

Random Variable



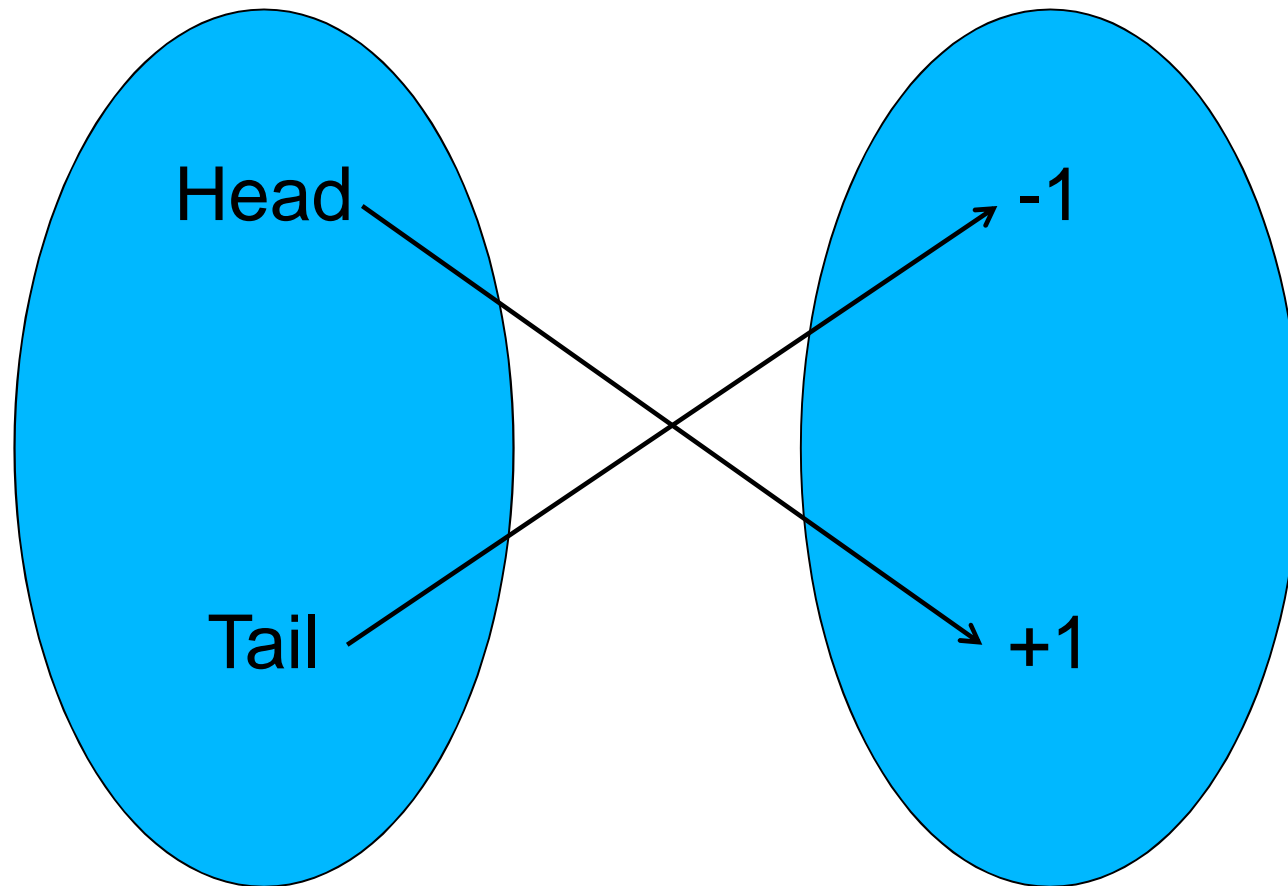
Random variable – definition

- Assigning a number to outcomes of an experiment

