→ **Probability & statistics** →

(I) → (i) $(A_1 \cup A_2).F \Rightarrow$ all female students from 1st & 2nd year.

(ii). $F.\bar{J} \Rightarrow$ female students not from Jammu.

(iii). $A_1\bar{F}\bar{J} \Rightarrow$ first year students which are not female & not from Jammu.

(iv). $A_3F\bar{J} \Rightarrow$ 3rd year female students not from Jammu.

(v). $(A_1 \cup A_2).JF \rightarrow$ All female students from 1st & 2nd year who are from Jammu.

(2) → A, B, C →

(i). $P(A \cup B \cup C) \Rightarrow 1 - P(\bar{A} \cap \bar{B} \cap \bar{C})$

(ii). $\Rightarrow P(A) + P(B) + P(C) + P(\bar{A} \cap \bar{B} \cap \bar{C})$

(iii). $P(\bar{A} \cap \bar{B} \cap \bar{C})$

(iv). $P(A \cap B \cap C)$

(v). $P(A) + P(B) + P(C)$

(vi). $P(A \cap B \cap \bar{C})$ | (vii). $P(A) + P(\bar{A} \cap \bar{B})$

check

4 children

(3) → $S = \{\underset{2}{\downarrow}, \underset{2}{\downarrow}, \underset{2}{\downarrow}, \underset{2}{\downarrow}\} \Rightarrow 2^4 \Rightarrow$ (16).

(a) → A = { 2 boys & 2 girls }.

↳ $\frac{4!}{2!.2!} \Rightarrow \frac{4 \times 3 \times 2}{4} \Rightarrow$ (6).

(b). $B = \{\underset{G}{\downarrow}, -, -, \underset{G}{\downarrow}\} \Rightarrow 2^2 \Rightarrow$ (4).

(c). $C = \{-, -, -, -\} \Rightarrow (2!) \Rightarrow$ (2).

(d). $D: \{- - - -\} \Rightarrow$ (2 ways).

(4) → $P(A) = (1/3)$; $P(B) = 1/4$; $P(AB) = 1/6$

$P(\bar{A}) = 2/3$, $P(\bar{A} \cup \bar{B}) = P(\bar{A}) + P(B) - P(\bar{A} \cap B)$

$\Rightarrow \frac{2}{3} + \frac{1}{4} - \left(\frac{1}{4} - \frac{1}{6}\right)$

$\Rightarrow 2/3 - 1/6 \Rightarrow$ (1/2).

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

$\Rightarrow \frac{3}{4} + \frac{3}{8} - P(A \cap B)$

$\Rightarrow \frac{9}{8} - P(A \cap B)$

$0 \le P(A \cap B) \le 1$

$-1 \le -P(A \cap B) \le 0$

$\frac{1}{8} \le \left\{\frac{9}{8} - P(A \cap B)\right\} \le \frac{9}{8}$

$\frac{1}{8} \le P(A \cup B) \le 1$

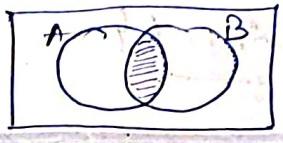
$0 \le P(A \cup B) \le 1$

$0 \le \frac{9}{8} - P(A \cap B) \le 1$

$-\frac{9}{8} \le -P(A \cap B) \le -\frac{1}{8}$

$\frac{1}{8} \le P(A \cap B) \le \frac{9}{8}$

→ Both are not true, I think.



(6) → P.M.S. $P(AB) = P(A) \cdot P(B)$

$\Rightarrow P(A \cap B) = (1 - P(\bar{A})) \cdot P(B)$

$\Rightarrow \{P(B) - P(\bar{A}B)\} = P(B) + P(\bar{A}) \cdot P(B)$

$\Rightarrow P(\bar{A}) \cdot P(B) = P(\bar{A} \cdot B)$

$\Rightarrow$ R.H.S.

Simi. ll. for $\bar{B}$.

(7) Do question No. (7) from slides.

(8) →

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(1,2,3) {1,2,... 6}

(9). → $ax^2+bx+c=0$

(a). for real roots → $b^2-4ac \geq 0$

b = 1 → ✗

b = 2 → (1)

b = 3 → (3)

b = (4) → (4)

b = 5 → 8

b = 6 → 9

for real roots → 25 possibilities

Total = 6×6×6 = (216)

P = 25/216

(b). P' = (1-P)

(10) →

$M_1, M_2, M_3, \ldots\ldots\ldots, M_n$

$f_1 \quad f_2 \quad f_3 \qquad\qquad f_n$

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$\left(\frac{N}{nr}\right) * \left(\frac{m}{n}\right) *$

(12) → (a), (i). $[a_i \geq 1]$

$^{N}C_{m}$ → $a_1 + a_2 + a_3 + \dots + a_m = N$.

$(a_1 - 1) + (a_2 - 1) + \dots + (a_m - 1) = (N - m)$

$({}^{nr}C_N) *$ →

$$A_1 + A_2 + \dots + A_m = (N - m)$$

$\Rightarrow {}^{m + N - m - 1}C_{N-m} \Rightarrow {}^{N-1}C_{N-m}$

⇓

$$^{N-1}C_{m-1}$$

Probability → $\dfrac{{}^{N-1}C_{m-1}}{({}^{nr}C_N)}$

(ii) → $a_1 + a_2 + a_3 + \dots + a_n = N$

$(a_1 - 1) + (a_2 - 1) + \dots + (a_n - 1) = (N - n)$

$A_1 + A_2 + \dots + A_n = (N - n)$

Probability → $\dfrac{{}^{n + N - n - 1}C_{N-n}}{{}^{nr}C_N}$

$\Rightarrow \left(\dfrac{{}^{N-1}C_{n-1}}{{}^{nr}C_N}\right)$

(b) → So, last no. is drawn at m^{th} ball. → $({}^{n}C_1)$.

So, till $(m-1)$ ball drawn → all $(n-1)$ no. are covered."

$a_1 + a_2 + \dots + a_{n-1} = (m-1)$

$(a_1 - 1) + (a_2 - 1) + \dots + (a_{n-1} - 1) = m - 1 - n + 1$

$= (m - n)$

Probability → $\dfrac{{}^{n}C_1 * {}^{n-1+m-n-1}C_{m-n}}{{}^{nr}C_m}$

$\Rightarrow \dfrac{n * {}^{m-2}C_{m-n}}{{}^{nr}C_m} \Rightarrow \dfrac{n * {}^{m-2}C_{n-2}}{{}^{nr}C_m}$

(13) → Proba → $\dfrac{n_1}{n_1 + n_2} * \dfrac{(n_1 - 1)}{n_1 - 1 + n_2}$

(5.) (10) → (2) (2R 2W.) $\dfrac{{}^{5}C_2 * {}^{5}C_2}{{}^{10}C_4}$

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(a)

(14) → $P_r = 1 - P_r$ (No. of student have same birthday).

$$\Rightarrow 1 - \frac{365 P_n}{(365)^n}$$

~~X~~ (b) → $$\frac{365 P_n}{(365)^n} = \frac{1}{2}$$

cross check & verify.

(15) → (a).

(b) → $$\frac{8!}{4! \cdot 2! \cdot 2! \cdot 2!}$$

$$\Rightarrow \frac{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2}{1 \quad 16}$$

$$\Rightarrow 42 \times 60$$

$$\Rightarrow 2520.$$