Probability

Mithun sir এর pdf
Sharif " " "

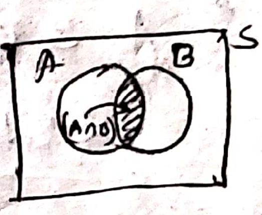
$P(A\cup B) = P(A)+P(B) - P(A\cap B)$

পরস্পর বর্জনশীল হলে, $\Rightarrow P(A\cup B) = P(A)+P(B)$

$$P(A\cup B) = \frac{n(A\cup B)}{n(S)} = \frac{n(A)}{n(S)} + \frac{n(B)}{n(S)} = P(A)+P(B)$$

অবর্জনশীল হলে, $\Rightarrow P(A\cup B) = P(A)+P(B) - P(A\cap B)$

$$P(A) = \frac{n(A)}{n(S)} \;;\; P(B) = \frac{n(B)}{n(S)}$$



$$n(A\cup B) = n(A)+n(B)-n(A\cap B)$$

$$\therefore P(A\cup B) = \frac{n(A\cup B)}{n(S)} = \frac{n(A)+n(B)-n(A\cap B)}{n(S)}$$

$$= \frac{n(A)}{n(S)} + \frac{n(B)}{n(S)} - \frac{n(A\cap B)}{n(S)}$$

$$= P(A)+P(B)-P(A\cap B)$$

$P(A/B) = \frac{P(A\cap B)}{P(B)}$

$$= \frac{n(A\cap B)/n(S)}{n(B)/n(S)}$$

$$= \frac{n(A\cap B)}{n(S)}$$

$$P(A\cap B) = \cancel{\frac{n(A\cap B)}{n(S_1)\cdot n(S_2)}} \quad \frac{n(A\cap B)}{n(S_1)\cdot n(S_2)}$$

$$= \frac{n(A)}{n(S_1)} \cdot \frac{n(B)}{n(S_2)}$$

$$= P(A)\cdot P(B)$$

$$P(A/B) = \frac{P(A\cap B)}{P(B)}$$

* $\boxed{\begin{matrix} W-4 \\ B-5 \end{matrix}}$ $W + B = 4 + 5 = 9$

→ ৩টা তুললে কালো হওয়ার possibility

$$\frac{{}^{5}C_3}{{}^{9}C_3} = \frac{10}{84}$$

* তাস - 52
লাল - 26
কালো - 26

Spades - B - 13
Disk/Diamonds - R - 13
Clubs - কাল - B - 13
Hearts - R - 13

Black
Red

* A ও B এর জেতার সম্ভাবনা $\frac{1}{3}$ & $\frac{1}{4}$।
একত্রে সম্ভাবনা ?

$$P(A \cap B) = P(A) \times P(B) = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= \frac{1}{3} + \frac{1}{4} - \frac{1}{12} = \frac{1}{2}$$

* Students = 40

F = 20 F & C = 10

C = 25

$$P(F) = \frac{20}{40} = \frac{1}{2}; \quad P(C) = \frac{25}{40} = \frac{5}{8}$$

$$P(F \cap C) = \frac{10}{40} = \frac{1}{4} \quad \therefore P(C/F) = \frac{P(C \cap F)}{P(F)}$$
$$= \frac{1/4}{1/2} = \frac{1}{2}$$

ছেলেটি ফুটবল খেললে, ক্রিকেট খেলার সম্ভাবনা কত?

*

W - 3
B - 2

T = 5

W - 2
B - 5

T = 7

→ কালো হওয়ার সম্ভাবনা $\frac{5}{7}$

⇒ দুইটি থলি হতে একটি করে বল তুললে অন্তত একটি সাদা হওয়ার সম্ভাবনা ?

→ কালো হওয়ার সম্ভাবনা = $\frac{2}{5}$

∴ উভয় থলি হতে একটি করে দুইটি কালো বল হওয়ার সম্ভাবনা $= \frac{5}{7} \times \frac{2}{5}$

$= \frac{2}{7}$

∴ অন্তত একটি সাদা হওয়ার সম্ভাবনা $= 1 - \frac{2}{7}$

$= \frac{5}{7}$

---

*

W - 4
R - 3

T = 7

W - 3
R - 7

T = 10

W - 6
R - 7
B - 9

T = 22

* ~~তিনটি থ~~ থে একটি করে তিনটি তুললে তিনটিই লাল হওয়ার সম্ভাবনা $= \frac{3}{7} \times \frac{7}{10} \times \frac{7}{22} = \frac{21}{220}$

* $\boxed{\text{তৃতীয় থলি}}$ থেকে তিনটি বল তুললে সেগুলো সকলে লাল বা সাদা হওয়ার সম্ভাবনা ?

