

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

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

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

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

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

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

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

$$= \frac{26!}{2} \cdot \frac{325 \times 325}{270725}$$

$$P(A) = 0.3902$$

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 occurrence of
 same suits i.e

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

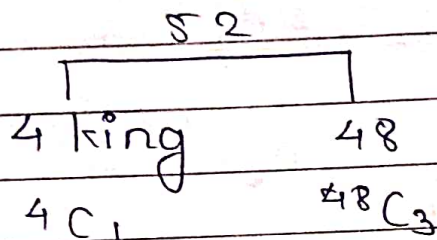
$$P(C) = \frac{{}^{13}C_4 + {}^{13}C_4 + {}^{13}C_4 + {}^{13}C_4}{{}^{52}C_4}$$

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

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

$$P(C) = 0.0106$$

iv) D = one is king



there are 4 kings in total 52 cards.
 Since one king card to be selected,
 no. of favorable cases to the event
 $m = 4C_1 \cdot 48C_3$

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

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

$$P(D) = 0.2556$$

2.3) $\rightarrow n = {}^{10}C_4 = 210$

i) A = Prob that each of 4 categories
 of profession is included
 hence no. of favorable case for A is
 $\frac{2}{3} = 3C_1 \cdot 4C_1 \cdot 2C_1 \cdot 1C_1$

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

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

ii) B = committee should consist of characted accountant & at least one engineer
∴ this can be done in either of following ways

a) 1 CA + 1 engineer + 2 others

$${}^1C_1 + {}^3C_1 + {}^6C_2 = 45$$

b) 1 CA + 2 engineer + 1 other

$${}^1C_1 + {}^3C_2 + {}^6C_1 = 18$$

c) 1 CA + 3 engineers + None

$${}^1C_1 + {}^3C_3 + {}^6C_0 = 1$$

$$m = 45 + 18 + 1$$

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