# Number System - Part VI, Permutation Combination - Part III & Probability - Part I

Course on General Aptitude for GATE 2022-23 Batch - Part I

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# PERMUTATION

# COMBINATION

| COMBINATION | PERMUTATION |
|---|---|
| 1. Meaning ✓ Selection | Selection followed by Arrangement |
| 2. $\boxed{{}^nC_r} = \dfrac{n!}{(n-r)! \times r!}$ → ${}^nP_r$ | $\boxed{{}^nP_r} = \dfrac{n!}{(n-r)!}$ |
| ${}^nP_r = {}^nC_r \times r!$ | |
| 3. $\boxed{{}^nC_r}$ | |

A | B | C

0 ⇒ 1 ⇒ ${}^3C_0 = 1$

1 ⇒ A या B या C = ${}^3C_1 = 3$

A | B | C

0 ⇒ 1

1 ⇒ A या B या C ⇒ 3

$n = {}^3P_0 = {}^3C_0 \times 0! = 1 \times 1 = 1$

${}^3P_1 = {}^3C_1 \times 1! = 3 \times 1 = 3$

A | B | C

(C)

$\boxed{{}^3C_2 = {}^3C_1} = 3$

2

AB या BC या CA

3

ABC ⇒ 1

${}^3C_3 = 1$

NOTE Complementary Com.

$\boxed{{}^nC_r = {}^nC_{n-r}}$

A | B | C

(P) ${}^3P_2 = {}^3C_2 \times 2!$

$= 3 \times 2$

| | | |
|---|---|---|
| AB | BC | CA |
| BA | CB | AC |

⇒ 6 = 6.

| | | |
|---|---|---|
| ABC | BAC | CAB |
| ACB | BCA | CBA |

(C)

${}^3P_3 = {}^3C_3 \times 3!$

$= 1 \times 6 = \boxed{06}$

$$^{n}C_{r} = {}^{n}C_{n-r}$$

① $^{5}C_{3} = {}^{5}C_{5-3} = {}^{5}C_{2} = \frac{5 \cdot 4}{1 \cdot 2} = 10$.

② $^{10}C_{8} = {}^{10}C_{10-8} = {}^{10}C_{2} = \frac{10 \cdot 9}{1 \cdot 2} = 45$.

$^{5}C_{2} = \frac{5 \cdot 4}{1 \cdot 2} = 10$

$^{10}C_{3} = \frac{10 \cdot 9 \cdot 8}{1 \cdot 2 \cdot 3} = 120$

(E)

$^nC_0 = 1$

$^nC_1 = n$ //

$^nC_n = {}^nC_{n-n} = {}^nC_0 = 1$

(P)

