

Properties of Relations

Equivalence Relation

A relation is said to be equivalence if it is

- Reflexive
- Symmetric
- Transitive

Poset

A relation is said to be poset if it is

- Reflexive
- Antisymmetric
- Transitive

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

Reflexive $R = \{(1,1), (2,2), (3,3), (1,3), (2,3)\}$
 $\times R = \{(1,1), (2,2), (1,3), (2,3), \dots\}$

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

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

Antisymmetric $\times R = \{(1,3), (3,1)\}$

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

Properties of a Relation

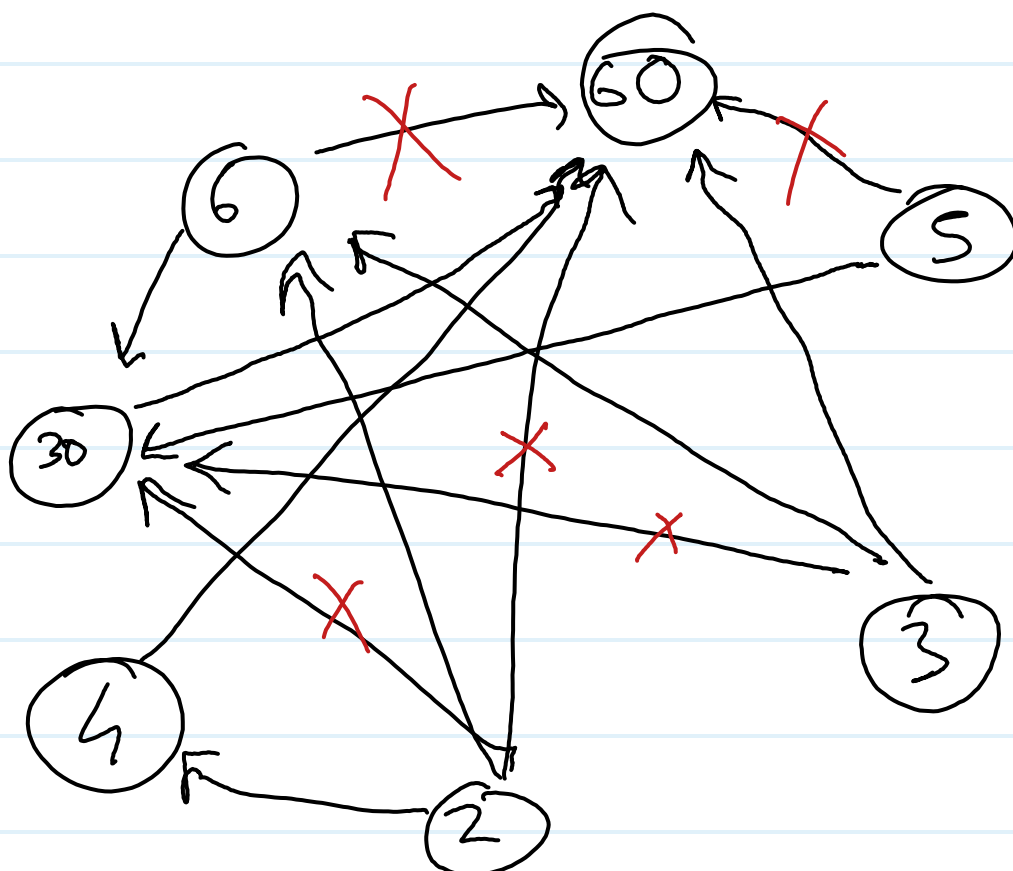
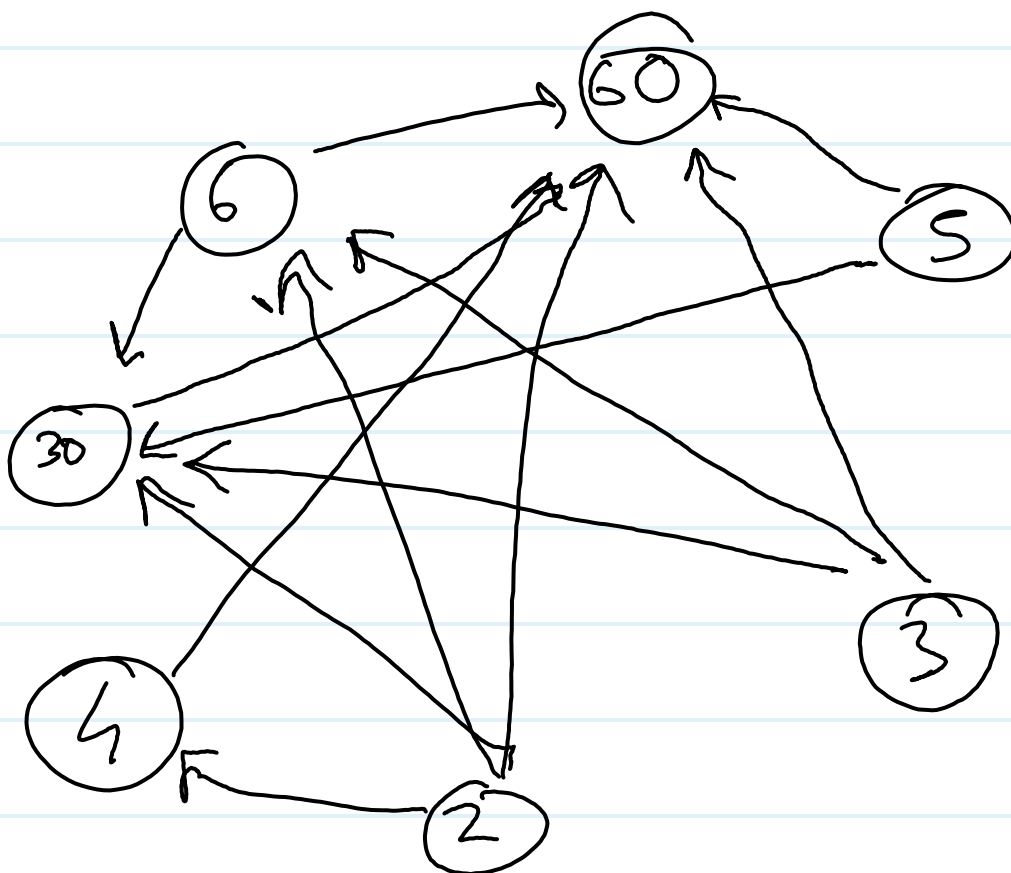
Reflexive : for every $(a,a) \in R, \forall a \in A$

