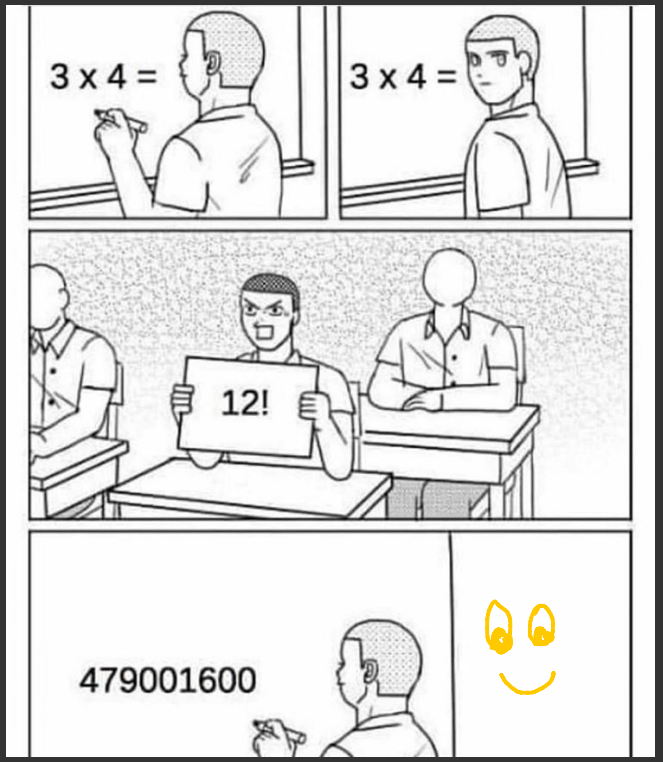
20th Feb '23

CLASS #4

PERMUTATION AND COMBINATIONS



Let's start @ 9:05

⇒ hands On

→ lots of Quizzes

→ Probability applⁿ

→ Interview Questions

} agenda

$$^{n}C_{k} = \frac{^{n}P_{k}}{k!} = \frac{\frac{n!}{(n-k)!}}{k!} = \frac{n!}{(n-k)! \cdot k!}$$

$$\boxed{{}^{n}C_{1} = n} = \frac{n!}{(n-1)!\,1!} = \frac{n \times (n-1)!}{(n-1)!} = n$$

$\{1, 2, 3, 4, 5, \ldots, n\}$

selecting nothing

$$\boxed{{}^{n}C_{0} = 1}$$

$$= \frac{n!}{(n-0)!\,0!} = \frac{n!}{n! \times 1} = 1$$

$${}^nC_0 + {}^nC_1 + {}^nC_2 + \cdots\cdots\cdots + {}^nC_n$$

Very Imp ★

$n = 3$

$S = \{1, 2, 3\}$ ✓

whole possible subsets ?

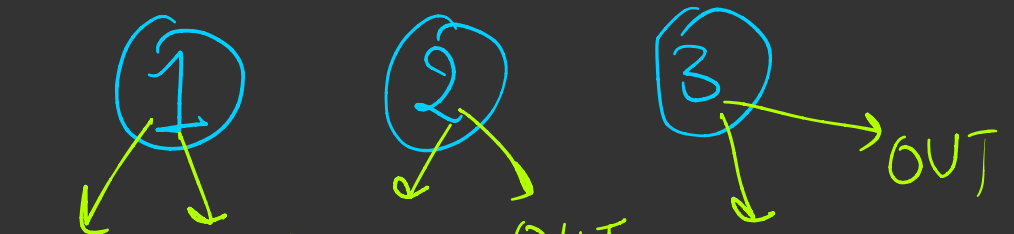
${}^3C_0 = 1 = \{\}$

$+ \; {}^3C_1 = 3 = \{1\}, \{2\}, \{3\}$ $= 8$ ✓

$+ \; {}^3C_2 = \frac{3 \times 2}{2 \times 1} = 3 = \{1,2\}\{2,3\}, \{3,1\}$ $= 2^n$

${}^3C_3 = 1 \quad = 8 = \{1,2,3\}$

T/F



$2 \times 2 \times 2 = 2^3$

⇒ All OUT → { } = null = ∅

⇒ All IN → {1, 2, 3}

⇒ 2^n

Possible subsets.

- - - {1, 3} - - - - - - - - -

all 8 subsets.

Probability (Application of Pr(·))

A bag contains 3 Red and 2 Blue Balls.

→ 2 Balls at random ✓

→ Prob. that all of these are RED

Solution.