↳ মোট বল 6 + 7 + 9 = 22

$$P(R \cup W) = P(R) + P(W)$$

$$= \frac{{}^{7}C_3}{{}^{22}C_3} + \frac{{}^{6}C_3}{{}^{22}C_3} = \frac{35}{1540} + \frac{20}{1540}$$

$$= \frac{55}{1540}$$

(c) ১ম ও ২য় বাক্স ~~নির্বাচন~~ থেকে একটি বাক্স নির্বাচন করে একটি বল তুললে, বলটি সাদা হওয়ার সম্ভাবনা;

⇒ ~~১ম~~ দুইটি বাক্স থেকে একটি ~~বাক্স~~ তোলার সম্ভাবনা $= \frac{1}{2}$

∴ ১ম বাক্স হতে সাদা তোলার সম্ভাবনা $= \frac{1}{2} \times \frac{4}{7} = \frac{2}{7}$

∴ ২য় " " " " " $= \frac{1}{2} \times \frac{3}{10} = \frac{3}{20}$

∴ একটি সাদা বল উঠানোর সম্ভাবনা $= \frac{2}{7} + \frac{3}{20}$

$= \frac{61}{140}$

A can hit a target 3 times in 5 shots
B " " " " " 2 " " 6 "
C " " " " " 3 " " 7 "

#

A hit $P(A) = \frac{3}{5}$, A miss $q(A) = \left(1 - \frac{3}{5}\right) = \frac{2}{5}$

B " $P(B) = \frac{2}{6} = \frac{1}{3}$, B " $q(B) = 1 - \frac{2}{6} = \frac{4}{6} = \frac{2}{3}$

C " $P(C) = \frac{3}{7}$; C " $q(C) = 1 - \frac{3}{7} = \frac{4}{7}$

$\boxed{\text{2 shoots hit 2 (দুইবার হিট করবে)}}$

$\Rightarrow P(\text{2 shoots hit}) = P(A)\,P(B)\,q(C) + P(A)\,q(B)\,P(C) + q(A)\,P(B)\,P(C)$

$= \frac{3}{5} \times \frac{1}{3} \times \frac{4}{7} + \frac{3}{5} \times \frac{2}{3} \times \frac{3}{7} + \frac{2}{5} \times \frac{1}{3} \times \frac{3}{7}$

$= \frac{12}{35}$ Ans.

(ii) P(At least 2 shoots hit) ? (অন্তত দুইবার, ২টি লাগবে)

$= P(A)\cdot P(B)\cdot P(C) + P(A)\cdot P(B)\cdot q(C) + P(A)\cdot q(B)\cdot P(C) + q(A)\cdot P(B)\cdot P(C)$

$= \frac{3}{5} \times \frac{1}{3} \times \frac{3}{7} + \frac{3}{5} \times \frac{1}{3} \times \frac{4}{7} + \frac{3}{5} \times \frac{2}{5} \times \frac{3}{7} + \frac{2}{5} \times \frac{1}{3} \times \frac{3}{7}$

$= \frac{3}{7}$ Ans

* (B) $\boxed{\begin{matrix} W-3 \\ B-5 \end{matrix}}$ $T=8$ (C) $\boxed{\begin{matrix} W-6 \\ B-8 \end{matrix}}$ $T=14$

~~B~~ A ball is transfered from B box to C. Then a ball draw from box C. Find the probability ~~that~~ ff: B - white.

⇒ Case I: A white ball is transfered from B to C.

