

# Conjuntos - Cardinalidad

Relaciones

Relaciones de orden

Retícula

**Conjunto** → Una colección de objetos

$\in$  → Pertenece

$$C = \{1, 2, 3, 4\}$$

$$\{1, 2, 3, 4, \{2, 3\}\}$$

$$\{2, 3\} \in C$$

**Denotamos un conjunto de 2 maneras**

— **Comprensión** →  $\{x \mid x \text{ asistió al encuentro de hoy}\}$   
 Regla

Conjunto de números pares →  $P = \{x \mid x \% 2 = 0\}$

**Extensión** → Nombrar elemento por elemento

$$E = \{ \text{Angélica}, \text{Luz}, \text{Karen}, \text{Mateo} \}$$

$$E = \{ \overset{v}{\text{Angélica}}, \overset{v}{\text{Luz}}, \overset{v}{\text{Karen}}, \overset{v}{\text{Mateo}} \}$$

## Operaciones con conjuntos

Unión  $\rightarrow (+) \rightarrow A+B = \{x \mid x \in A \vee x \in B\}$

$$\blacksquare A = \{1, 2, 3\} \quad B = \{4, 5, 6\}$$

$$A+B = \{1, 2, 3, 4, 5, 6\}$$

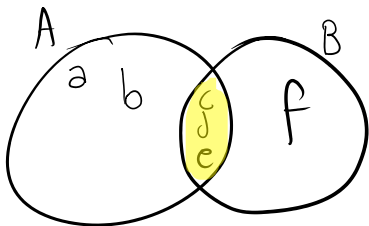
$$\blacksquare A = \{1, 2, 3\} \quad B = \{2, 3, 4\}$$

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

Intensección  $(\cdot) \rightarrow \{x \mid x \in A \wedge x \in B\} \rightarrow \text{Elementos compartidos}$

$$\blacksquare A = \{a, b, c, d, e\} \quad B = \{c, d, e, f\}$$

$$A \cdot B = \{c, d, e\}$$



Paréntesis  $\rightarrow A = \{a, b, c, d, e, f, \{g, h\}\}$

$a \in A$   
 $b \in A$   
 $c \in A$

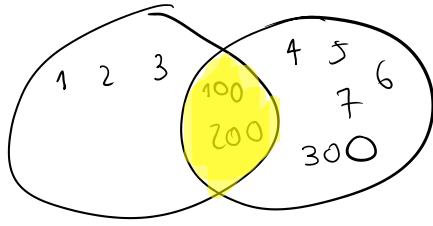
$d \in A$   
 $\{d\}$   
 $\{g, h\} \in A$

$g \notin A$   
 $h \notin A$

$$A = \{1, 2, 3, 100, 200\}$$

$$\swarrow B = \{4, 5, 6, 7, 100, 200, 300\}$$

$$A \cdot B = \{100, 200\}$$



Diferencia (-) de A con respecto a B ( $A-B$ )

$$\overline{A} - B = \{x \mid x \in A' \wedge x \notin B\}$$

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

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

$\neq$

$$B-A = \{ \}$$

Excluir del primer conjunto los de la intersección

Diferencia simétrica entre A y B ( $\oplus$ )

$$A \oplus B = B \oplus A$$

$$A \oplus B = \{x \mid (x \in A \wedge x \notin B) \vee (x \notin A \wedge x \in B)\}$$

$$(A-B) \cup (B-A)$$

$$A = \{1, 2, 3, 4, 5, 6\} \quad B = \{4, 5, 6, 7\}$$

$$A \oplus B$$

$$(A-B) + (B-A)$$

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

$$(A-B) + (B-A) = \{1, 2, 3, 7\}$$

$$B-A = \{7\}$$

Complemento =  $(\cdot)'$

$X$  = Conjunto universal

$A'$

$$X = \{1, 2, 3, 4, 5\}$$

$$A' = X - A$$

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

$$A' = \{3, 4, 5\}$$

$$X = \{\text{Tom}, \text{Zoë}, \text{Oro}, \text{Lola}, \text{Milo}\}$$

$$M = \{\text{Tom}, \text{Zoë}\}$$

$$X - M$$

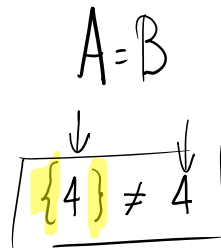
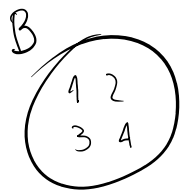
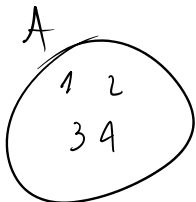
$$M' = \{\text{Oro}, \text{Lola}, \text{Milo}\}$$

