Unit 1A

Set Notation

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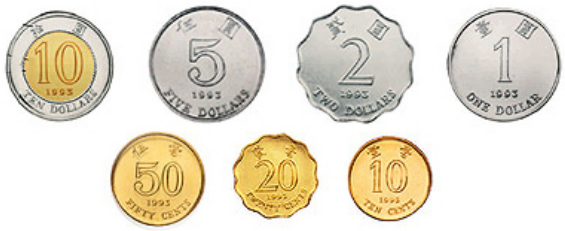
Set-Roster Notation

- The roster notation of a set simply lists all members of the set inside braces { }.
- Example:

$C = \{10¢, 20¢, 50¢, \$1, \$2, \$5, \$10\}$



- The order is not important.
- The same element needs not appear more than once. (Duplicate elements are redundant and can be removed.)

Set-Builder Notation

- We can "build" a set by describing what properties its members have.
- Set-builder notation:

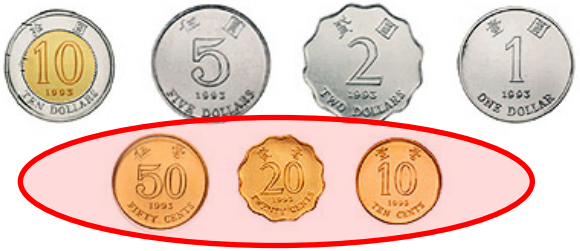
$$T = \{ x \in S \mid P(x) \}.$$

If no ambiguity, S can be omitted.

such that

The set of all elements x in S such that $P(x)$ is true.

- Example:
  - Let C = {10¢, 20¢, 50¢, $1, $2, $5, $10}.
  - D is the set whose elements are all elements $x \in C$ such that x is completely bronze in color.
  - D = {$x \in C \mid x$ is completely bronze in color.}
    = {10¢, 20¢, 50¢}



Examples

- The set of even numbers.
  - Set-roster: $\{\ldots, -4, -2, 0, 2, 4, \ldots\}$
  - Set-builder: $\{x \in \mathbb{Z} \mid x = 2k \text{ for some integer } k\}$

- The set of integers that are multiples of 3 or multiples of 5.
  - Set-builder: $\left\{\begin{array}{r} x \in \mathbb{Z} \mid x = 3m \text{ for some integer } m \\ \text{or } x = 5n \text{ for some integer } n \end{array}\right\}$

More Examples

- The set of real numbers greater than a and less than b:
  - Set-builder: $\{x \in \mathbb{R} \mid a < x < b\}$.
  - This is called the open interval between a and b, denoted by (a, b).
    - Note that (a, b) can also be used to denote an ordered pair. You need to tell what it means from the context.
  - If a is included in the set, we denote it by $[a, b)$.
  - If both a and b are included, we denote it by $[a, b]$, which is the closed interval between a and b.