

12 people
5 men
7 women

5 person group 3 men, 2 women

$$\binom{5}{3} \binom{7}{2}$$

5 person group w/ at least 1 man

$$\begin{array}{l} \text{all possible} \\ \binom{12}{5} \end{array} - \begin{array}{l} \text{no men} \\ \binom{7}{5} \end{array}$$

groups w/

1 man $\binom{5}{1} \binom{7}{4} +$

2 men $\binom{5}{2} \binom{7}{3} +$

⋮

5 men $\binom{5}{5} \binom{7}{0} +$

sum

Functions

map input to an output

$$f(x) = x^2$$

$$f(x) = \sqrt{x}$$

$$x \in \mathbb{Q}$$

$$f\left(\frac{m}{n}\right) = \frac{m}{n}$$

$$f\left(\frac{1}{2}\right) = 1 \quad f\left(\frac{3}{6}\right) = 3$$

$$\frac{1}{2} = \frac{3}{6}$$

mapping from 1 set to another

$$f: \mathbb{R} \rightarrow \mathbb{R} \quad f(x) = x^2$$

$$f: X \rightarrow Y$$

X is the domain

Y is the co-domain

each element in X maps to a
unique value in Y

$\forall x \in X$

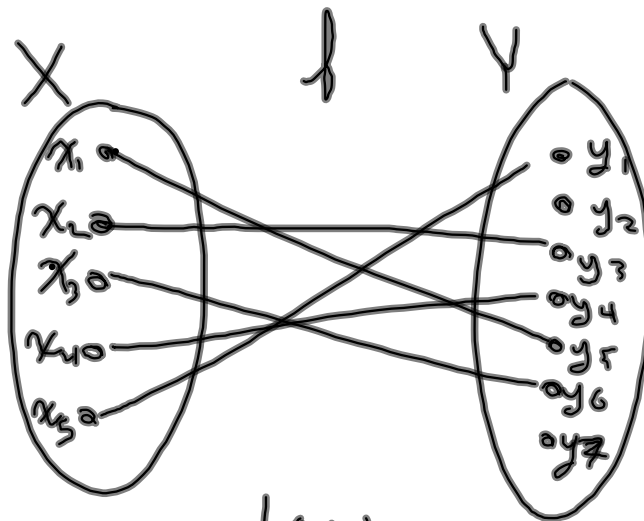
can't map to 2 (or more)
 $y \in Y$

$$\text{range of } f = \left\{ y \in Y \mid y = f(x) \text{ for some } x \in X \right\}$$

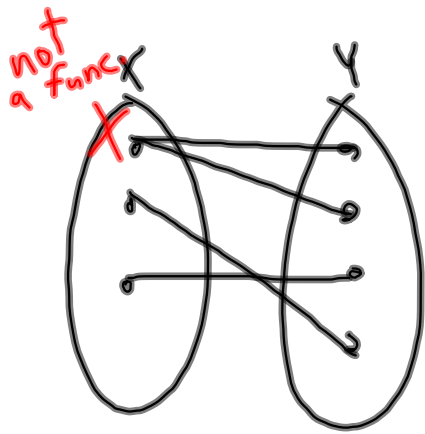
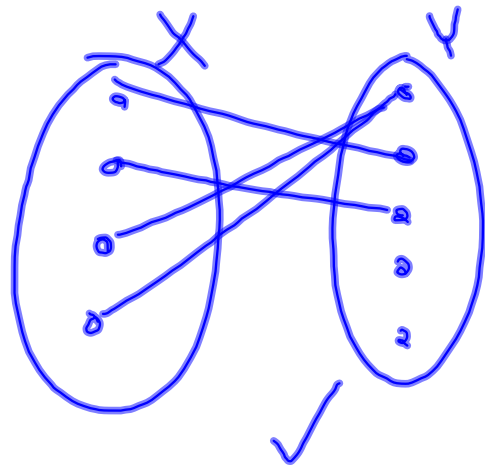
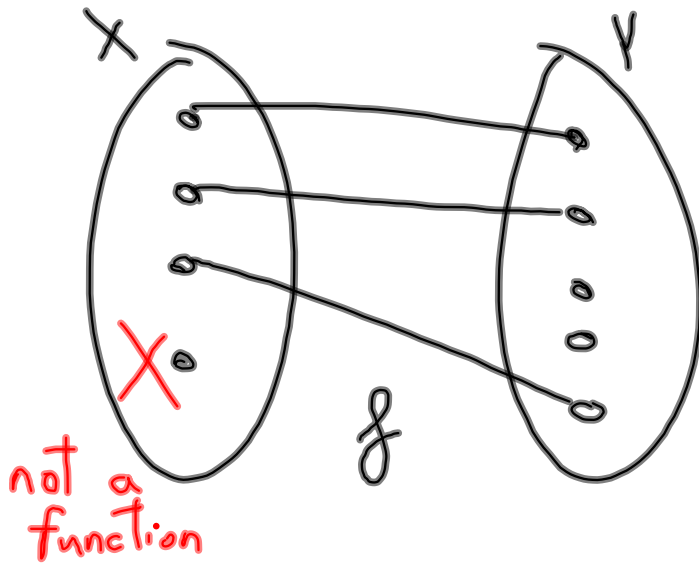
preimage of an element y

