Department of Statistics

Class: FY M.Sc (Data Science) **Subject: Statistics**

Practical : IV Theory of Probability **Date:**

Q.1 If a pair of unbiased coins are tossed. Obtain the probability of occurrence of i) both the heads ii) Single head iii) at least one head

Q.2 Four cards are drawn at random from a well shuffle 52 cards. Find the probability that

i) Two are red & two are black card
ii) All cards are of different suits.
iii) All are of same suit
iv) One is king

Q.3. A commodity of four to be formed from three engineers , four economist, two statisticians and one CA.

i) What is the probability that each of the four categories is included in the commodity.
ii) What is the probability of commodity consist CA and at least one engineer.

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Q.1) →

$\Omega = \{HH, HT, TH, TT\}$

$n = 4$

i) A : Occurance of both head

$A = \{HH\}$, $n(A) = 1$

$P(A) = \frac{1}{4}$

ii) B : Single head

$B = \{HT, TH\}$, $n(B) = 2$

$P(B) = \frac{1}{2}$

iii) C : Atleast one head

$C = \{HH, HT, HH\}$

$P(C) = \frac{3}{4}$

Q.2) → The total no. of case in which four cards are selected from 52 cards is given by $\binom{52}{4}$ or $^{52}C_4$

hence Ω contain

$n = \binom{52}{4}$

i) A = Occurance of two red & two black card

52

Black	Red
26	26
$^{26}C_2$	$^{26}C_2$

two red cards can be drawn in $^{26}C_2$ ways

two black cards can be drawn in $^{26}C_2$ ways

∴ both red and black cards are to be favorable cases to the event A will be

$$m = {}^{26}C_2 \cdot {}^{26}C_2$$

$$P(A) = \frac{{}^{26}C_2 \cdot {}^{26}C_2}{{}^{52}C_4}$$

$$= \frac{26 \times 25}{2} \times \frac{325 \times 325}{270725}$$

$$P(A) = 0.3902$$

ii) B = All cards are different suits.

Total cards = 52

$$P(B) = \frac{{}^{13}C_1 \cdot {}^{13}C_1 \cdot {}^{13}C_1 \cdot {}^{13}C_1}{{}^{54}C_4}$$

$$= \frac{28561}{265200}$$

$$P(B) = 0.1077$$

iii) C = All are same suits.

Let event c equal to occurance of same suits i.e

All cards are either diamond, heart, club, spade using addition principle we get.

$$P(C) = \frac{{}^{13}C_4 + {}^{13}C_4 + {}^{13}C_4 + {}^{13}C_4}{{}^{52}C_4}$$

$$= 4 \cdot \frac{^{13}C_4}{^{52}C_4}$$

$$= \frac{2860}{270725}$$

$$P(C) = 0.0106$$

iv) D = one is king

52

4 king | 48

$^4C_1$ | $^{48}C_3$

their are 4 kings in total 52 cards. Since one king card to be selected. no. of favorable cases to the event

$$m = {}^4C_1 \cdot {}^{48}C_3$$

$$P(D) = \frac{{}^4C_1 \cdot {}^{48}C_3}{{}^{52}C_4}$$

$$= \frac{69184}{270725}$$

$$P(D) = 0.2556$$

2.3) → $n = {}^{10}C_4 = 210$

i) A = Prob that each of 4 categories of profession is included

hence no. of favorable case for A is

$$m = {}^3C_1 \cdot {}^4C_1 \cdot {}^2C_1 \cdot {}^1C_1$$

$$P(A) = \frac{{}^3C_1 \cdot {}^4C_1 \cdot {}^2C_1 \cdot {}^1C_1}{{}^{10}C_4}$$

$$P(A) = \frac{24}{210} = 0.1143$$

ii) B = commitee should consist of characted accountant & at least one engineer
∴ this can be done in either of following ways
No of ω

a) 1 CA + 1 engineer + 2 others
$^1C_1 + {}^3C_1 + {}^6C_2 = 45$

b) 1 CA + 2 engineer + 1 other
$^1C_1 \cdot {}^3C_2 \cdot {}^6C_1 = 18$

c) 1 CA + 3 engineers + None
$^1C_1 \cdot {}^3C_3 \cdot {}^6C_0 = 1$

$m = 45 + 18 + 1$

$P(B) = \frac{64}{210} = 0.3048$