(3R) and (2B)

$$P = \left(\frac{\#\text{ of way of picking 2 Red Balls.}}{\text{Total \# of way of picking any 2 Balls}} \right)$$

Total Balls $= 3 + 2 = 5$

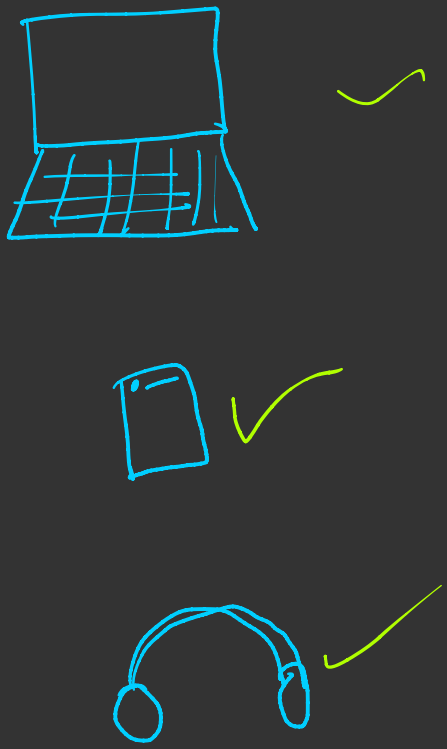
$^5C_2 \rightarrow$ Total ways of selecting 2 Balls

Out of 3 Red Balls.

$^3C_2 \rightarrow$ # of ways Picking 2 red Balls.

$$P = \frac{{}^3C_2}{{}^5C_2} = \frac{\frac{3\times 2}{2\times 1}}{\frac{5\times 4}{2\times 1}} = \frac{3}{10}$$

Prob. of Picking 2 red Balls

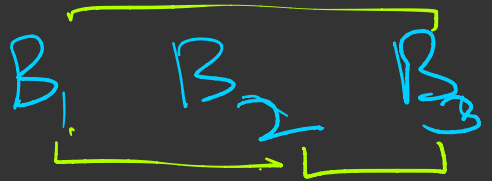


5 Balls.

$$P(1R \& 1B) = \frac{{}^{3}C_1 \times {}^{2}C_1}{{}^{5}C_2}$$

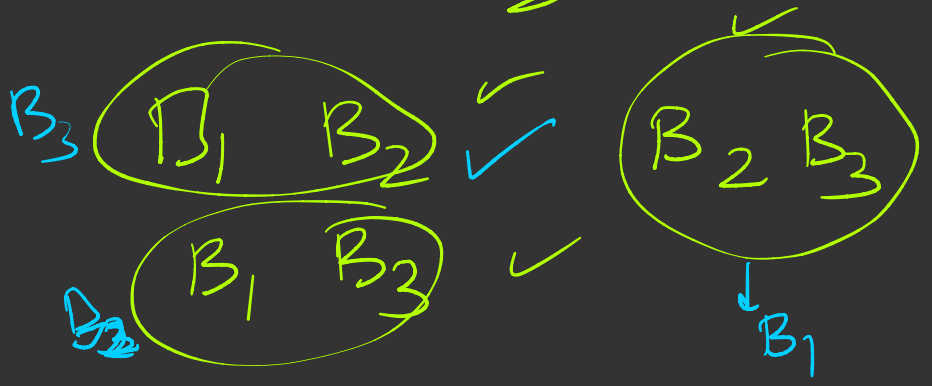
3 2

$$= \frac{(3 \times 2/1)}{\left(\frac{5 \times 4}{2 \times 1}\right)} = \frac{3 \times 2 \times 2}{5 \times 4} = (3/5)$$



$\rightarrow$ 3 Balls

Select 2 Balls

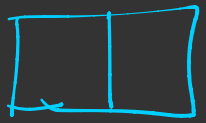


$= {}^3C_2$

$= \frac{3 \times 2}{2 \times 1} = 3$

$\Rightarrow {}^3C_2 = \frac{{}^3P_2}{2!} =$

W A seats



Selection

$B_1 B_2 \longrightarrow$

Arrangement = 6

(B_1, B_2) — ${}^3P_2$

(B_2, B_1) —

${}^3P_2$

$= \frac{3!}{(3-2)!} = 3!$

$= 6$

$B_1 B_3 \longrightarrow$ (B_1, B_3) —

(B_3, B_1) —

$B_2 B_3 \longrightarrow$ (B_2, B_3) —

(B_3, B_2) —

${}^3P_2 / 2! = 3$ ✓