Example

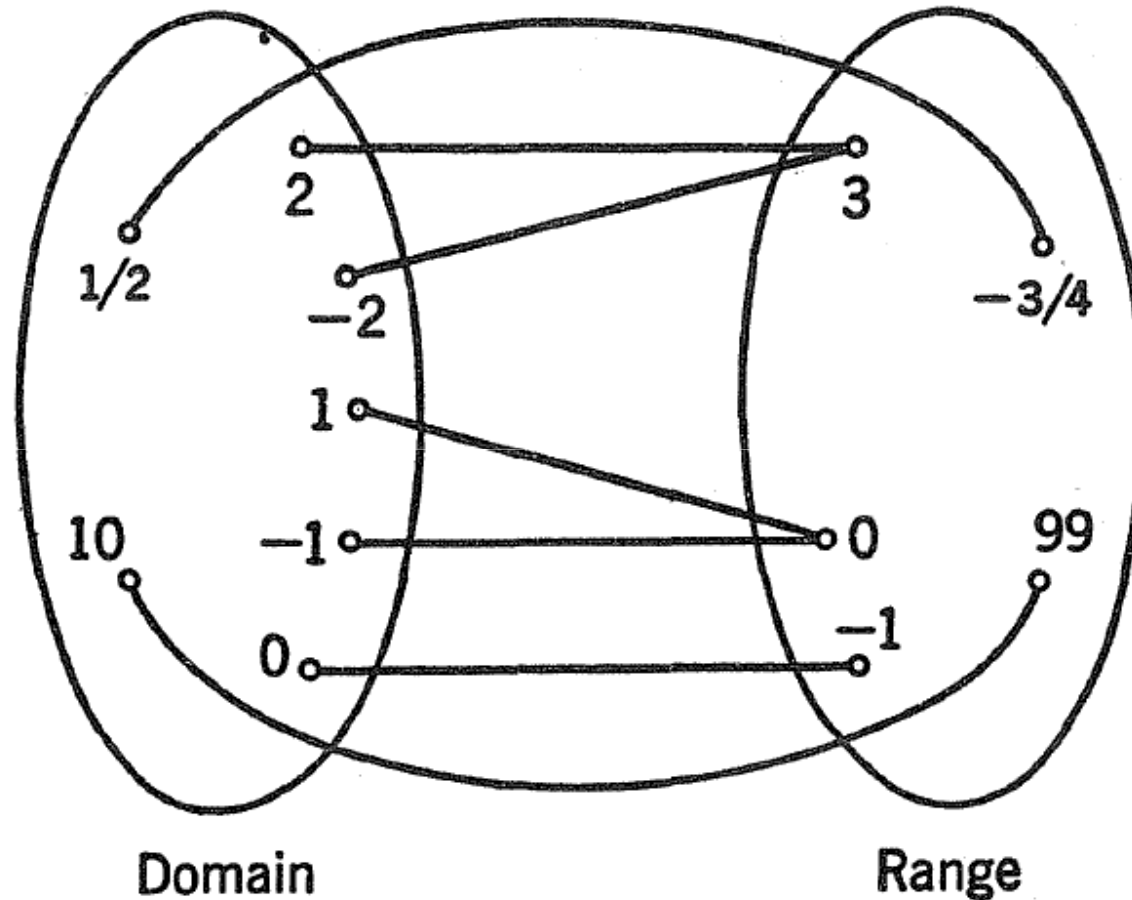
- Fair coin flipping
- Outcomes = {Head, Tail}
- Assignments = {Head = 1, Tail = -1}