P(white from B) $= \frac{3}{8}$

P(white " C) $= \frac{\cancel{3}}{8} \times \frac{7}{\cancel{15}_{5}} = \frac{7}{40}$

Case II: A black ball is transfered from B to C

P(Black from) $= \frac{5}{8}$

P(White ball from box C) $= \frac{5}{8} \times \frac{6}{15} = \frac{1}{4}$

Probability of whit ball from c,

$= P(\text{case } 1)$ or $P(\text{case } 11)$

$= \frac{7}{40} + \frac{1}{4} = \frac{17}{40}$

Ans.

#

$P(H \cap W) = \frac{1}{7} \times \frac{1}{5} = \frac{1}{35}$

$P(H \cup W) = \frac{1}{7} + \frac{1}{5} - \frac{1}{35} = \frac{11}{35}$

Husband ও wife দুইজন দুইটি পোস্ট-এর জন্য আলাদা পোস্টে apply করেছে। Husband এর selectioned probability $= \frac{1}{7}$

wife " " " $= \frac{1}{5}$

find the probability of one of them be selected.

Soln; Given,

$P(H) = \frac{1}{7}$; not selecting (H) $= \left(1 - \frac{1}{7}\right) = \frac{6}{7}$

$P(W) = \frac{1}{5}$; " " $q(W) = \left(1 - \frac{1}{5}\right) = \frac{4}{5}$

p (one of them will be selected)

$= P(H) \cdot q(W)$ or $q(H) \cdot P(W)$

$= \left(\frac{1}{7} \times \frac{4}{5}\right) + \left(\frac{6}{7} \times \frac{1}{5}\right)$

$$= \frac{4}{35} + \frac{6}{35} = \frac{2}{7}$$ Ans

#

1st student solved problem, $P(A) = \frac{1}{2}$; Not solved $q(A) = 1 - \frac{1}{2} = \frac{1}{2}$

2nd " " " , $P(B) = \frac{1}{3}$; " " $q(B) = \frac{2}{3}$

3rd " " " , $P(C) = \frac{1}{4}$; " " $q(C) = 1 - \frac{1}{4} = \frac{3}{4}$

P(Problem will be solved) $= 1 - P$(fails to solve problem)

$$= 1 - q(A) \cdot q(B) \cdot q(C)$$

$$= 1 - \left(\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4}\right)$$

$$= \frac{3}{4}$$ Ans.

#

Total cards : 52

Cards drawn = 3

$\therefore$ sample space $= {}^{52}C_3 = 22100$

Probability of being king $= {}^4C_1 = 4$

" " " queen $= {}^4C_1 = 4$

" " " ten $= {}^4C_1 = 4$

$\therefore$ favourable event $= 4 \times 4 \times 4 = 64$

$\therefore$ Required probability $= \frac{\text{favourable event}}{\text{sample space}}$

$$= \frac{64}{221600}$$

Total cards = 52

drawn = 4

~~Spa~~ Sample space = $^{52}C_4$

(i) P(All cards are diamond)

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

$$= \frac{11}{4165}$$

(ii) There is one card in each suit:

⇒ Probability of a diamond = $^{13}C_1$

" " a club = $^{13}C_1$

" " a Heart = $^{13}C_1$

" " a spade = $^{13}C_1$

Favourable event = $^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1$

∴ Required probability = $\frac{\text{favourable event}}{\text{sample space}}$

$$= \frac{13 \times 13 \times 13 \times 13}{^{52}C_4} = \frac{28561}{270725}$$

R-5, W-7, B-9

T = 5+7+9 = 21

Drawn, D = 3

(i) P(Three balls are different color) $= \frac{^5C_1 * {}^7C_1 * {}^9C_1}{^{21}C_3}$

$$= \frac{9}{38} \text{ Ans}$$

(ii) P(two balls are same color) :

	$\boxed{5R}$	$\boxed{7W}$	$\boxed{9B}$	
$S_1 \rightarrow$	2	1	0	$\rightarrow {}^5C_2 * {}^7C_1 \times {}^9C_0 = 70$
$S_2 \rightarrow$	2	0	1	$\rightarrow {}^5C_2 \times {}^7C_0 \times {}^9C_1 = 90$
$S_3 \rightarrow$	1	2	0	$\rightarrow {}^5C_1 \times {}^7C_2 \times {}^9C_0 = 105$
$S_4 \rightarrow$	1	0	2	$\rightarrow {}^5C_1 \times {}^7C_0 \times {}^9C_2 = 180$
$S_5 \rightarrow$	0	2	1	$\rightarrow {}^5C_0 \times {}^7C_2 \times {}^9C_1 = 189$
$S_6 \rightarrow$	0	1	2	$\rightarrow {}^5C_0 \times {}^7C_1 \times {}^9C_2 = 252$