$^nP_0 = {}^nC_0 \times 0! = 1 \times 1 = 1$

$^nP_1 = {}^nC_1 \times 1! = n \times 1 = n$

$^nP_n = {}^nC_n \times n!$

$= 1 \times n! = n!$

NOTE

(P) NOTE

$$\boxed{{}^{n}P_{n} = {}^{n}C_{n} \times n! = n!}$$

RX

$n \Rightarrow n!$

$3 \Rightarrow 3!$

$= 06$

$\boxed{1|2|3}$

$1\ 2\ 3$
$1\ 3\ 2$

$2\ 1\ 3$
$2\ 3\ 1$

$3\ 1\ 2$
$3\ 2\ 1$

$\boxed{0\ C}$

$\boxed{1, 1, 2}$

$1\ 1\ 2$
$1\ 2\ 1$

$2\ 1\ 1$

3

$n \Rightarrow n! = 3$

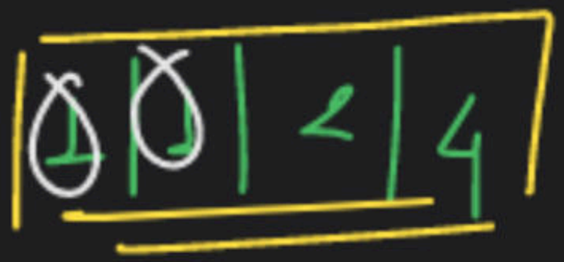
$3 \Rightarrow 3! / 2!(1)$

$1, 1, 1$

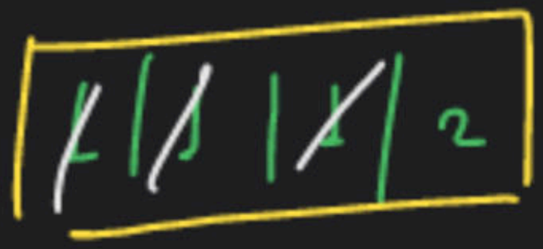
$\cancel{1}\ \cancel{1}\ \cancel{1}$

$\frac{3!}{3!} = 01$

$4! = 24$




$4!/2! = 12$




$4!/3! = 4$