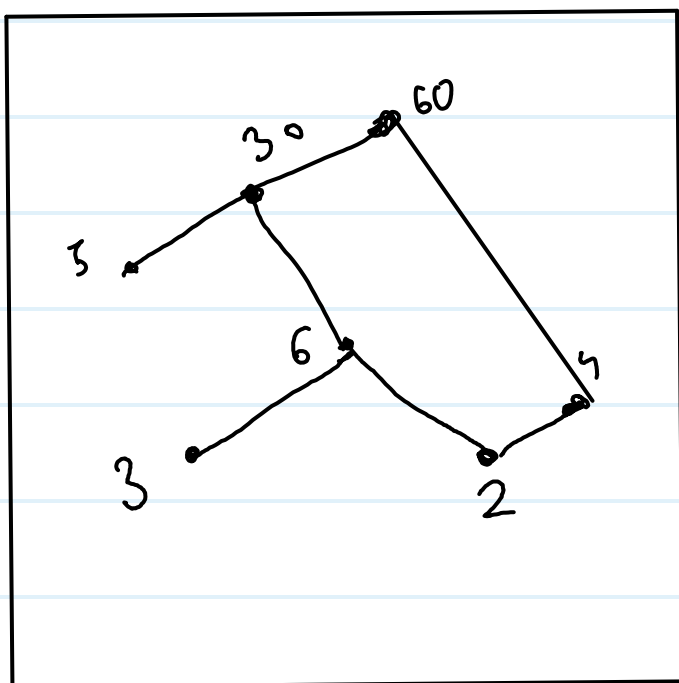
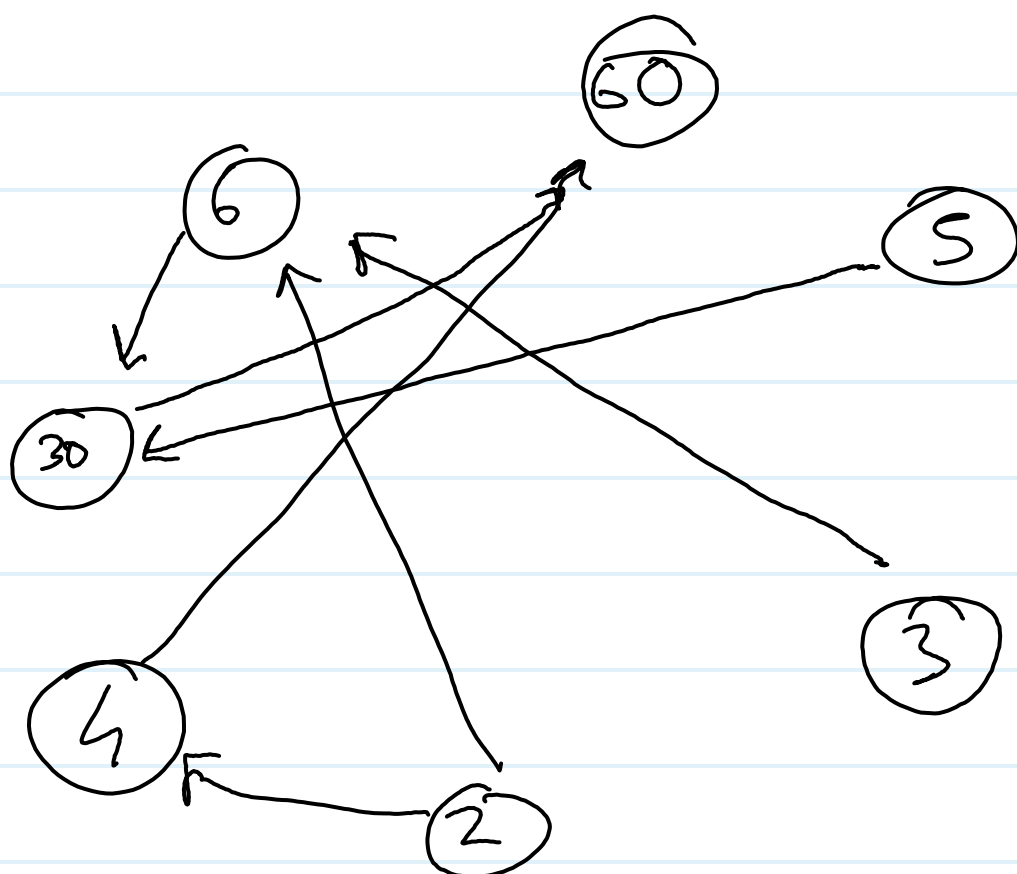
Symmetric : If $(a,b) \in R$ then $(b,a) \in R$
 (a,a) doesn't matter