$$X = \mathbb{N} \quad A = \{x \in \mathbb{N} \mid x \neq 1, 2, 3\}$$

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

## Relaciones básicas entre conjuntos

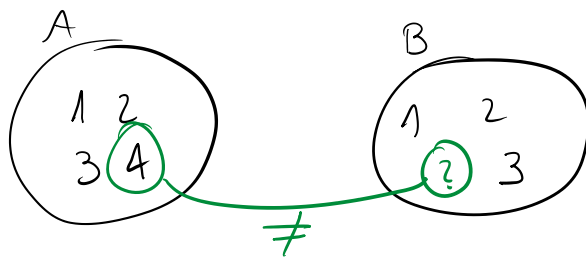
→ Igualdad →  $A = B \leftrightarrow \forall x (x \in A \leftrightarrow x \in B)$



$$B = \{1, 2, 3, 4, \{4\}\}$$

Diferencia ( $\neq$ )

$$A \neq B \leftrightarrow \exists x (x \in A \leftrightarrow x \notin B)$$

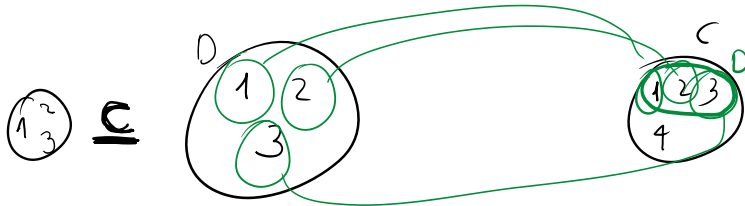


$A \neq B$

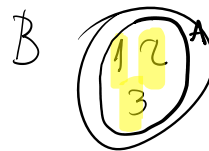
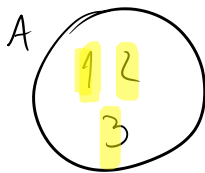
$B \neq A$

Inclusion ( $\subseteq$ )

$$A \subseteq B \iff \forall x (x \in A \rightarrow x \in B)$$



$D \subseteq C$



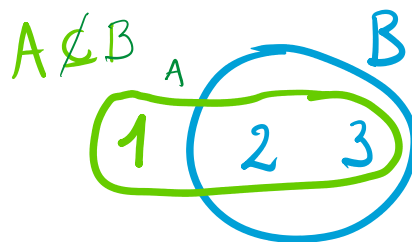
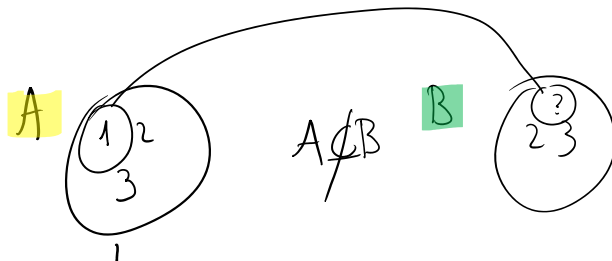
$A \subseteq B \times$

"Me permite que tengan los mismos elementos"

$\subseteq$  parecido a  $\leq$

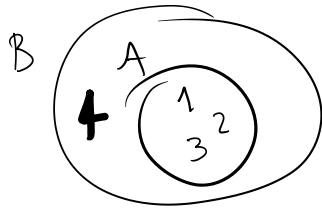
No inclusion ( $\not\subseteq$ )

$$A \not\subseteq B \iff \exists x (x \in A \wedge x \notin B)$$



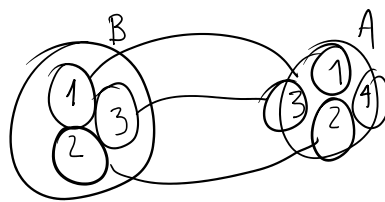
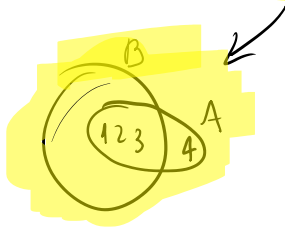
## Inclusion Propia $\rightarrow (\subset)$

$$A \subset B \leftrightarrow \forall x (x \in A \rightarrow x \in B) \wedge \exists x (x \notin A \wedge x \in B)$$



## No Inclusion Propia $\not\subset$

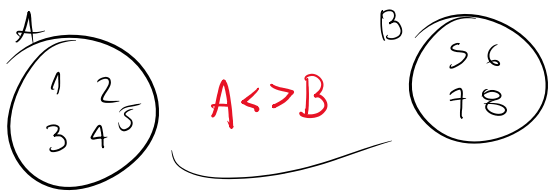
$$A \not\subset B \leftrightarrow \exists x (x \in A \wedge x \notin B) \vee \forall x (x \in B \rightarrow x \in A)$$



$A \not\subset B$

## Exclusion mutua ( $\leftrightarrow$ ) $A \leftrightarrow B$

$$A \leftrightarrow B \leftrightarrow \forall x (x \in A \rightarrow x \notin B)$$



"Si estar en A, no estar en B"

"Todo elemento de A no puede estar en B"

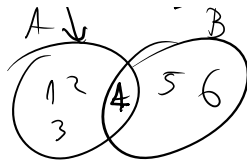
## No exclusion mutua ( $\nleftrightarrow$ )

$$A \nleftrightarrow B \leftrightarrow \exists x (x \in A \wedge x \in B)$$

...