$4!/4! = 01$

$\Rightarrow {}^{n}P_n \Rightarrow n!$

(1) DELHI  $n! = 5! = 120$.

(2) MADAM  $\frac{5!}{2!} = 60$

(3) MATHEMATICS.

$\frac{11!}{2! \times 2! \times 2!}$

(M) (A) (T)

(4) SUCCESS

$\frac{7!}{2! \cdot 3!} = 420$

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# Agenda : Letters Arrangement

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**Q.11** How many different words can be formed from the letters of the word GANESHPURI when:

(A) All the letters are taken. (= No condition.)

(B) The letter G always occupies the first place.

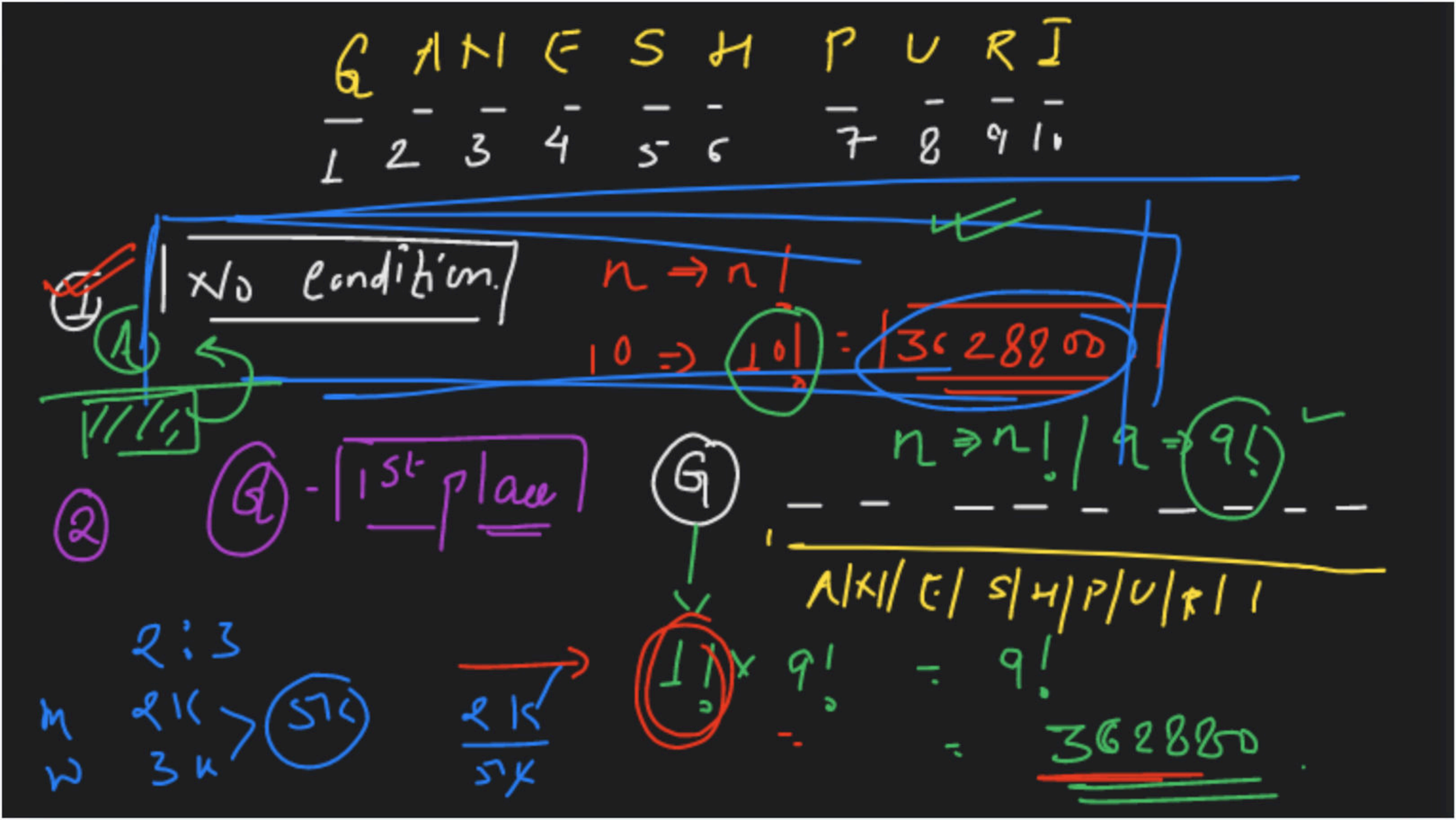
(C) The letters P and E respectively occupy the first and last places.

