# Continuous Random Variables:-

If a r.v can assume uncountable set of values, it is said to a continuous r.v

eg:- The age, the height or weight of the students in a classes is all R.V.

Note:- 1. In case of CRV, we usually talk of the value in a perticular interval and not at a point.

2. (i) DRV represent count data

(ii) CRV represent measure data

# Probability density functions-

Let $x$ be a CRV defined on the sample space S. Let $f(x)$ be a real valued function defined on R such that for any real numbers $a$ and $b$ $(a<b)$

$$P(a \leq x \leq b) = \int_a^b f(x)\,dx.$$

If the function $f(x)$ satisfies

(i) $f(x) \geq 0 \quad \forall x \in R$

(ii) $\int_{-\infty}^{\infty} f(x)\,dx = 1$ then

$f(x)$ is known as p.d.f of $X$

## Cumulative Distribution Function (CDF)
(Both DRV and CRV)

The cumulative distribution function of a r.v $X$ is defined by

$$F(x) = P(X \le x) = \sum_{t \le x} p(x)$$

if $X$ is a drv with p.m.f $p(x)$

$$F(x) = P(X \le x) = \int_{-\infty}^{x} f(x)\,dx$$

if $X$ is a CRV with p.d.f

Note :- If $X$ is a continuous r.v, then

$$\frac{d}{dx}[F(x)] = f(x)$$

## Properties of C.D.F

(i) $0 \le F(x) \le 1, \quad -\infty < x < \infty$

(ii) $F'(x) = f(x) \ge 0$, so that $F(x)$ is a non-decreasing function

(iii) $F(-\infty) = 0$

(iv) $F(\infty) = 1$

(v) $F(x)$ is a continuous function of $x$ on the right

(vi) $P(a < x \leq b) = \int_a^b f(x)\,dx = F(b) - F(a)$

(vii) $\because F'(x) = f(x)$.

We have $\frac{d}{dx}[F(x)] = f(x)$

$\Rightarrow dF = f(x).dx$.

This is known as probability diff^ble of $x$.

(viii) Discontinuities of $F(x)$ are atmost countable.

Note:- The c.d.f is used to find the cumulative probabilities in a probability distribution

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