$$\therefore \text{Required probability} = \frac{S_1 + S_2 + S_3 + S_4 + S_5 + S_6}{{}^{21}C_3} = \frac{886}{1330}$$

$$= \frac{\cancel{443}}{} \quad \frac{443}{665}.$$

#

P(solved by $\boxed{\text{at least}}$ two):

$P(x) = \frac{1}{2}$, not solved $q(x) = \frac{1}{2}$

$P(y) = \frac{1}{3}$, " " $q(y) = \frac{2}{3}$

$P(z) = \frac{1}{4}$, " " $q(z) = \frac{3}{4}$

$\therefore P(\text{solved by at least two}) = P(x)\cdot P(y)\cdot q(z) + P(x)\, q(y)\, P(z) + q(x) P(y) P(z) + P(x)\cdot P(y)\cdot P(z)$

$= 7/24$

$\frac{{}^4C_2}{{}^{52}C_2} = \frac{1}{221}$ | 52 cards থেকে একটি দুটি কার্ড প্রত্যেক দুটিতে ace হওয়ার possibility

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এক লিপইয়ারে 53 sunday হওয়ার possibility কত?

leap year = 366 days

$52 \times 7 = 364$ days

এতে আছে 52টি Sunday হবে। অতিরিক্ত ~~2টি~~ বাকি 2টি Sunday

$366 - 364 = 2$ days

বাকি দুটি দিনে একটি একটি ~~Sunda~~ কিংবা Sunday ~~...~~ হওয়ার সম্ভাবনা

(i) Sun, mon, (ii) Mon, tues (iii) tues, wed,

(iv) wed, thurs (v) Thurs, fri (vi) Fri, Sat (vii) Sat, Sun

$\therefore$ Chance $= \frac{2}{7}$

$\frac{{}^4C_1 \times {}^4C_1 \times {}^4C_1}{{}^{52}C_3} = \frac{64}{22100} = \frac{16}{5525}$

from two dice:

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)
(2, 1) (2, 2) (2, 3) (2, 4) (2, 5) (2, 6)
(3, 1) (3, 2) (3, 3) (3, 4) (3, 5) (3, 6)
(4, 1) (4, 2) (4, 3) (4, 4) (4, 5) (4, 6)
(5, 1) (5, 2) (5, 3) (5, 4) (5, 5) (5, 6)
(6, 1) (6, 2) (6, 3) (6, 4) (6, 5) (6, 6)

P(The sum of the dice is 8) = $\frac{5}{36}$

P(both dice come up same number) = $\frac{6}{36} = \frac{1}{6}$

Cards → 52

Black → 26 — Clubs – 13, Spads – 13

Red → 26 — Heart – 13, Diamonds – 13

Type	Colors Red	Black	Total
Ace	2	2	4
Non Ace	24	24	48
Total	26	26	52

∴ P(Ace/Black)

$= \frac{P(\text{Ace and Black})}{P(\text{Black})} = \frac{2}{26}$

~~4 A A~~

4 Aces

12 Face cards
↓
4 King, 4 Queen, 4 Jack

36 Number cards
(2 – 10) = 9×4 = 36

16 lettered cards → 4 Aces, 12 Face cards

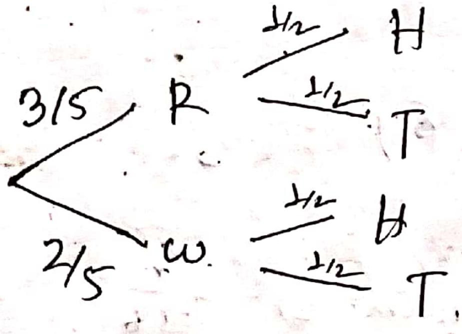
36 Numbered " → $\boxed{2, 3, 4, 5, 6, 7, 8, 9, 10}$

↳ $9 \times 4 = 36$

#

$\boxed{\begin{matrix} R-3 \\ W-2 \end{matrix}}$ & coin

Probability tree:



$P(RH) = \frac{3}{5} \times \frac{1}{2} = \frac{3}{10} = 0.3$

$P(RT) = \frac{3}{5} \times \frac{1}{2} = \frac{3}{10} = 0.3$

$P(WH) = \frac{2}{5} \times \frac{1}{2} = \frac{2}{10} = 0.2$

$P(WT) = \frac{2}{5} \times \frac{1}{2} = 0.2$

1.7×10^{-3}

$.17 \times 10^{-2}$

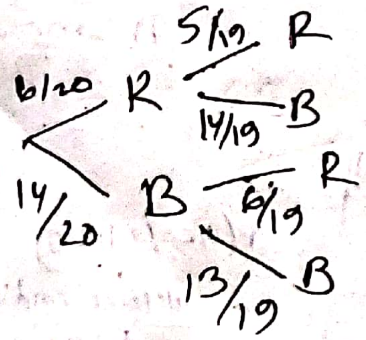
$.017 \times 10^{-1}$

$.0017$

$= .002$

Tree Diagram:

select 2 pen from 20 Pens, 14 Blue & 6 Red. Don't Replace:



$\therefore P(A \cap B) = P(A \text{ and } D)$

$P(A/D) = \dfrac{P(A \cap D)}{P(D)}$

$P(\text{Ace}/\text{Black}) = \dfrac{P(\text{Ace and Black})}{P(\text{Ace})}$

$\therefore P(\text{Ace and Black}) = P(\text{Ace}) \cdot P(\text{Black}/\text{Ace})$

Sin 2? Slide (Nazmul Sharif):

Ex 3:

W-5
R-6.
B-4

urn → পাত্র

$T = 5+6+4 = 15$

Drawn = 2

(i) $P(\text{both are red}) = \dfrac{{}^{6}C_2}{{}^{15}C_2} = \dfrac{1}{7}$

(ii) $P(\text{one white and one black ball}) = \dfrac{{}^{5}C_1 \times {}^{4}C_1}{{}^{15}C_2} = \dfrac{4}{21}$

Ex-5 /

T. Cards = 52
drawn = 4

(i) $P(\text{All cards are spades}) = \dfrac{{}^{13}C_4}{{}^{52}C_4}$

(ii) $P(\text{Two spades and two hearts}) = \dfrac{{}^{13}C_2 \times {}^{13}C_2}{{}^{52}C_4}$

(iii) $P(\text{All cards are black}) = \dfrac{{}^{26}C_4}{{}^{52}C_4}$

Ex: 1.33

R-8
W-3
B-9

$T = 8+3+9 = 20$

a) all 3 are red $= \dfrac{{}^{8}C_3}{{}^{20}C_3}$

b) " 3 " white $= \dfrac{{}^{3}C_3}{{}^{20}C_3}$

c) $P(\text{2 are red and 1 is white}) = \dfrac{{}^{8}C_2 \times {}^{3}C_1}{{}^{20}C_3}$

d) $P(\text{at least 1 is white}) = \dfrac{{}^{3}C_1 \times {}^{3}C_2 \times {}^{3}C_3}{{}^{20}C_3}$

(e) P(1 of each colour drawn) = $\dfrac{^8C_1 \times {}^3C_1 \times {}^9C_1}{^{20}C_3}$

(f) P(The balls are drawn in the order red, white, blue)

$$= \frac{^8C_1}{^{20}C_1} \times \frac{^3C_1}{^{19}C_1} \times \frac{^9C_1}{^{18}C_1}$$

Ex-9: A bag contain 50 tickets from 1 to 50. drawn 5 and arranged in ascending order ($t_1 < t_2 < t_3 < t_4 < t_5$). Find the probability of t_4 carrying the number 45.

⇒ t_1, t_2, t_3 must be drawn out of tickets numbered from 1 to 44. ∴ favourable number $^{44}C_3$.

t_4 draw at 45 ∴ " " $^1C_1$

t_5 " at 46 - 50 ∴ " " $^5C_1$

∴ Required probability = $\dfrac{^{44}C_3 \times {}^1C_1 \times {}^5C_1}{^{50}C_5}$

= 0.03

Find the probability of getting neither heart nor king when a card is drawn from a well shuffled of 52 cards.