(D) All the vowels are always together.

(E) How many words of 5 letters each can be formed each containing 3 consonants and 2 vowels?

(F) All the vowels are never together.

(G) No 2 vowels are together.



G A N E S H P U R I

1 2 3 4 5 6 7 8 9 10

① No condition

$n \Rightarrow n!$

$10 \Rightarrow 10! = 3628800$

② G - 1st place

G

$n \Rightarrow n! \mid 9 \Rightarrow 9!$

A|N|E|S|H|P|U|R|I

$1! \times 9! = 9!$

$= 3628800$

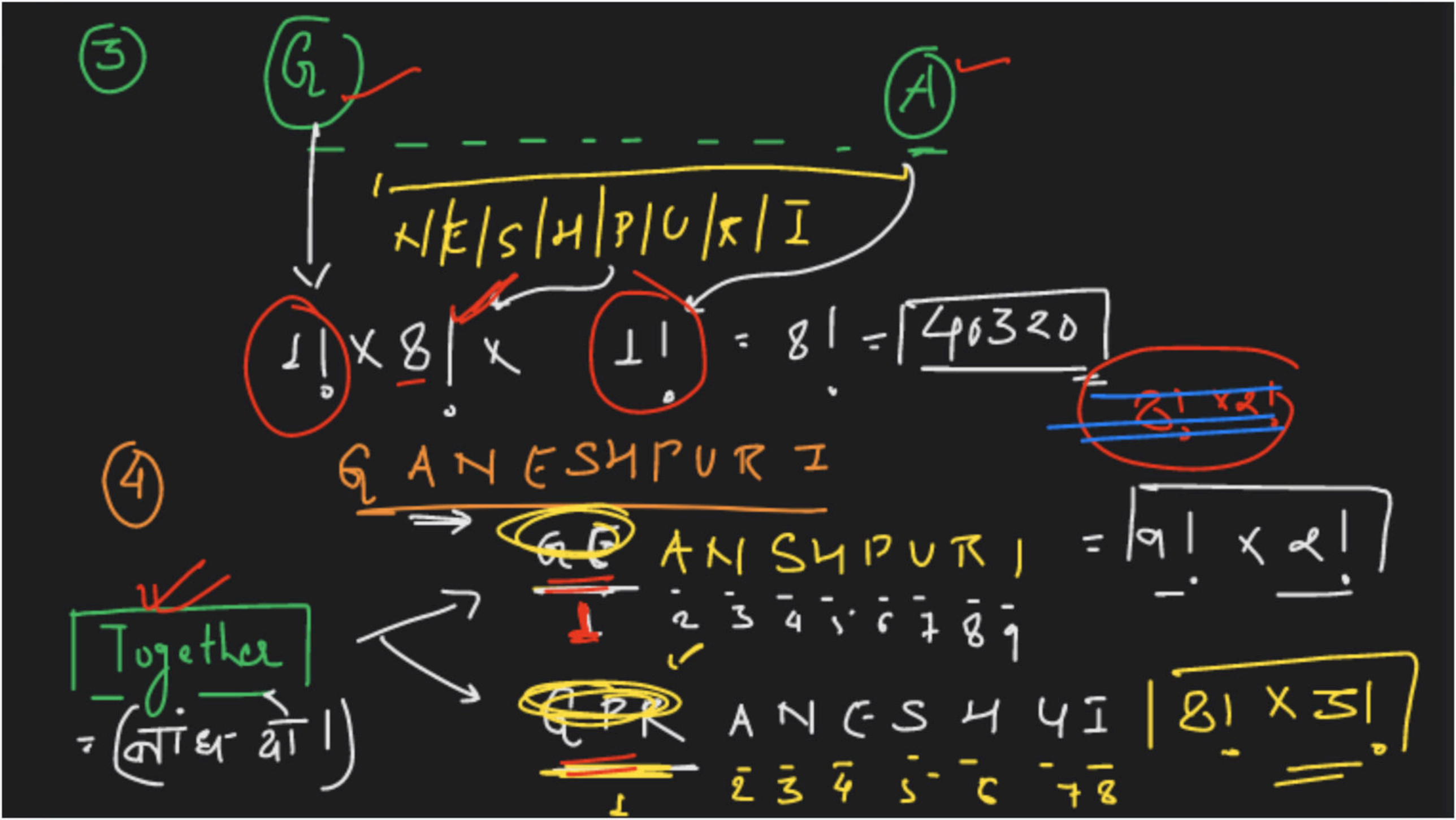
2 : 3

M 2K

W 3K

