Def:

Random experiment is an experiment having the following properties:

1. The outcome can not be predicate with certainly.
2. The outcome can describe prior to the performance.
3. It can be repeated under the same conditions.

For examples

- Tossing a coin.
- Choice of a real number between 0 and 1.
- Drawing a card from playing card.

<u>Distribution function of discreet r.v.</u>

Distribution function of discreet r.v. is called probability mass function (p.m.f) and satisfies the conditions

- $0 \leq p(x_i) \leq 1.$
- $\sum_{i=1}^{\infty} p(x_i) = 1.$

Ex: let X be a discreet r.v. with the following p.m.f.

$$p(X = x) = \begin{cases} 0.1 & x = 0.2 \\ 0.2 & x = 0.4 \\ 0.2 & x = 0.5 \\ 0.3 & x = 0.8 \\ 0.2 & x = 1 \\ 0 & o.w \end{cases}$$

Find

1. $p(X \leq 0.5)$
2. $p(0.25 \leq X \leq 0.75)$
3. $p(X = 0.2 \mid X < 0.6)$

Sol

1. The event $X \leq 0.5$ can happen only if X is 0.2,0.4,0.5

$$p(X \leq 0.5) = p(X = 0.2) + p(X = 0.4) + p(X = 0.5)$$
$$= 0.1 + 0.2 + 0.2 = 0.5$$

2. $p(0.25 \leq X \leq 0.75) = p(X = 0.4) + p(X = 0.5)$
$$= 0.2 + 0.2 = 0.4$$

3.
$$p(X = 0.2 \mid X < 0.6) = \frac{p(X = 0.2)\ and\ p(X < 0.6)}{p(X < 0.6)}$$
$$= \frac{0.1}{0.1 + 0.2 + 0.2} = 0.2$$

Ex: suppose the probability mass function of r.v. X is

x	-2	-1	0	1	2
$p(x)$	$\frac{c}{10}$	$\frac{4c}{10}$	0.1	0.2	0.2

Find

1. The value of c.
2. $p(-1 < X \leq 2)$

Sol\

1. $\sum_{i=1}^{\infty} p(x_i) = 1.$
$$\frac{c}{10} + \frac{4c}{10} + 0.1 + 0.2 + 0.2 = 1$$
$$\frac{5c}{10} + 0.5 = 1 \Longrightarrow \frac{5c}{10} + \frac{5}{10} = 1$$
$$\frac{5c + 5}{10} = 1 \Longrightarrow 5c + 5 = 10$$
$$5c = 5 \Longrightarrow c = 1$$

x	-2	-1	0	1	2
$p(x)$	0.1	0.4	0.1	0.2	0.2

2. $p(-1 < X \leq 2) = 0.1 + 0.2 + 0.2 = 0.5$