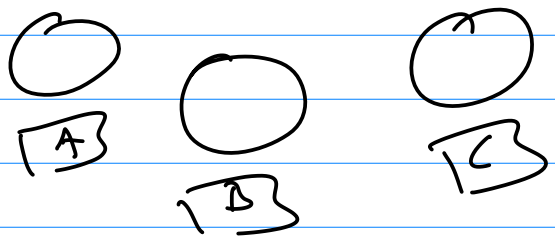
Math 322

Syllabus

Ch9 Relationships



(Mark, Eg, black)

3-tuple

$A \times B \times C = \{(a,b,c) \mid a \in A \wedge b \in B \wedge c \in C\}$

$|A \times B \times C| = |A| \cdot |B| \cdot |C|$

Def n-ary relation is a subset of $A_1 \times A_2 \times \cdots \times A_n$

Def binary relation (or just called a relation)

2-ary is a subset of $A_1 \times A_2$

(sets of ordered pairs)

Ex R is a relation $A = \{1,2,3,\ldots,100\}$ $B = \{\square, \Delta, O\}$

$R = \{(1,\square), (2,\square), \boxed{(3,\Delta)}, (3,O), (100,O)\}$

$3 R \Delta$ $3 \not R \square$

terms R is a relation from A to B

domain codomain

if $(a,b) \in R$ write $a R b$

$(a,b) \notin R$ write $a \not R b$

Visualize Relations from A to B

① R = list the pairs

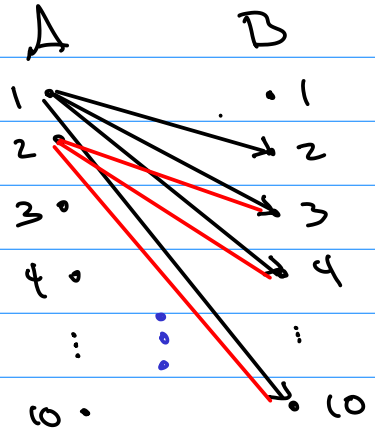
② $R = \{(a,b) \mid$ propositional function on a, b's $\}$

Ex: $A = \{1, 2, \ldots, 10\}$ $B = \{1, 2, \ldots, 10\}$

$R = \{ (1,2), (1,3), \ldots, (1,10),$
$(2,3), (2,4), \ldots, (2,10),$
$(3,4), (3,5), \ldots, (3,10),$
$\vdots$
$(9,10) \}$

$R = \{ (a,b) \mid a < b \}$

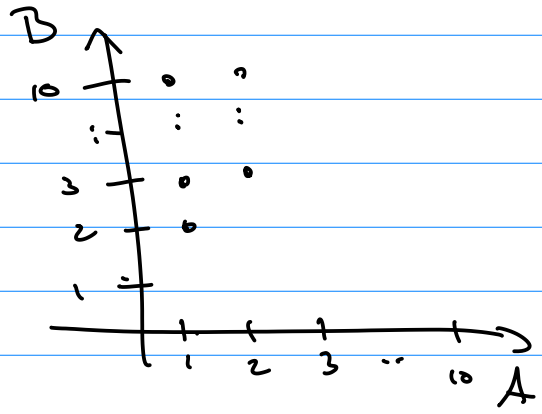
③ digraph



④ Table

R	1	2	3	...	10
1		X	X		X
2			X		X
3					X
⋮					
10					

(A)



→ Function: binary relation with the restrictions..

$f: A \to B$

all $a \in A$ map and they have one $b \in B$

for $f(a) = b$