$\Rightarrow$ Getting a card of heart, $P(A) = \frac{13}{52}$

" a " " king, $P(B) = \frac{4}{52}$

$A \cap B$; Getting a king of heart, $P(A \cap B) = \frac{1}{52}$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{13}{52} + \frac{4}{52} - \frac{1}{52} = \frac{4}{13}$$

Again probability of neither heart nor king is given by $P(A^c \cap B^c)$

$$\therefore P(A^c \cap B^c) = P(A \cup B)^c = 1 - P(A \cup B)$$

$$= 1 - \frac{4}{13}$$

$$= \frac{9}{13}$$

Ex-15: $P(A) = \frac{25}{100}$, $P(B) = \frac{30}{100}$

$P(C) = \frac{20}{100}$, $P(A \cap B) = \frac{10}{100}$

$P(A \cap C) = \frac{5}{100}$, $P(B \cap C) = \frac{8}{100}$, $P(A \cap B \cap C) = \frac{3}{100}$

$\boxed{\text{অন্তত একটি newspaper হলেও পড়ে}}$

$$P(A\cup B\cup C) = P(A) + P(B) + P(C) - P(A\cap B) - P(B\cap C) - P(C\cap A) + P(A\cap B\cap C)$$

$$= \frac{25}{100} + \frac{30}{100} + \frac{20}{100} - \frac{10}{100} - \frac{8}{100} - \frac{5}{100} + \frac{3}{100}$$

$$= \cancel{\frac{55}{100}} \; \frac{11}{20}$$

~~$P(A\cup B\cup C)^c \rightarrow$~~

For a person chosen at random, find the probability that he reads none of the newspaper.

$$P(A\cup B\cup C)^c = 1 - P(A\cup B\cup C) = 1 - \frac{11}{20} = \frac{9}{20}$$

for mutually exclusive events;

$$P(A\cup B\cup C) = P(A) + P(B) + P(C) \leq 1$$

$$\cancel{P(A\cap B)} \; P(A\cup B) = P(A) + P(B) \leq 1$$

for 3 coins:

sample = {HHH, HHT, HTH, HTT, TTT, TTH, THT, THH}

{HHH, HHT, HTH, HTT, TTT, TTH, THT, THH}

~~when~~ A & B ~~are Independent~~, will be independent if;

$$P(A \cap B) = P(A) \cdot P(B)$$

Ex-17 ir দেখতে হবে

Ex-19 যতক্ষণ না ace আসে ততক্ষণ পর্যন্ত drawn করতে হবে।

$$P(A) = \frac{^{48}C_n}{^{52}C_n} = \frac{48!}{n!(48-n)!} \cdot \frac{n!(52-n)!}{52!}$$

$$= \frac{(52-n)(51-n)(50-n)(49-n)}{52 \cdot 51 \cdot 50 \cdot 49}$$

Also, $P(B/A) = \dfrac{^{4}C_1}{^{(52-n)}C_1} = \dfrac{4}{52-n}$

$$\therefore P(A \cap B) = P(A) \cdot P(B/A)$$

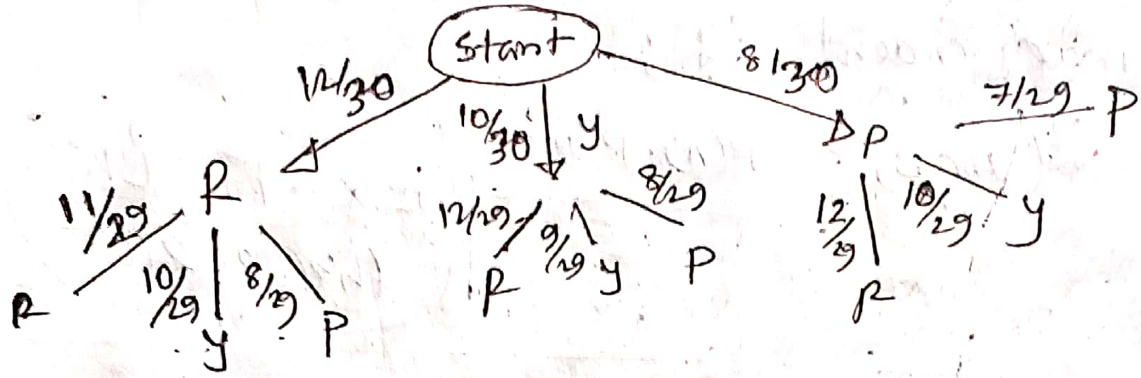
$$= \frac{4(51-n)(50-n)(49-n)}{52 \cdot 51 \cdot 50 \cdot 49}$$