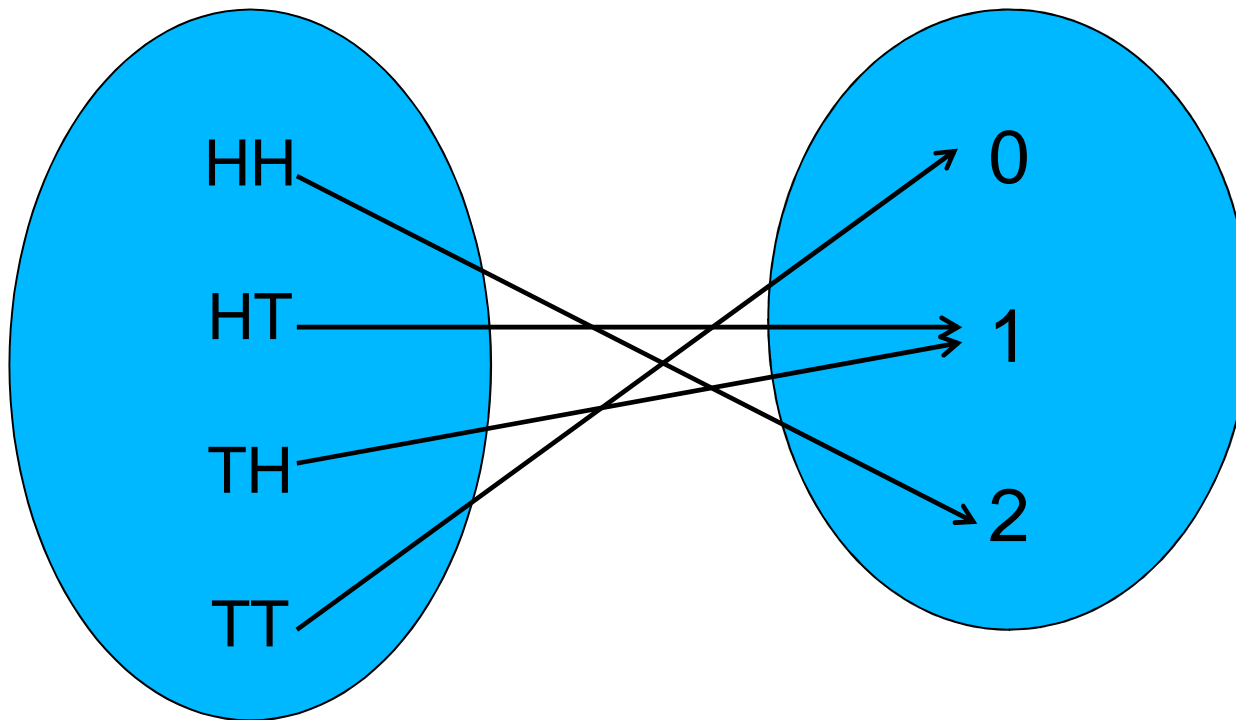
Domain and Range

Domains
NOT
necessarily
numbers



One more example

- Fair coin tosses two times
- Outcomes = $\{HH, HT, TH, TT\}$



Range of
RV is 0-2

One more example

- A true–false quiz consists of 15 questions.
- A random variable assigning = the total number of correct answers in each quiz.
- What is the range of RV?
- No. of correct answers can vary from 0 to 15
- Therefore random variable range=0 to 15



One more example

- Three people are selected from a group of five men and four women
- A random variable X is the number of women selected
- What is the range of RV?
- $X = \{0, 1, 2, 3\}$
- Range is 0 to 3

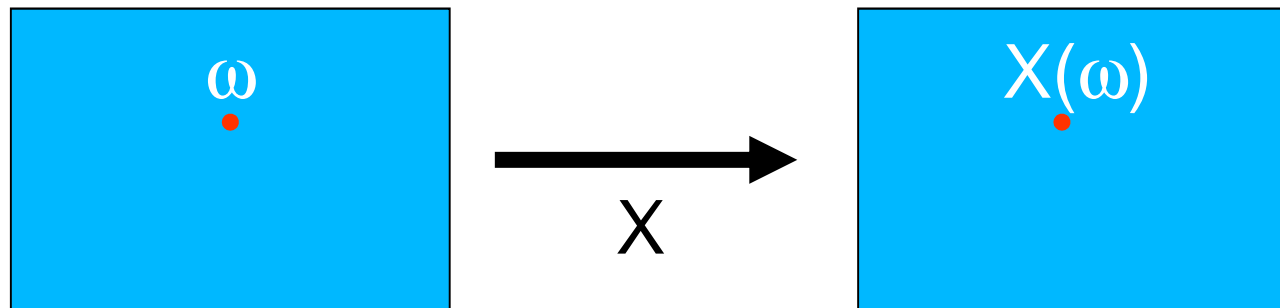


Outcome	X
Three men	0
Two men and one woman	1
One man and two women	2
Three women	3

Outcome	X	Possible ways
Three men	0	$C(5,3) = 5!/(3! \times 2!) = 10$
Two men and one woman	1	$C(5,2) \cdot C(4,1) = 5!/(2! \times 3!) \times 4!/(1! \times 3!) = 40$
One man and two women	2	$C(5,1) \cdot C(4,2) = 5!/(1! \times 4!) \times 4!/(2! \times 2!) = 30$
Three women	3	$C(4,3) = 4!/(3! \times 1!) = 4$

Random variable

- What is it?
 - A function
 - Mapping
- Real-valued function defined over the space of a **random** experiment



Discrete and continuous RV

Rolling a pair of dice – look @ sum of numbers - discrete

- Range of RV = 2 to 12
- Not strictly i.e. $\{2,3,4,5,6,7,8,9,10,11,12\}$

Measuring height of student selected at random-continuous

- Range of RV = 1.5 to 2
- Any value between 1.5 to 2 is possible

