

## Formulas - U-2

The first moment about mean always zero  $M_1 = 0$

$$1) M_1 = 0$$

$$2) M_2 = M'_2 - (M'_1)^2$$

$$3) M_3 = M'_3 - 3M'_2 M'_1 + 2(M'_1)^3$$

$$4) M_4 = M'_4 - 4M'_3 M'_1 + 6M'_2 (M'_1)^2 - 3(M'_1)^4$$

## Skewness

→ literally skewness means lack of symmetry.  
We study skewness to have an idea about the shape of the curve which we can draw with the help of the given data

$$\beta_1 = \frac{M_3^2}{M_2^3}$$

$$\beta_2 = \frac{M_4}{M_2^2}$$

$$1) \bar{x} = \frac{\sum x_i}{N}$$

$$y_i = \frac{1}{N}(x_i - \bar{x})$$

→ if  $x$  is discrete random variable  
 $\rightarrow \mu = 4$

$$f = 1 \quad 8 \quad 28 \quad - \quad N = 4 \quad f_i = 1 \quad \bar{x} = 4$$

$$\bar{x} = \frac{\sum x_i}{N} = \frac{36}{4} = 4$$

$$\mu_x = \frac{1}{\sum f_i} \sum f_i (x_i - \bar{x}) + \bar{x}$$

### Binomial distribution

Probability to get exactly  $r$  successes  
 with probability  $p$  of success  
 $P(r) = {}^n C_r p^r q^{n-r}$

$$\text{Mean} = \underline{\mu = np}$$

$$\text{Variance} = (\underline{\sigma^2}) = E(x^2) - \mu^2$$

$$\underline{\sigma^2 = npq}$$

$$\text{i)} P(x \geq 7)$$

$$\Rightarrow P(x=7) + P(x=8) + P(x=9)$$

$n$  is  
 $\downarrow$   
 success

$p^7$   
 $\downarrow$   
 failure

$q^{n-7}$   
 $\downarrow$   
 failure

$$\frac{123}{11} =$$

$$(\bar{x} - 10)^2 / 11 =$$

Poisson

$$P(X=x) = \frac{e^{-\lambda} \lambda^x}{x!}$$

$$\lambda = np$$

Poisson  $\approx$  Binomial