

## Probability Assignment Set-1

**1. Show that two disjoint events can never be mutually independent.**

**Solution:**

Let A and B be the two non empty events

1. if A and B are disjoint events, then

$$P(A \cap B) = 0 \quad \dots(1)$$

2. if A and B are independent events, then

$$P(A \cap B) = P(A)P(B) \quad \dots(2)$$

from equation (1) and equation (2) we get,  $P(A)P(B) = 0$

this implies that either  $P(A)$  or  $P(B)$  equals to 0, also A or B be empty events

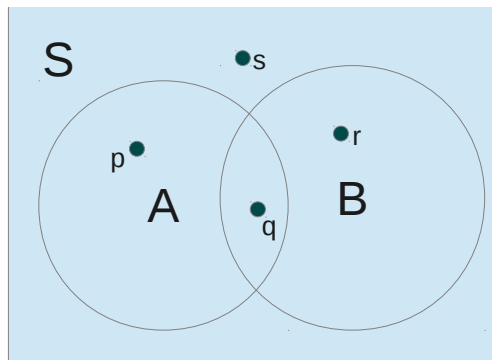
this contradicts to our assumption that A and B are non empty events

Hence, two disjoint sets can never be mutually independent.

**2. Show that are the minimum number of points in a sample space if there are two events A and B that are independent of each other? Why?**

**Solution:**

If there are two events A and B that are independent of each other, then there should be atleast 4 points in the sample space. The condition is described in the following Venn diagram.



S is the sample space containing the 4 points p, q, r and s having equal probability of getting selected. An event A contains two points p and q and event B contains points q and r.

Probability of occurrence of A,  $P(A) = \frac{1}{2}$  and

Probability of occurrence of B,  $P(B) = \frac{1}{2}$

Probability of occurrence of both A and B,  $P(A \cap B) = \frac{1}{4}$

Probability of occurrence of A given B has occurred,  $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1/4}{1/2} = \frac{1}{2} = P(A)$

this implies that the occurrence of the A does not affected by the occurrence of B under the given conditions.

**Submitted By-**

**PANKAJ KUMAR B110349CS**

**RAVI ROUSHAN B110843CS**