Find the conditional probability জানলে

~~P(A/B) কে বের করতে হবে।~~

P(A/B) অথবা P(B/A) বের করতে হবে।

A bag of 30 tulip bulbs was purchased from a nursery. The bag contains 12 red, 10 yellow & 8 purple tulip bulbs



#

	Fatemy ①	factory ②	total
defective			
good			
Total			

#

Number of Heads, x	0	1	2	3
Probability $P(x)$	$1/8$	$3/8$	$3/8$	$1/8$

mean, $\mu = \Sigma x \cdot P(x)$

Variance, $\sigma^2 = \Sigma [x^2 \cdot P(x)] - \mu^2$

SD, $\sigma = \sqrt{[\Sigma x^2 \cdot P(x)] - \mu^2}$

~~# mean of $x \cdot F(x)$~~

~~# variance = $x^2 \cdot F(x)$~~

find the mean, variance and standard deviation of the probability function:

$$F(x) = \frac{x}{10} \; ; \text{ for } x = 1, 2, 3, 4$$

$\Rightarrow$ Mean, $E(x) = \sum_{i=1}^{n} x \cdot F(x)$

$$= \sum_{i=1}^{4} x \cdot \frac{x}{10}$$

$$= 1 \cdot \frac{1}{10} + 2 \cdot \frac{2}{10} + 3 \cdot \frac{3}{10} + 4 \cdot \frac{4}{10}$$

$$= \frac{30}{10} = 3$$

$\Rightarrow$ Variance, $E(x^2) = \sum_{i=1}^{n} x^2 \cdot F(x)$

$$= \sum_{i=1}^{4} x^2 \cdot \frac{x}{10}$$

$$= 1^2 \cdot \frac{1}{10} + 2^2 \cdot \frac{2}{10} + 3^2 \cdot \frac{3}{10} + 4^2 \cdot \frac{4}{10}$$

$$= 10$$

$\therefore \boxed{Var(x)} = E(x^2) - (E(x))^2$

$= 10 - 3^2 = 1$

$\therefore$ S.D, $\sigma_x = \sqrt{Var(x)} = 1$

Ans

$f(x) = \begin{cases} \frac{3}{4}x(2-x) & , 0 < x < 2 \\ 0 & , \text{otherwise} \end{cases}$

$$E(x) = \int_0^2 x \, f(x)\,dx = \int_0^2 x \cdot \frac{3}{4}x(2-x)\,dx.$$

$$E(x^2) = \int_0^2 x^2 f(x)\,dx$$

$$Var(x) = E(x^2) - E(x)$$

Let x and Y be random variables $E(x) = 7$, $E(y) = -5$, find $E(4x - 2y + 6)$

$\Rightarrow$

Hint: use this properties.