$$= \left\{ x \in X \mid f(x) = y \right\}$$

$$f: X \rightarrow Y$$



x	$f(x)$
x_1	y_5
x_2	y_3
x_3	y_6
x_4	y_4
x_5	y_1



Does $f=g$? $f: X \rightarrow Y$ $g: X \rightarrow Y$

$f=g$ iff $f(x)=g(x) \forall x \in X$

$f: \mathbb{R} \rightarrow \mathbb{R}$

$g: \mathbb{R} \rightarrow \mathbb{R}$

$f(x) = |x|$ $g(x) = \sqrt{x^2}$

Does $f=g$?

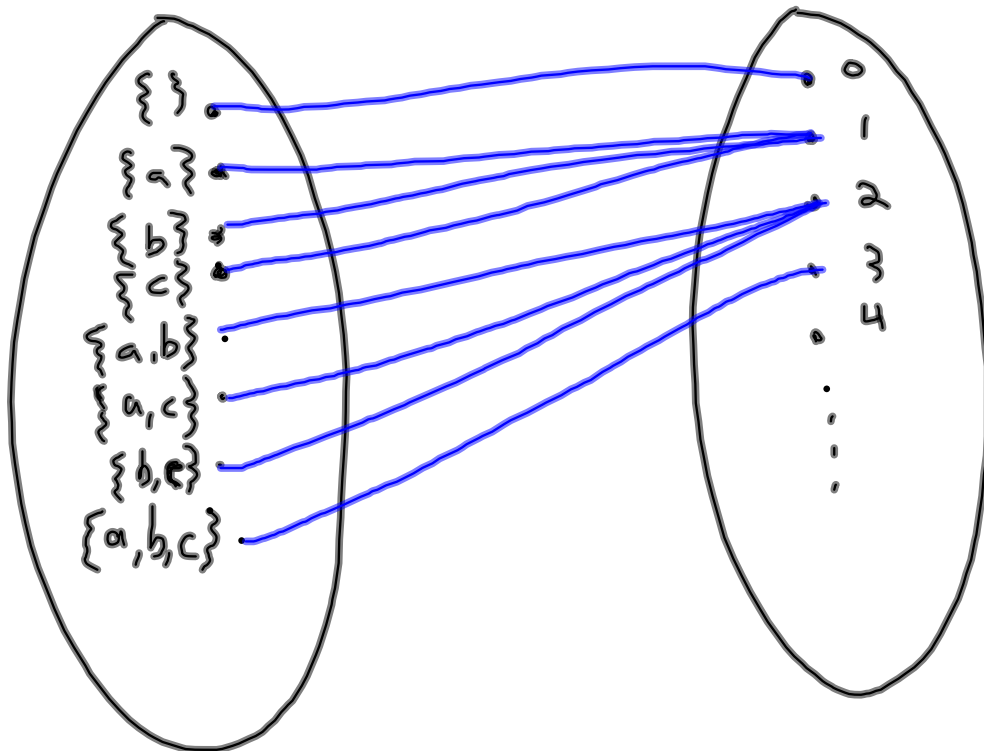
Identity

$i_x: X \rightarrow X$

$i_x(x) = x$

$$F: \mathcal{P}(\{a, b, c\}) \rightarrow \mathbb{Z}^{\text{non neg}}$$

$F(s) = \# \text{ of elements in } s$



S : set of all strings made up of a's and b's.

$$g(s) = \# \text{ of a's in } s$$

ϵ : empty string

$$g(bb) = 0$$

$$g(baab) = 2$$

$$g(\epsilon) = 0$$

Boolean function

domain: set of all ordered n -tuples
on $0,1$

ω -domain: $\{0,1\}$

$$f: \{0,1\}^n \rightarrow \{0,1\}$$

$$\{0,1\} \times \{0,1\} \times \{0,1\} \dots$$

f

a	b	c	$f(a,b,c)$
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0