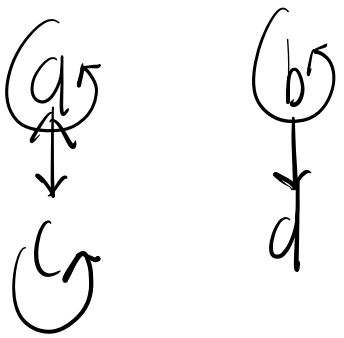
(1)

$R =$ 

(2)

$$R \circ S = \{(1,x),(1,4),(4,x),(4,4),(5,x),(2,2),(3,2),\}$$

(3) $R_1 \cup R_2 = \{(1,2),(1,3),(1,6),(1,5),(2,1),(3,6),(4,2),(5,6),(6,2),(6,3),(6,6)\}$

$R_1 \cap R_2 = \{(1,2),(5,6)\}$

(4)

$R =$

X \ Y	1	2	3	4	5
1	0	1	0	0	1
2	1	0	1	0	0
3	0	1	0	1	0
4	0	0	1	0	1
5	1	0	0	1	0

1

not reflexive: diagonal does not consist of all 1s. not (1,1)...

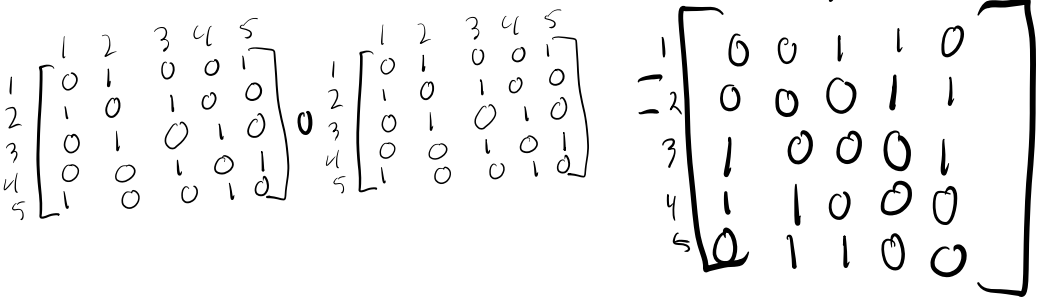
irreflexive: yes it is, 0's on the diagonal

symmetric: yes, $R = R^{-1}$ an (a,b) = (b,a)

antisymmetric: no, ex: (1,2) and (2,1) all agree over diagonal

transitive:

$R \circ R \subseteq R$ is transitive



(5) (a) Yes it is an equivalent relation, for every entery the age will be the same so they can be found equivalent. a is 47 and so is b and so on, thus they are symmetric. a is 47 so when compared to its self it will also be reflexive. A is 47, b is 47, and so will c. thus transitive.

(b) No this not. Easiest example is that a is related to b by grand parent. B to C by another grand parent, but A is not related to C so A and C are not equivalent by not being transitive.

(6) I used sibling a few times to mean brother or sister

Reflexive? a = arron

a is brother of a

you can not be your own sibling so it does not work

Symmetric? a = arron b = brett

a is a sibling of b

yes this can be flipped either way and make sense.

transitive? no, can not be your own sibling

NO, S is not and equivalence relation

because it is not symmetric

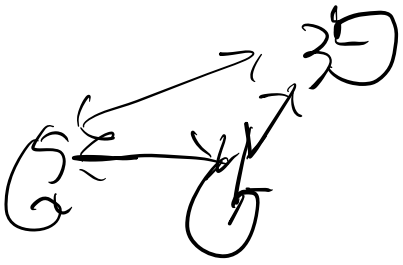
(7) 4 options with 4 to match to it

thus $4 \cdot 4 =$ $\boxed{16}$

8 $\{1,2,3,4,5,6\}$ $\{\{1,2\},\{3,4,5\},\{6\}\}$

$(1 \leftrightarrow 2)$

6



9

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix} \end{array} \quad \circ \quad \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

$$F \circ E = \begin{bmatrix} 1 & 1 & 0 \\ 2 & 2 & 1 \\ 1 & 1 & \end{bmatrix} = \{(1,1),(1,2),(2,3),(3,3)\}$$

no it is not