5K

$\frac{2K}{5K}$



(3) G A

N E S H P U R I

$1! \times 8! \times 1! = 8! = \boxed{40320}$

$8! \times 2!$

(4) G A N E S H P U R I

GE A N S H P U R I $= \boxed{9! \times 2!}$

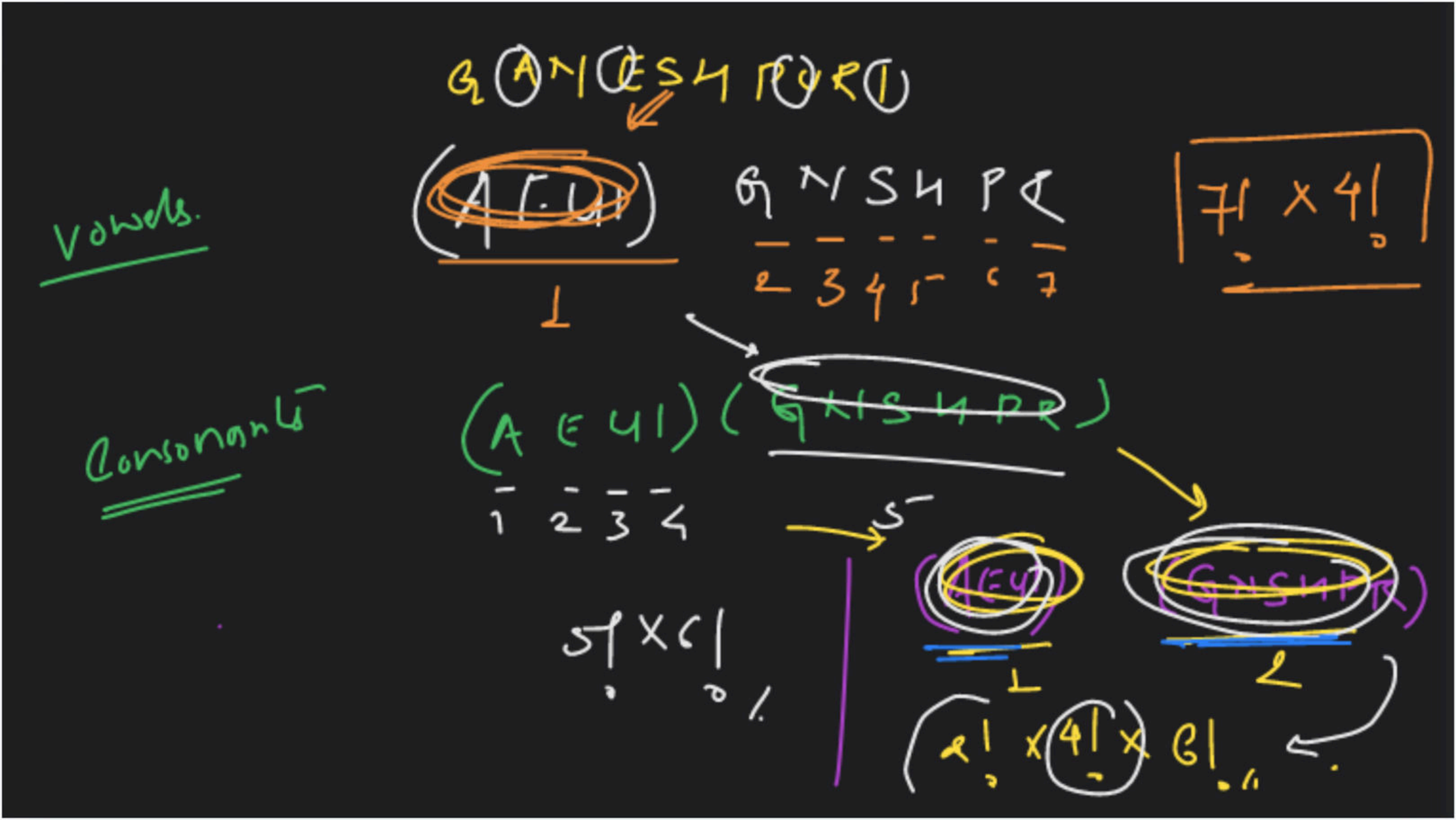
1 2 3 4 5 6 7 8 9

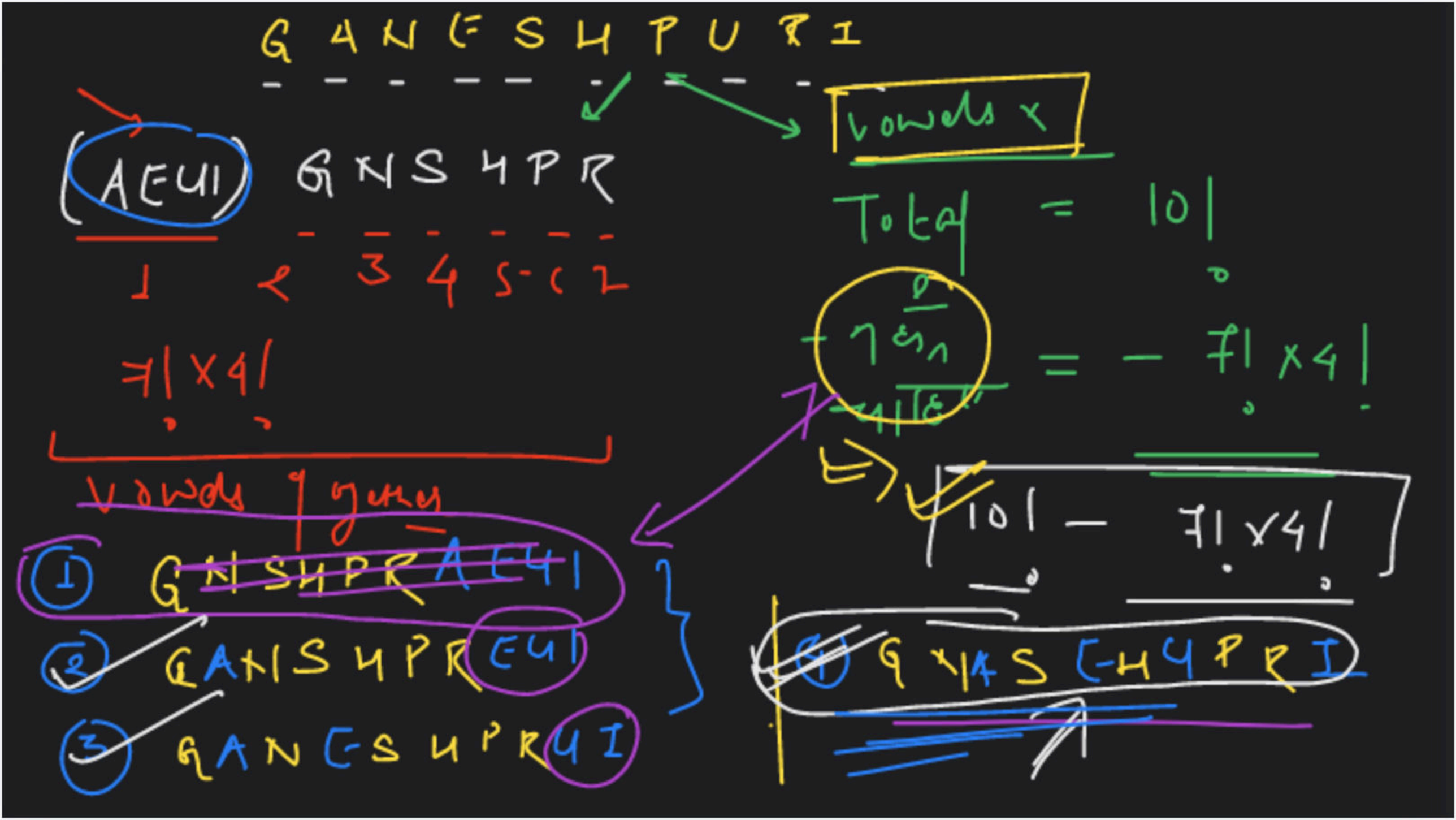
GPR A N E S H U I $\boxed{8! \times 3!}$

1 2 3 4 5 6 7 8

Together

= (बांध दो।)


GANESHPURI
Vowels.
(AEUI)
1
GNSHPR
2 3 4 5 6 7
7! x 4!
Consonants
(AEUI)(GNSHPR)
1 2 3 4
5!
5! x 2!
(AEUI)
(GNSHPR)
1
2
2! x 4! x 2!



G A N E S H P U R I

(AEUI) G N S H P R

1 2 3 4 5 6 7

$7! \times 4!$

vowels of gather

1. G N S H P R A E U I
2. G A N S H P R E U I
3. G A N E S H P R U I

vowels x

Total = $10!$

$-\frac{\text{Gen}}{\text{Ate}} = -7! \times 4!$

$\Rightarrow 10! - 7! \times 4!$

4. G N A S E H U P R I

GANESHPURI

(AEUI) $\boxed{G\ N\ S\ H\ P\ R}$ G

$6! \times (7C_4 \times 4!)$

$\times G \times N \times S \times H \times P \times R \times$

(A E U I)

vowels - 04.

(G N S H P R)

consonants.

