Relations

- in mathematical way, relate 2 or more objects together.

$A = \{5, 10, 15\}$. $x \in A$ $\quad \boxed{R \rightarrow x * y = 10}$ ← can be any thing. eg: $x^2 + y^2 = 1$

$B = \{0, 1, 2\}$ $\quad y \in B$ $\quad (5, 2)$, $(10, 1)$ have relation.

A = domain of R. $\quad xRy$

B = co-domain of R.

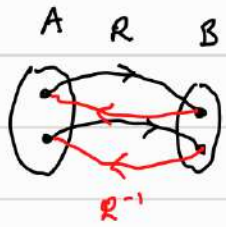
r/s = connection b/w 2 elements of 2 different set based on certain rule.

Inverse Relation

- denoted R^{-1} (from B to A)

$$R^{-1} = \{(y, x) \in B \times A \mid (x, y) \in A \times B\}.$$ (s.t.)

Note: $(A \times B) \neq (B \times A)$



eg: $A = \{2, 3, 4\}$ $\quad B = \{5, 6, 8\}$.

$xRy \rightarrow \frac{y}{x}$ $\quad R = \{(2, 6), (2, 8), (3, 6), (4, 8)\}$.

$R^{-1} = \{(6, 2), (8, 2), (6, 3), (8, 4)\}$.

Reflexitivity

- element related to itself.

eg: $A = \{2, 3, 4, 6, 7, 9\}$ $\quad xRy \rightarrow \frac{x-y}{3}$, $\forall x, y \in A$.

$\frac{2-2}{3} = 0$: $R = \{(2, 2), (3, 3), (4, 4) \ldots\}$ ↻ 2 r/s with itself. = reflex

Symmetry

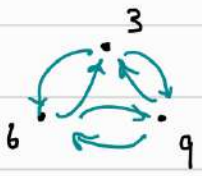
- (x, y), (y, x) relation.

$R = \{(6, 3), (3, 6), (9, 6), (6, 9) \ldots\}$.

r/s in both dirn = symmetry

Transitivity

- same as symmetry but > 2 points
- r/s b/w 1, 2 & 2, 3 & 1, 3 i.e all 3 points have r/s.



Properties of 'Equality'

$R \in \mathbb{R}$, $\forall x, y \in R$, $xRy \rightarrow x = y$.

R reflexive. R symmetric ($x = y$ / $y = x$). R transitive. $x = y$, $y = x$, $x = z$

Properties of 'less than'

$xRy \rightarrow x < y \vee y < x$

$x < y < z$ ⌐ then $x < z$

R not reflexive, not symmetric but transitive.

Equivalence Relation

if R reflexive, symmetric & transitive, then considered equivalence relation

Equivalence class

$[a] = \{x \in A \mid x R a\}$

eg: $A = \{0, 1, 2, 3, 4\}$ $\quad R = \{(0,0), (0,4), (1,1), (1,3), (2,2), (3,1), (3,3), (4,0), (4,4)\}$

$[0] = \{0, 4\}$ ← look at 2nd digit

↑ class of 0 (look at 1st digit from R)

$[1] = \{1, 3\}$. $\quad [2] = \{2\}$ $\quad [3] = \{1, 3\}$ $\quad [4] = \{0, 4\}$.