11/06/2025 - Matematicas Discretas ∧ (UdeC \ WV 14-16)

1. Repaso:

a. Conjuntos: $A = \{a_1, a_2, \ldots, a_n\}$

$V = \{a, e, i, o, u\}$

b. n-Tuplas: $A = (a_1, a_2, \ldots, a_n)$

(R, G, B)

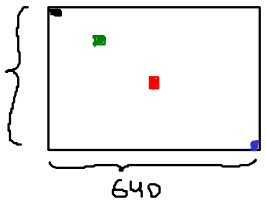


Imagen: $480 \times 640 = 307200$

$I = \{(\overset{R}{0},\overset{G}{0},\overset{B}{0}), (\overset{R}{255},\overset{G}{255},\overset{B}{255}), \ldots (0,0,255)\}$

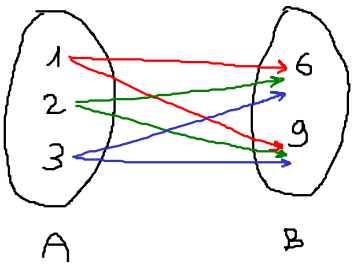
c. Producto cartesiano:

$$A \times B = \{(x,y) \mid x \in A, y \in B\}$$

Sea: $A = \{1,2,3\} \longrightarrow |A| = n(A) = 3$

$B = \{6,9\} \longrightarrow |B| = n(B) = 2$

$A \times B = \{(1,6), (1,9), (2,6), (2,9), (3,6), (3,9)\}$



$|A \times B| = n(A \times B) = |A||B| = 2 \cdot 3$

$|A \times B| = 6$

3. Relaciones: R = Relación

$R \subseteq A \times B$

$R = \{(x,y) \mid x \in A, y \in B, P(x,y)\}$ ← Propiedad ↔ Predicado.

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

$B = \{6,9\}$

$R = \{(x,y) \mid x \in A, y \in B, x \text{ divide a } y\}$

Propiedad { x divide a y ①

$D(x,y)$ ②

$x \mid y$ ③

$R = \{(x,y) \mid x \in A, y \in B, x \mid y\}$ → $y \% x = 0$

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

$B = \{6, 9\}$

$R = \{(1,6), (1,9), (2,6), (3,6), (3,9)\}$

$A \times B = \{(1,6), (1,9), (2,6), (2,9), (3,6), (3,9)\}$

Representaciones de la relación

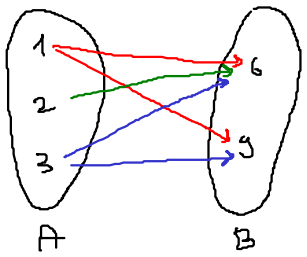
a. Pares ordenados

$R = \{(1,6), (1,9), (2,6), (3,6), (3,9)\}$

b. Tabla:

x	y
1	6
1	9
2	6
3	6
3	9

c. Diagrama de Flechas



d. Tabla matricial

R	6	9
1	x	x
2	x	
3	x	x

(A → 2, B → 6)

d. Matriz binaria (0,1)

$$M_R = \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{cc} 1 & 2 \end{array} \\ \begin{bmatrix} 1 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix} \end{array}$$

4. Relación en un solo conjunto

$$R \subseteq A \times A$$

$$R = \{(x,y) \mid x \in A, y \in A, P(x,y)\}$$

Ejemplo: Sea $A = \{1,2,3,4\}$

$R = \{(x,y) \mid x + y$ sea un numero par $\}$

$A^2 = A \times A = \{1,2,3,4\} \times \{1,2,3,4\} = \{$

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

$R = \{(1,1), (1,3), (2,2), (2,4), (3,1), (3,3), (4,2), (4,4)\}$

$R = \{(1,1), (1,3), (2,2), (2,4), (3,1), (3,3), (4,2), (4,4)\}$

Representaciones

Tabla

x	y
1	1 ✓
1	3 ✓
2	2 ✓
2	4 ✓
3	1 ✓
3	3 ✓
4	2 ✓
4	4 ✓

Diagrama de Flechas

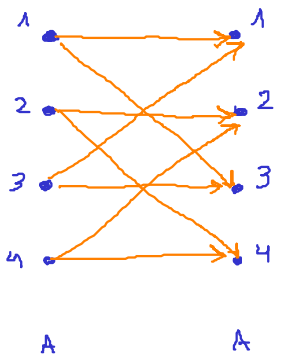


Tabla Matricial

R	1	2	3	4
1	x		x	
2		x		x
3	x		x	
4		x		x

Matriz de Relacion

$$M_R = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

Grafo dirigido (Digrafo)