

Section 1.2: subsets

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3:04 PM

Subsets: set A is a subset of B
if every member of A also
belongs to B

$$A \subseteq B$$

↑
"is a subset of"

examples: $\{2, 3, 4\} \subseteq \mathbb{N}$

$$\mathbb{N} \not\subseteq \{2, 3, 4\}$$

↑
because, for example, 1 is not
in $\{2, 3, 4\}$

$$\{2, 3\} \subseteq \{2, 3, 4\}$$

$$\{2, 3\} \subseteq \{2, 3\}$$

$$\{2, \textcircled{3}\} \not\subseteq \{2\}$$

↑
because $3 \notin \{2\}$

True or False:

$$\mathbb{N} \subseteq \mathbb{Z}$$

T

$$\mathbb{Z} \subseteq \mathbb{N}$$

F

$$\mathbb{Z} \subseteq \mathbb{N} \quad \text{F}$$

$$\{1, 2, 3, \dots, 10\} \subseteq \{100, 99, 98, \dots, 1\} \quad \text{T}$$

$$\emptyset \subseteq \{2, 3\}$$



in fact, \emptyset is a subset of every set, including itself

digression: (will not be tested)
which is bigger?

$$\{1, 2, 3, \dots\}$$

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

subsets: $A \subseteq B$

proper subsets: $A \subset B$

- set A is a proper subset of B if every member of A belongs to B and there is at least one member of B that is not in A

examples:

$$\{2, 3\} \subset \{2, 3, 73, 157\}$$

$$\{2, 3\} \not\subseteq \{2, 3\}$$

need an extra element
in here that isn't in
the other set - to have
the first set be
a proper subset

note: $\{2, 3\} \subseteq \{2, 3\}$

True or False?

T $\emptyset \subset \mathbb{N}$

F $\emptyset \subset \emptyset$

T $\mathbb{N} \subset \mathbb{Z}$

T $\{2, 4\} \subset \{x \mid x \text{ is an even integer}\}$

F $\{2, 4, 6, \dots\} \subset \{y \mid y \text{ is an even natural number}\}$

$\nwarrow \nearrow$
these sets are equal

Evil questions:

$2 \in \mathbb{N}$ F

$\mathbb{N} \in \mathbb{Z}$ F

$(2, 3) \in \mathbb{Z}$

if you replace with \subseteq , it's okay

not a set
 $\{2\} \subseteq \mathbb{N} \checkmark$
 $2 \in \mathbb{N}$

not a
set!
brackets are
wrong!

$$\{(2,3)\} \subseteq \{(1,2), (2,3), (2,4)\}$$

$$(2,3) \in \{(1,2), (2,3), (2,4)\}$$

$$N \in \{\emptyset, N, Z, R\}$$

use \subset , \subseteq , and $=$ to compare two sets

use \in to compare objects inside a set with the set itself

$$\begin{array}{ccc} \text{---} & \in & N \\ \uparrow & & \uparrow \\ \text{number} & & \text{set of numbers} \end{array}$$

Non-evil questions:

True or False?

$$-3 \in Z \quad T$$

$$-3 \in N \quad F$$

$$\{-3\} \subseteq N \quad F$$

$$\{-3\} \subseteq Z \quad T$$

$$\{-3\} \subseteq \{-3\} \quad T$$