Probability

Random Variable

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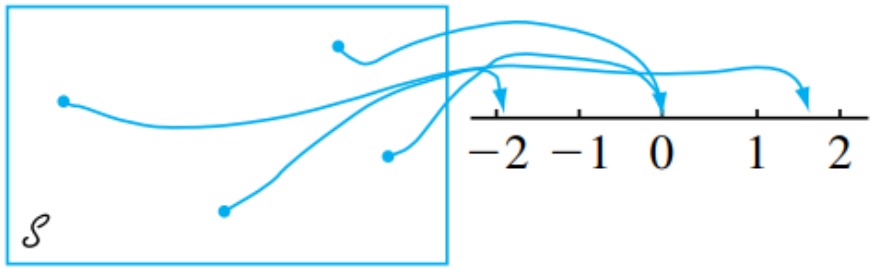
Intro…

- In many situations, it is desirable to **assign a numerical value to each outcome of an experiment**.
- Such an assignment is called a **random variable (rule of association)**



Random Variable

- Such a **rule of association** is called a **random variable**
  - **Variable** because different numerical values are possible and
  - **Random** because the observed value depends on which of the possible experimental outcomes results
- Random variables are customarily denoted by **uppercase letters**
- The notation $X(s) = x$ means that x is the value associated with the outcome s by the random variable X

Example - 01

- Suppose that an electrical engineer has on hand **six resistors**. **Three** of them are **labeled $10\ \Omega$** and the **other three** are labeled $20\ \Omega$. The engineer **wants to connect a $10\ \Omega$ resistor and a $20\ \Omega$ resistor** in series, to **create a resistance of $30\ \Omega$**.Now suppose that in fact the **three resistors labeled $10\ \Omega$** have actual resistances of **9,10, and $11\ \Omega$**, and that the **three resistors labeled $20\ \Omega$** have actual resistances of **19, 20, and $21\ \Omega$**.

The process of **selecting one resistor of each type is an experiment** whose **sample space consists of nine** equally likely outcomes

Example - 02

- List the possible values of the random variable X, and find the probability of each of them.

Outcome	X	Probability
(9, 19)	28	1/9
(9, 20)	29	1/9
(9, 21)	30	1/9
(10, 19)	29	1/9
(10, 20)	30	1/9
(10, 21)	31	1/9
(11, 19)	30	1/9
(11, 20)	31	1/9
(11, 21)	32	1/9

Example - 02

- List the possible values of the random variable X, and find the probability of each of them.

x	$P(X = x)$
28	1/9
29	2/9
30	3/9
31	2/9
32	1/9

Outcome	X	Probability
(9, 19)	28	1/9
(9, 20)	29	1/9
(9, 21)	30	1/9
(10, 19)	29	1/9
(10, 20)	30	1/9
(10, 21)	31	1/9
(11, 19)	30	1/9
(11, 20)	31	1/9
(11, 21)	32	1/9

References

- Statistics for Engineers and Scientists, Fourth Edition, William Navidi Colorado School of Mines
- Khan Academy