PROBABILITY

UDAY KUMAR - FWC22086

16.4.2 [1]**Four 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. The desired set of selecting diamonds $\{00, 01, 02\}$ and selecting one spade is $\{13\}$

Number 0f ways of selecting 3 diamonds P(00 , 01 , 02) $= {}^{13}C_3$
Number of ways of selecting 1 spade P(13) $= {}^{13}C_1$
selecting four cards from deck P(x) $= {}^{52}C_4$

$$\therefore \text{P}_{req} = \frac{\text{P}(00, 01, 02)\text{P}(13)}{P(X)}$$

$$= \frac{{}^{13}C_3 \times {}^{13}C_1}{{}^{52}C_4}$$

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

$$= \frac{\frac{13\times12\times11\times10!}{3!X10!} \times \frac{13\times12!}{1!\times12!}}{\frac{52\times51\times50\times49\times48!}{4!\times48!}}$$

$$= \frac{\frac{89232}{312}}{\frac{649700}{312}}$$

$$\therefore \boxed{\text{P}_{req} = \frac{286}{20285}}$$

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