Note Title 10/25/2013

$\neg w \to i$

$\neg w \to j$

Binary relation: relationship between two sets A & B.

Binary relation between A & B a subset of $A \times B$.

$$R \subseteq \{(a,b) \mid a \in A, b \in B\}.$$

aRb iff $(a,b) \in R$

$a \not R b$ iff $(a,b) \notin R$.

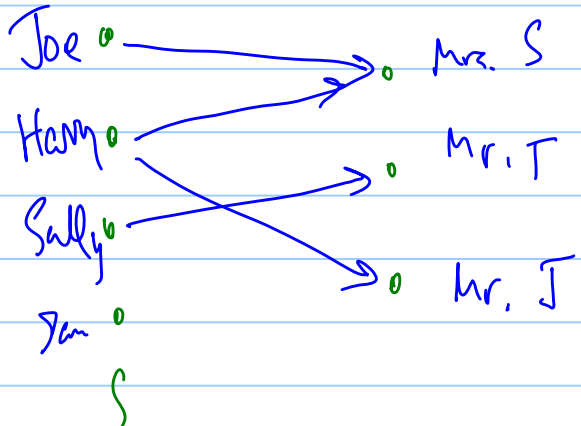
S: Set of Students

T: Set of all teachers.

SET iff s has such an email to t

$s \in S$

$t \in T$.



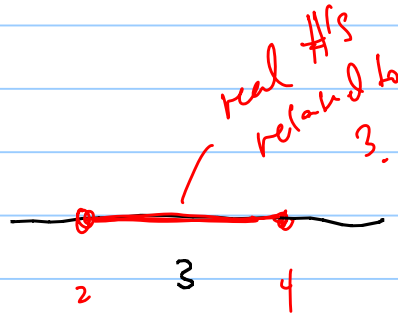
Arrow diagram.

$F = \{$ (Joe, Mrs. S), (Harry, Mrs. S), (Harry, Mr. J), (Sally, Mr. T) $\}$

	Mrs S.	Mr. T	Mr J
Joe	1	0	0
Harry	1	0	1
Sally	0	1	0
Sam	0	0	0

Relation P between $\mathbb{Z}$ and $\mathbb{R}$.

$a P x$ iff $|a - x| \leq 1$.



$3 P 2.8$ $\quad 3 P 3.5$

$3 \not P 1.8$ $\quad 3 \not P 4.2$.

Binary relation on a set A. A domain of the relation.

Binary relation L on $\mathbb{R}$. $x L y$ iff $x \leq y$.

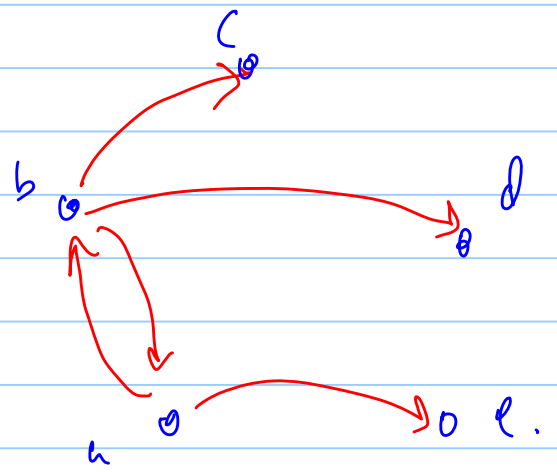
$3.2 \; L \; 4.5$

$4.5 \not L 3.2$.

Bin relation P on $\mathbb{Z}$ $\quad x P y$ if x & y are relatively prime.

$A = \{a, b, c, d, e\}$

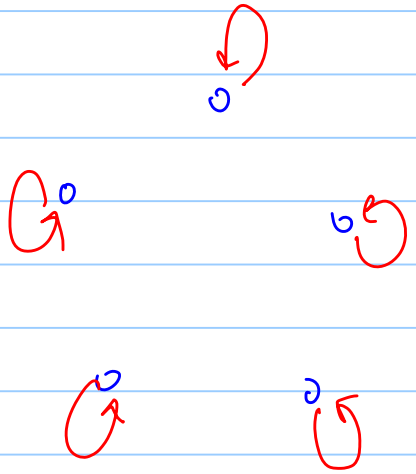
$R = \{(b,c), (b,d), (a,e), (a,b), (b,a)\}$



$(a,b) \neq (b,a)$

Properties of binary relations:

R
Binary relation on A is reflexive if $\forall a \in A$ $\{(a,a) \in R$ / aRa



xRy if x knows y's email address — reflexive.

R xRy if $x \leq y$.

Anti-reflexive if aRa for every $a \in A$.

(no self-loops in arrow diagram)

xPy x beat y in the race. ← anti-reflexive.

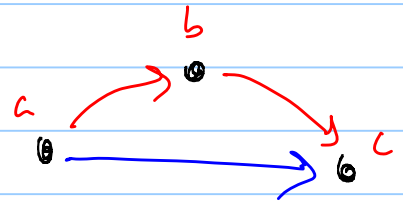
$x \not P x$ for all runners x

xHy if x sent y an email yesterday.

not necessarily refl or anti-refl.

Transitivity R on A is transitive if

aRb and $bRc \Rightarrow aRc$.



xRy if $x \leq y$.

$(x \leq y$ and $y \leq z) \Rightarrow x \leq z$.

Domain $\mathbb{Z}$ aPb if $b = a^n$ for n integer ≥ 1.

aPb bPc

$b = a^n$ $c = b^m$ $\Rightarrow$ $c = b^m = (a^n)^m = a^{n \cdot m}$

aPc.

Not transitive xPy x rel prime to y.

$7P3$ $3P4$

$7 \not P 4$.