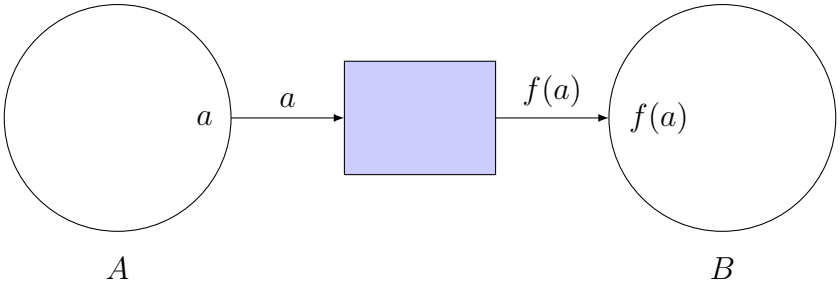
Functions: Mapping from Sets to Sets

Video companion

1 Function as a machine



A function $f : A \to B$ is a rule/formula/machine that transforms each element $a \in A$ into $f(a) \in B$.

a : input
$f(a)$: output

2 Examples

Abstract example:

$A = \{1, 2, 10\}$ $\quad B = \{\text{apple}, \text{DE}, \text{monkey}\}$
$f : A \to B$
$f(1) = \text{apple}$
$f(2) = \text{apple}$
$f(10) = \text{monkey}$

Study participants test positive or negative:

$$X = \{\text{all people in VBS study}\} \qquad Y = \{+, -\}$$
$$\text{Test} : X \to Y$$
$$\text{Test}(\text{person}) = +$$
$$\text{Test}(\text{person}) = -$$

Profit by year:

$$Y = \{...2010, 2011, 2012, ...\} \qquad \mathbb{R}$$
$$\text{Profit} : Y \to \mathbb{R}$$
$$\text{Profit}(\text{year}) = \text{profit/loss in year}$$
$$\text{Profit}(2011) = 1,007$$
$$\text{Profit}(2012) = -10,000$$

3 Supervised learning

Given: some examples of inputs $a \in A$ and outputs $f(a) \in B$
Mission: figure out $f : A \to B$