 4, 6, 8\}$$

……………………………………………………………………………………………..

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

$$A = \{a, b, d, h, i\}$$

$$B = \{c, e, f, g\}$$

8. Subset

Set A is a subset of set B if and only if every element in A is also an element in B

So we use $A \subseteq B$

Example : list all possible subsets of set $A = \{S, E, T\}$

A can be subset itself

Three elements $\{S, E, T\}$

Two elements subsets $\{S, E\}, \{S, T\} \ and \{E, T\}$

One element subsets $\{S\}, \{E\} \ and \ \{T\}$

Empty element subset $\{\ \ \}$

How many subsets does $A = \{S, E, T\}$ have ?

Formula for Calculation is

2^n , where n is numbers of elements

$n(A) = 3$

And the subsets of A is $2^3 = 8$

Counting

$\{\ \}$

$\{S\}, \{E\}, \{T\}$

$\{S, E\}, \{S, T\}, \{E, T\}$

$\{S, E, T\}$

9. Proper Subset

Set A is a proper subset of set B if there is at least one element in B not contained in A

So we use $A \subset B$

$A = \{M, A, T, H, S\}$

$B = \{M, A, T, H\}$ $\Rightarrow B \subset A$

$C = \{M, T, H, S\}$ $\Rightarrow C \subset A$

$D = \{A, T\}$ $\Rightarrow D \subset A$

List all the proper subsets of set $A = \{S, E, T\}$

$\{ \ \}$

$\{S\}, \{E\}, \{T\}$

$\{S, E\}, \{S, T\}, \{E, T\}$

How many proper subsets does set A have?

$A = \{S, E, T\}$

Formula for Calculation is

$2^n - 1$, where n is numbers of elements

$n(A) = 3$

And the proper subsets of A is $2^3 - 1 = 7$

10. Superset

Superset is a set containing all of the elements of another set.

A is a superset of B if every element in B is also in A.

$$A \supseteq B$$

11. Proper superset

A is a proper superset of B in $A \supseteq B$ and $A \neq B$ so we got $A \supset B$

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

If B is proper subset of A $\qquad$ so we have A is proper superset of B

$B \subset A$ $\qquad\qquad\qquad$ $A \supset B$

12. Power Set

The set all the subsets of a set.

If $A = \{S, E, T\}$, then what is $P(A)$?

$$P(A) = \{\{\quad\}, \{S\}, \{E\}, \{T\} \quad \{S, E\}, \{S, T\}, \{E, T\}, \quad \{S, E, T\}\}$$

How many elements does the power set of $A = \{S, E, T\}$ have ?

$$n\big(P(A)\big) = 2^3 = 8$$

Thank You