

Section 1.1: cont'd

Tuesday, September 24, 2013

8:32 AM

Assignment #1 due on
Wednesday, Oct 2

Quiz #1 on
Friday, Oct 4

example: write the set $D = \{4, 5\}$ in
set-builder notation

note: answers will vary

$D = \{x \mid x \text{ is a natural number greater than 3 but less than 6}\}$

$D = \{y \mid y \text{ is 4 or 5}\}$

$D = \{ \text{☺} \mid \text{☺} \text{ is a natural number and is between 3 and 6} \}$

$D = \{z \mid z \text{ is a single-digit natural number that begins with the letter "f"}\}$

more notation:

$$A = \{ 1, 2, 3, \dots, 10 \}$$

$$8 \in A$$

↑
"is an element of"
or "belongs to"

$$18 \notin A$$

equality of sets:

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

order
doesn't matter

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

repetition doesn't
matter

union of sets:

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

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

$$A \cup B = \{ 1, 2, 3, 4, 6 \}$$

$$A \cup B = \{1, 2, 3, 4, 6\}$$

↑
"Union"

↑
these elements are either in A
or B or both

scary formal definition:

$$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$$

intersection of sets:

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

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

$$A \cap B = \{2\}$$

$$A \cap B = \{x \mid x \in A \text{ and } x \in B\}$$

examples:

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

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

$$C = \{4, 5, 6\}$$

$$\begin{aligned} \text{find } A \cup C &= \{1, 2, 3, 4, 5, 6\} \\ B \cap C &= \{4, 6\} \\ A \cap C &= \{\} \end{aligned}$$

the empty set $\emptyset = \{ \}$

but never, ever

~~$\{ \emptyset \}$~~

examples:

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

$$\begin{aligned} \text{And } A \cup \emptyset &= A \\ A \cap \emptyset &= \emptyset \end{aligned}$$

subset:

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

$$B = \{1, 2, 3, \dots, 10\}$$

$$A \subseteq B$$

↑

"is a subset of"

A is a subset of B if every element of A also belongs to B

example: True or False?

$$B \subseteq A$$

F because, for example,
 $10 \notin A$

but we could say that
 $B \not\subseteq A$

example: True or False?

if $A = \{1, 2, 3\}$, then

$$A \subseteq A \quad T$$

$$A \subseteq \mathbb{N} \quad T$$

$$\emptyset \subseteq A \quad T$$



the empty set is, in fact, a subset of
all sets (including itself)

$$1 \subseteq A \quad F \quad (\text{but } 1 \in A)$$

not a set

$$(2, 3) \subseteq A \quad F$$

still not a set

$$A \in \mathbb{N} \quad F$$

needs to be
a natural number
to be true

digression: will not be
tested

$$A \in \{ \emptyset, \{1, 2, 3\}, \dots \}$$

$$A \in \{ \emptyset, \{1, 2, 3\}, N \}$$

combining three or more sets:

$$\begin{aligned} \text{let } A &= \{1, 2, 3\} \\ B &= \{2, 4, 6\} \\ C &= \{3, 4, 5\} \end{aligned}$$

$$\text{find } A \cup (B \cap C) = \{1, 2, 3, 4\}$$

$$B \cap C = \{4\}$$

$$(A \cup B) \cap C = \{3, 4\}$$

$$A \cup B = \{1, 2, 3, 4, 6\}$$