Antisymmetric : If $(a,b) \in R$ then $(b,a) \notin R$
 (a,a) doesn't matter

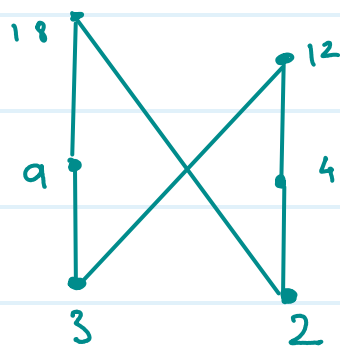
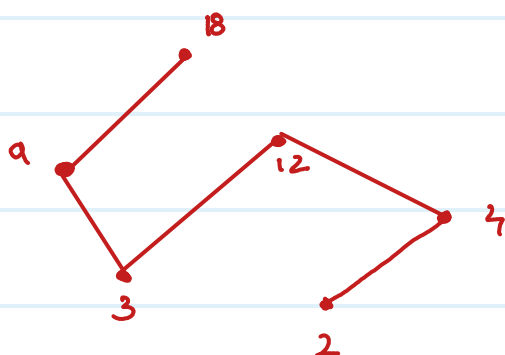
Transitive : If $(a,b) \in R$ & $(b,c) \in R$
 then $(a,c) \in R$

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

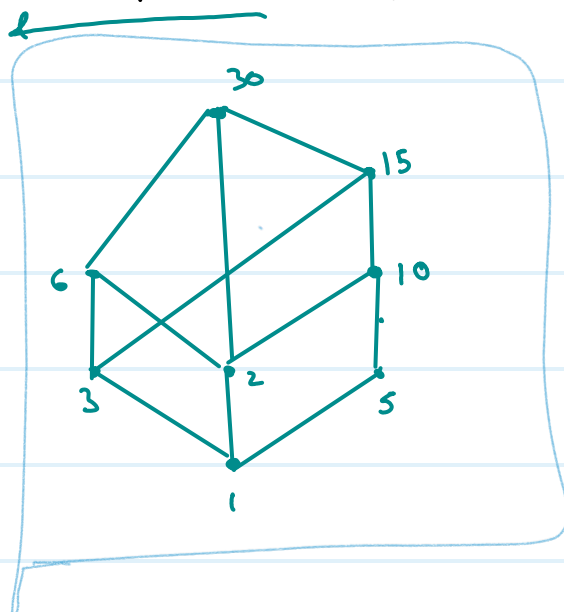




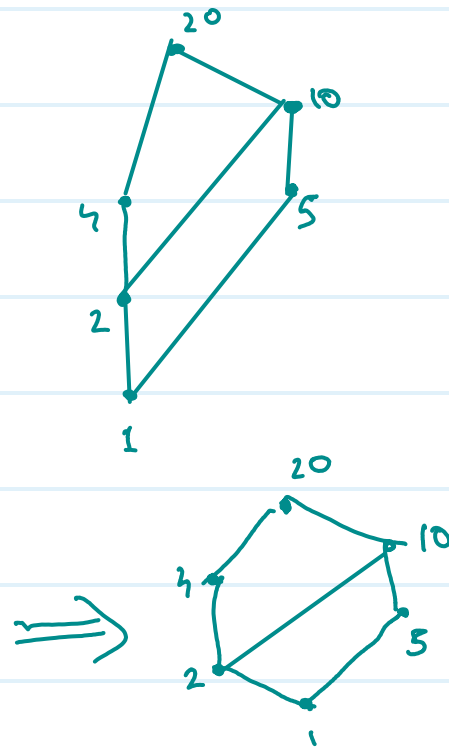
(2, 3, 4, 9, 12, 18)



$D_{30} \Rightarrow (1, 2, 3, 5, 6, 10, 15, 30)$



$$D_{20} \Rightarrow \{1, 2, 4, 5, 10, 20\}$$



$$D_{48} \Rightarrow \{1, 2, 3, 4, 6, 8, 12, 16, 24, 48\}$$

