

PROBABILITY

UDAY KUMAR - FWC22086

16.4.6 ¹Four cards are drawn from a well-shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade?.

Solution:

Let the cards drawn from the deck be $X = \{0, 1, 2, 3\}$ and $Y = \{0, 1\}$, where **0** denotes the card is from diamonds and **1** denotes the card is from spades. **D** be the event such that the selected card is from diamond $X_d = \{00, 01, 02\}$ **S** be the event such that the selected card is spade $X_S = \{13\}$

Number of ways of selecting 3 diamonds $P(X_d) = {}^{13}C_3$

Number of ways of selecting 1 spade $P(X_S) = {}^{13}C_1$

Number of ways of selectin 4 cards out of 52 is $P(X) = {}^{52}C_4$

$$\therefore P_{req} = \frac{P(X_d) \times P(X_S)}{P(X)} \quad (16.4.6.1)$$

$$= \frac{{}^{13}C_3 \times {}^{13}C_1}{{}^{52}C_4} \quad (16.4.6.2)$$

$$= \frac{\frac{13!}{3!(13-3)!} \times \frac{13!}{1!(13-1)!}}{\frac{52!}{4!(52-4)!}} \quad (16.4.6.3)$$

$$= \frac{\frac{13 \times 12 \times 11 \times 10!}{3! \times 10!} \times \frac{13 \times 12!}{1! \times 12!}}{\frac{52 \times 51 \times 50 \times 49 \times 48!}{4! \times 48!}} \quad (16.4.6.4)$$

$$= \frac{\frac{89232}{312}}{\frac{649700}{312}} \quad (16.4.6.5)$$

$$\therefore P_{req} = \frac{286}{20285} \quad (16.4.6.6)$$

¹Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)