i) $E(a) = a$

(ii) $E(bx) = bE(x)$

(iii) $E(ax+b) = aE(x) + b$

(iv) $E(X+Y) = E(X) + E(Y)$

Properties of variances: for any a & b

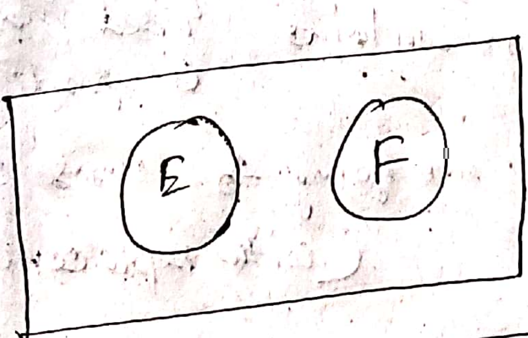
1) $Var(a) = 0$

(ii) $Var(bx) = b^2 \, var(X)$

(iii) $Var(ax+b) = a^2 \, var(X)$

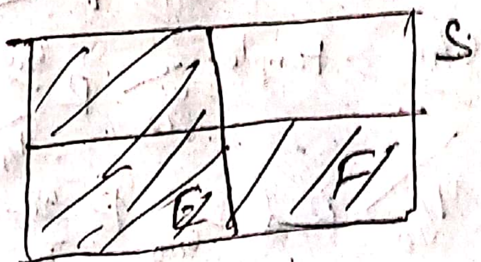
Mutually Exclusive

$$P(E \cup F) = P(E) + P(F)$$



Independent

$$P(E/F) = P(E) = \frac{P(E \cap F)}{P(F)}$$



(8-26 Jun lecture)

#

	factory 1	factory 2	total
defective	15	5	20
good	45	35	80
Total	60	40	100

$\xrightarrow{\text{make a joint}}$ probability table

d	factory 1	factory 2	total
defective	0.15	0.05	0.20
good	0.45	0.35	0.80
Total	0.60	0.40	1

1 → 0.20

2 → 0.60

3 → 0.80

4 → 0.40

5 → 0.15 → (defective and made in factory one)

6 → $P(D/F_1) = \frac{0.15}{0.60}$ (defective given made in factory one)

7 → $P(F_1/D) = \frac{0.15}{0.20}$ (in Factory one given defective)

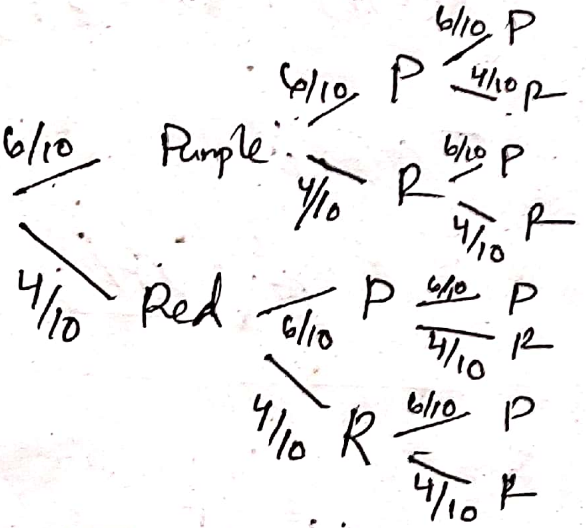
8. Are the events of selecting a defective chip and one made at factory one independent events?

$P(D \mid Fac1) = 0.25 \neq 20 = P(D)$

9. Are the events of selecting a defective chip and one made at factory one mutually exclusive events

$P(D \cap Fac1) = 0.15 \neq 0$

Probability tree (with replacement)

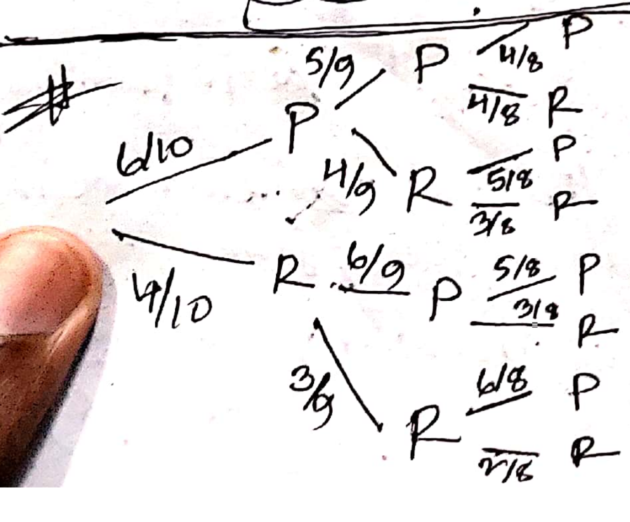


A box contains 4 red marbles
6 purple "

→ You are going to choose 3 marbles (with replacement)

① → $\frac{6}{10} \cdot \frac{6}{10} \cdot \frac{4}{10} = \frac{18}{125}$ (2 red, 1 purple).

(without replacement)



① → $\frac{6}{10} \times \frac{5}{9} \times \frac{4}{8}$ (2P, 1R)

$= \frac{1}{6}$ or 16.7%