

QUESTION : 12.13.3.84

ROLL NO:EE22BTECH11027

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12.13.3.84. Two cards are drawn from a well shuffled deck of 52 playing cards with replacement. The probability, that both cards are queens, is

- A $\frac{1}{13} \times \frac{1}{13}$
- B $\frac{1}{13} + \frac{1}{13}$
- C $\frac{1}{13} \times \frac{1}{17}$
- D $\frac{1}{13} \times \frac{4}{51}$

Solution: : Let p be the probability of selecting queens from the deck of 52 cards. There are 4 queens in a standard deck. So,

$$p = \frac{1}{13} \quad (1)$$

We can consider each draw as a Bernoulli trial with success defined as drawing a queen. Then, we can use the binomial probability formula:

$$P(X = k) = {}^nC_k (1 - p)^{n-k} p^k \quad (2)$$

where, $P(X = k)$ is the probability of getting k number of queens in trials. The probability for the trials

TABLE 4
PARAMETERS FOR CDF

parameter	value
n	2
p	$\frac{1}{13}$
k	0,1,2

to succeed to 2 times is $P(k = 2)$. Using (2) we get,

$$\begin{aligned} P(X = 2) &= {}^2C_2 \left(1 - \frac{1}{13}\right)^{2-2} \left(\frac{1}{13}\right)^2 \\ &= \frac{1}{13} \times \frac{1}{13} \end{aligned} \quad (3)$$

\therefore the probability, that both cards are queens, is $\frac{1}{13} \times \frac{1}{13}$.