$A \neq B$



Conjunto vacío  $\rightarrow (\emptyset) = \{ \}$

$$\emptyset = \{x \mid x \in A \wedge x \notin A\}$$

Conjunto Potencia =  $(P)$   $A = \{1, 2, 3\} \quad \{B \mid B \subseteq A\}$

$$P(A) = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$$

Siempre ponemos el vacío

$$A = \{1, 2, 3, \{4\}, 5, 6\}$$



$$1 \in A \quad \checkmark$$

$$\{1\} \in A \quad \times$$

$$\{4\} \subset A$$

$$\{1, \{4\}\} \subset A$$

$$\{1, \{4\}\} \in A$$

$\in$  : Un elemento

$$\{ \} \subset :$$

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

$$B = \{1, \{2, 3\}, 5, \{a\}, \text{gato}\} \quad |B| = 5$$

$$\{2, 3\} \in B \quad \checkmark$$

$$5 \in B \quad \checkmark$$

$$\{a\} \in B$$

$$\{1, \{2, 3\}, 5, a, \text{gato}\} \subset B$$

$$\{2, 3\} \subset B \quad \times$$

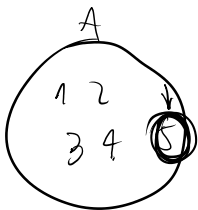
$$\{\{2, 3\}\} \subset B$$

$$\{\{2, 3\}, \{1\}\} \in B \quad \times$$

$$\{\emptyset\} \in B \quad \checkmark$$

**Cardinalidad.** num. elementos de un conjunto.

$$|A| = 4$$



$$|A| = 5$$



$$|B| = 2$$

$$A \cdot B \neq \emptyset$$

$$|A+B| = 7 \rightarrow |A| + |B| = 5 + 2 = 7$$

$$|A+B| = \begin{matrix} 1 & 2 \\ 3 & 5 \\ f & a \end{matrix} = 7$$

$$|A+B| = |A| + |B| - |A \cdot B|$$



$$|A| = 5$$



$$|B| = 4$$

$$|A+B| = 5$$

$$A+B$$

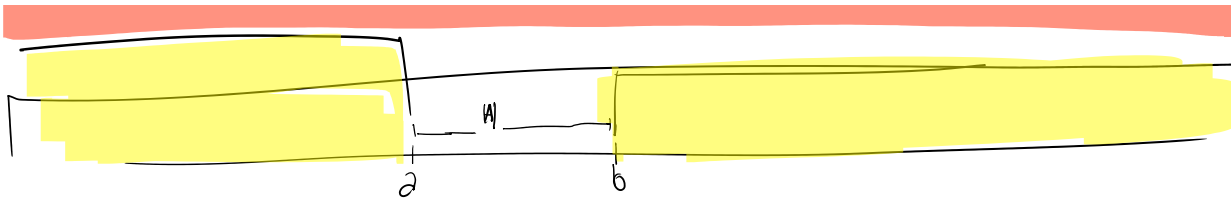


$$|A+B| = |A| + |B| - |A \cdot B|$$

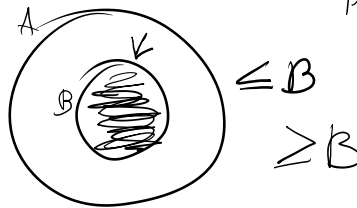
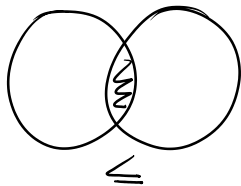
$$4 + 4 - 3 = 5$$

$$|A \cdot B| = 3$$





$$\Leftrightarrow |x| - b \leq |A| \leq |x| - a$$



$$X = \{1, 2, 3, 4, 5\}$$

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

$$B = \{4, 5, 1, 2\}$$

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

$$\rightarrow \max(0, (|A| + |B|) - |X|) \leq |A \cdot B| \leq \min(|A|, |B|)$$

$$\max(0, (3 + 4) - 5)$$

$$\max(0, 2) \leq$$

$$2 \leq 2 \leq 3$$