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CHAPTER PROBABILITY: CLASS No: 4

Qns: 1 A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a Six. Find the probability that it is actually a Six.

Solution

A → Man reports that it is a six

E_1 → Six occurs

E_2 → Six doesn't occur

$P(E_1) = 1/6$ $P(E_2) = 5/6$

$P(A/E_1) = 3/4$ ← 6 report, 6 occurs

$P(A/E_2) = 1/4$ ← Man reports, 6 doesn't occur

By Bayes $P(E_1/A) =$ Probability

Ans = 3/8

Qns 2 → Of people having HIV, 90% of the test detect the disease but 10% go undetected. Of people free of HIV, 99% of the test are judged HIV -ve but 1% are diagonsed as ~~people~~ having HIV +ve. From a large population of which only 0.1% have HIV, one person is selected at random, given the HIV test and the pathologist reports him/her as HIV +ve. What is the probability that the person actually has HIV?

Sol^n Mr A → Pathological Reports HIV +ve

E_1 → Person has HIV +ve

E_2 → Person does not have HIV +ve

$P(E_1) = 0.1\% = \frac{1}{1000}$

$P(E_2) = \frac{999}{1000}$

$P(A/E_1) = \frac{90}{100}$ (HIV Report → HIV present)

$P(A/E_2) = \frac{1}{100}$ (HIV Report → HIV not present)

$P(E_1/A) = \frac{\text{value put}}{}$

≈ 0.083 Approx

Ques 3 Assume that the chances of a patient having a heart attack is 40%. It is also assumed that a meditation and yoga course reduce the risk of heart attack by 30% and prescription of certain drugs reduces its ~~chance~~ Chance by 25%. At a time a patient can chose any one of the two options with equal probabilities. It is given that after going through one of the two options the patient selected at random "suffers a ~~heart~~ heartattack". Find the probability that the patient followed a course of meditation and Yoga?

A → patient suffers heartattack

E_1 → He followed Meditation & Yoga

E_2 → He followed Prescription of drug.

$P(E_1) = P(E_2) = 1/2$

$P(A/E_1) = \frac{70}{100} \times \frac{40}{100} = \frac{28}{100}$

$P(A/E_2) = \frac{25}{100} \times \frac{40}{100} = \frac{30}{100}$

$P(E_1/A) =$ value pkn

Qn 4 → If a machine is correctly set up, it produces 90% acceptable items. It it is incorrectly set up, it produces only 40% acceptable items. Past experience shows that 80% of the set ups are correctly done. If after a certain set up, the machine produces 2 acceptable items, find the probability that the machine is correctly set-up.

Soln A → 2 acceptable items are produced

E_1 → Machine is correctly set up

E_2 → Machine is incorrectly set up

$P(E_1) = 80/100$; $P(E_2) = \frac{20}{100}$ $P(A/E_1) = \frac{90}{100} \times \frac{90}{100}$ | $P(A/E_2) = \frac{40}{100} \times \frac{40}{100}$ | $P(E_1/A) = ?$

Topic — **Total law of probability**

A → Required event

E_1 →
E_2 →
E_3 →
} Options (atleast two)

$P(E_1) + P(E_2) + \dots = 1$ $\quad P(A|E_1)$ = Meaning wise

Formula $P(A) = P(E_1)P(A|E_1) + P(E_2)P(A|E_2) + P(E_3)P(A|E_3) + \dots$

Qn 5 → There are two bags. Bag I contains 3 Red & 4 green balls. Bag II contain 4 Red & 2 green balls. ~~A ball~~ → one of the bag is selected & from the selected bag a ball is drawn. what is the probability that it is Red.

A → ~~ball~~ Red ball is drawn (Required)

E_1 → Bag I is selected

E_2 → Req II " "

$P(E_1) = 1/2$ $\quad P(E_2) = 1/2$

$P(A|E_1) = 3/7$ $\quad P(A|E_2) = 4/6$

Req is $P(A)$ = value pls.

Qn 6 → A person has undertaken a construction job. The probabilities are 0.65 that there will be strike, 0.80 that the construction job will be completed on time if there is no strike and 0.32 that the construction job will be completed on time, if there is a strike. Determine the probability that the construction job will be completed on time.

Sol A → the construction job is completed on time

E_1 → there was a strike

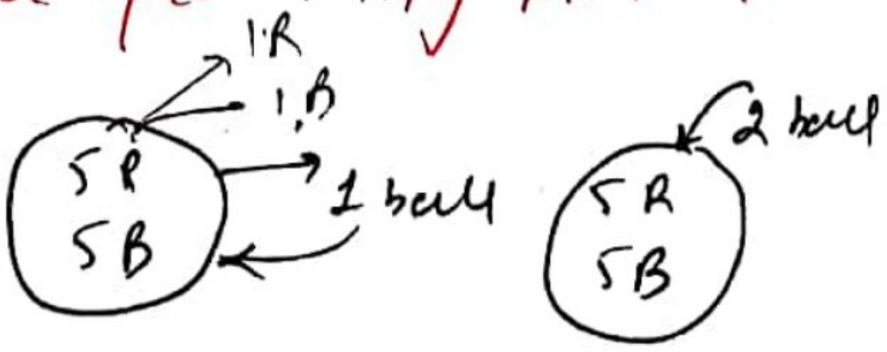
E_2 → there was no strike

$P(E_1) = 0.65$ $P(E_2) = 1 - 0.65 = 0.35$

$P(A|E_1) = 0.32$ $P(A|E_2) = 0.80$

$P(A) =$ value put

Qn 7 An urn contains 5 red & 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random what the probability that the second ball is red?



Sol^{n} A → the ball is drawn (second ball) is Red

E_1 → the first ball was Red

E_2 → the first ball was Black

$P(E_1) = \frac{5}{12}$ $P(E_2) = \frac{5}{12}$

$P(A/E_1)$ = 2nd Red / 1st ball = $\frac{7}{12}$

$P(A/E_2)$ = 2nd ball / 1st black = $\frac{5}{12}$

$P(A)$ = value put.