

SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

DEPARTMENT OF MATHEMATICS



(5 Conditional probability: The conditional probability of an event B assuming that the event A has happened, is defined as, $P(B|A) = \frac{P(A \cap B)}{P(A)}$, provided $P(A) \neq 0$ Similarly. $P(A|B) = \frac{P(A \cap B)}{P(B)}$, provided $P(B) \neq 0$ If A and B are independent, then prove that Theorem : 1. A cind B are independent 2. A and B are independent 3. A and B are independent. Proof: Given A and B are independent => P(AnB) = P(A)P($\rightarrow \mathbb{C}$ $I \cdot P(\overline{A} \cap B) = P(\overline{A}) \cdot P(B)$ A Consider, ANB $B = (A \cap B) \cup (\overline{A} \cap B)$ $P(B) = P \left[(A \cap B) \cup (\overline{A} \cap B) \right]$ $P(B) = P(A \cap B) + P(\overline{A} \cap B)$ =) $P(\overline{A} \cap B) = P(B) - P(A \cap B)$ = P(B) - P(A) P(B) (from ()) $= P(B) \left[1 - P(A) \right]$ $P(\overline{A} \cap B) = P(B) \cdot P(\overline{A})$. A and B are independent.

Scanned by CamScanne

16MA203- Probability & Random Processes S.Gowri , AP/Mathematics Page 1



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution) DEPARTMENT OF MATHEMATICS



(a)
(b)
(c)
$$P(A \cap \overline{b}) = P(A) \cdot P(\overline{b})$$

(c) $P(A \cap \overline{b}) = P(A \cap \overline{b})$
 $P(A) = P[(A \cap \overline{b}) \cup (A \cap \overline{b})]$
 $= P(A \cap \overline{b}) + P(A \cap \overline{b})$
 $= P(A) = P(A) - P(A \cap \overline{b})$
 $= P(A) = P(A) P(\overline{b})$
 $P(A \cap \overline{b}) = P(A) P(\overline{b})$
 $P(\overline{A} \cap \overline{b}) = P(\overline{A}) \cdot P(\overline{b})$
 $Consider,$
 $P(\overline{A} \cap \overline{b}) = P(A \cup B)$ (by Dermograms
 $Iaw)$
 $= I - P(A \cup B)$
 $= I - [P(A \cup B) + P(B) - P(A \cap B)]$
 $= I - [P(A) + P(B) - P(A) \cdot P(B)]$
 $= I - [P(A) + P(B) - P(A) \cdot P(B)]$
 $= P(\overline{A}) - P(B) + P(A) \cdot P(B)$
 $= P(\overline{A}) - P(B) - P(A) = P(A)$
 $= P(\overline{A}) - P(B) - P(A)$
 $= P(\overline{A}) - P(B) - P(A)$
 $= P(\overline{A}) [I - P(B)]$
 $P(\overline{A} \cap \overline{b}) = P(\overline{A}) P(\overline{b})$
 $\therefore \overline{A}$ and \overline{B} are independent.

Scanned by CamScanner

16MA203- Probability & Random Processes S.Gowri , AP/Mathematics Page 2

1. 1. 1.



SNS COLLEGE OF TECHNOLOGY (An Autonomous Institution) DEPARTMENT OF MATHEMATICS



PROBLEMS :

(1) From a bag containing 5 white balls and 6 green ba 3 balls are drawn with replacement. What is the chance that (i) all are of same colour (ii) they are alternativel of different colours.

Solution :

(i) P (all are of Same colour)

$$= P(a|| are white or all are green)$$

= $P(a|| are white) + P(a|| are green)$
= $P(I|| I|| I|| I|| + P(IG IG IIG)$
= $\frac{5}{11} \times \frac{5}{11} \times \frac{5}{11} + \frac{6}{11} \times \frac{6}{11} \times \frac{6}{11}$
= $\frac{125}{1331} + \frac{216}{1331}$
= $\frac{341}{1331}$

(ii) P (they are alternatively of different Colours) = P (IW 正G ⅢW or IG ⅢW ⅢG)

$$= \frac{5}{11} \times \frac{6}{11} \times \frac{5}{11} + \frac{6}{11} \times \frac{5}{11} \times \frac{6}{11}$$
$$= \frac{150}{1331} + \frac{180}{1331}$$
$$= \frac{330}{1331}$$

Scanned by CamScan

16MA203- Probability & Random Processes S.Gowri , AP/Mathematics Page 3



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution) DEPARTMENT OF MATHEMATICS



DEPARIMENT OF MATHEMATICS
(a) If A and B are events with $P(A) = \frac{3}{8}$, $P(B) = \frac{1}{2}$
and $P(A \cap B) = \frac{1}{4}$, find $P(A^{c} \cap B^{c})$.
$\frac{Soln:}{P(AUB)} = P(A) + P(B) - P(A \cap B)$
$= \frac{3}{8} + \frac{1}{2} - \frac{1}{4} = \frac{5}{8}$
$P(A^{c} \cap B^{c}) = P[(A \cup B)^{c}]$
= I - P(A b B)
$= 1 - \frac{5}{8} = \frac{3}{8}$
3) IF P(A) = 0.4, P(B) = 0.7, P(ANB) = 0.3, find
P(ANB) & P(AUB).
Soln: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
= 0.4 + 0.7 - 0.3
= 0.8
$P(\overline{A}\overline{D}\overline{B}) = P(\overline{A}\overline{U}\overline{B})$
= 1 - P(AUB)
= 1 - 0.8
= 0.2
$P(\overline{A} \cup \overline{B}) = P(\overline{A} \cap \overline{B})$
$= 1 - P(A \cap B)$
= 1-0.3
= 0.7

Scanned by CamScan

16MA203- Probability & Random Processes S.Gowri , AP/Mathematics Page 4