



الكلية : التربية للعلوم الصرفة

القسم او الفرع : الرياضيات

المرحلة: الثالثة

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اسم المادة باللغة العربية : نظرية احتمالية 1

اسم المادة باللغة الإنكليزية : **Probability Theory 1**

اسم المحاضرة التاسعة باللغة العربية: المنوال ومعامل الارتباط

اسم المحاضرة التاسعة باللغة الإنكليزية : The Mode and Correlation Coefficient

### المنوال Mode

Mode and median are two important measures of the central tendency. Here, we will define mode and medium of probability distribution

#### Definition: Mode

The mode of a probability distribution of r.v  $x$  is defined as that value of  $x$  say  $x$  for which the probability is maximum

$$\text{Mode} = \{x: p[X=x] = \max p[X=t]\}$$

In discrete r.v the mode represent the value  $x$  on  $x$ -axis which satisfy the inequality

$$\dots\dots < p(x-1) < p(x) > p(x+1) > p(x+2) > \dots\dots$$

The mode is  $x$ , or has two modes satisfy in inequality

$$\dots\dots < p(x-1) < p(x) = p(x+1) > p(x+2) > \dots\dots$$

The mode are  $x$  and  $x+1$ .

#### Definition: Covariance

If the r. v.  $X$  and  $Y$  have finite non-zero variance then the correlation coefficient between  $X$  and  $y$  is defined to be

$$r = \rho[x,y] = \frac{\text{cov}(x,y)}{\sqrt{\text{var}(x) \text{var}(y)}}$$

**comment :-**  $-1 \leq \rho(x,y) \leq 1$

**example:** Suppose that r. v.  $x$  can take each of the five values  $-2, 0, 1, 3$  and  $4$  with equal probability . we shall determine the s. d of  $y=4x-7$ ?

**Solution:**

$$E(x) = \frac{1}{5} (-2 + 0 + 1 + 3 + 4) = 1.2$$

$$E(X^2) = \frac{1}{5}(4 + 0 + 1 + 9 + 16) = 6$$

$$\sigma_x^2 = \text{var}(x) = 6 - (1.2)^2 = 4.56$$

$$\sigma_y^2 = \text{var}(y) = 16 - \text{var}(x) = 11.44$$

$$\text{S.D.} = \sigma_y = \sqrt{11.44} = 3.38$$