GG

① $10C_5 \times 5!$

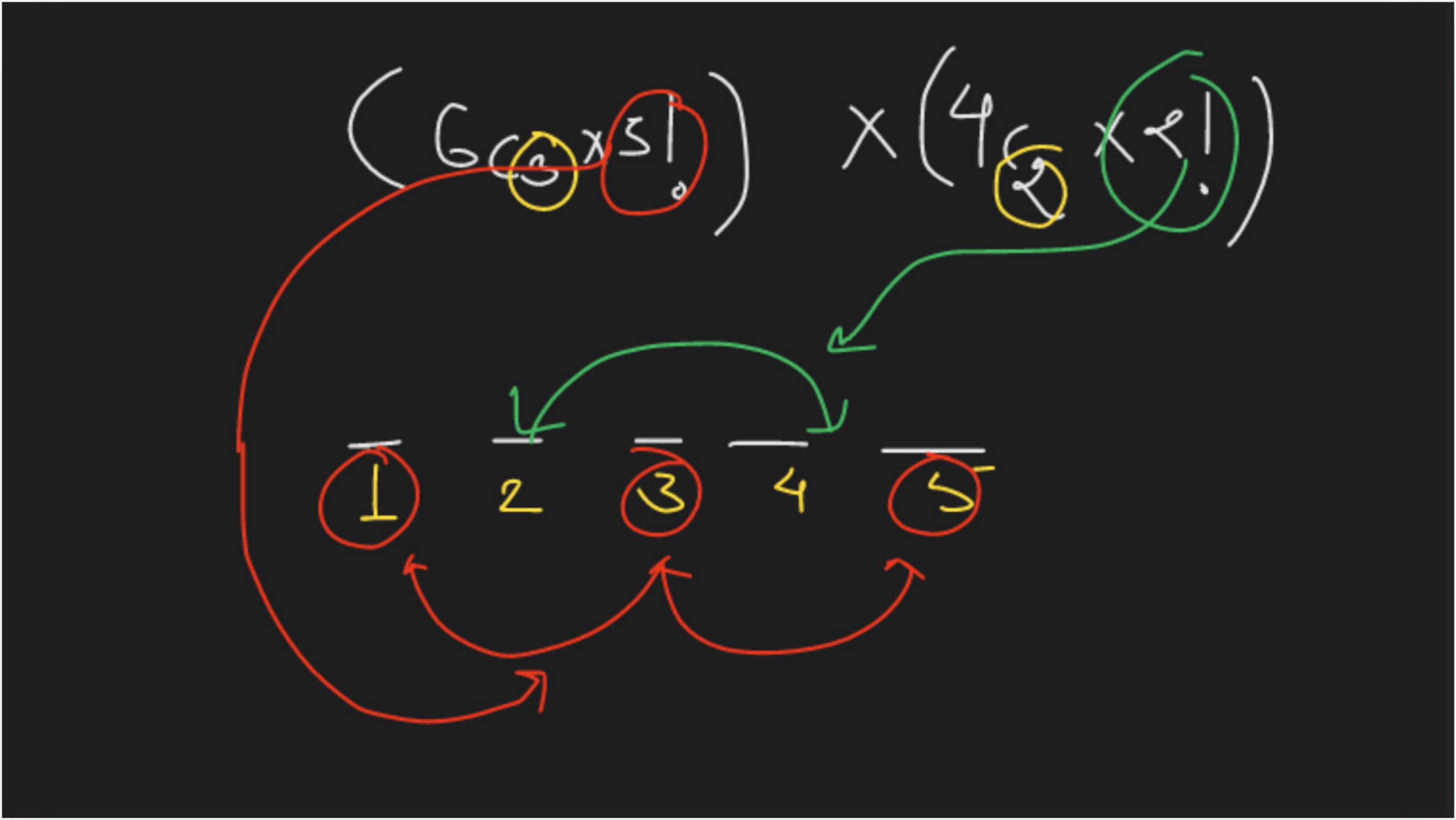
② 13 consonants : { 2 vowels -

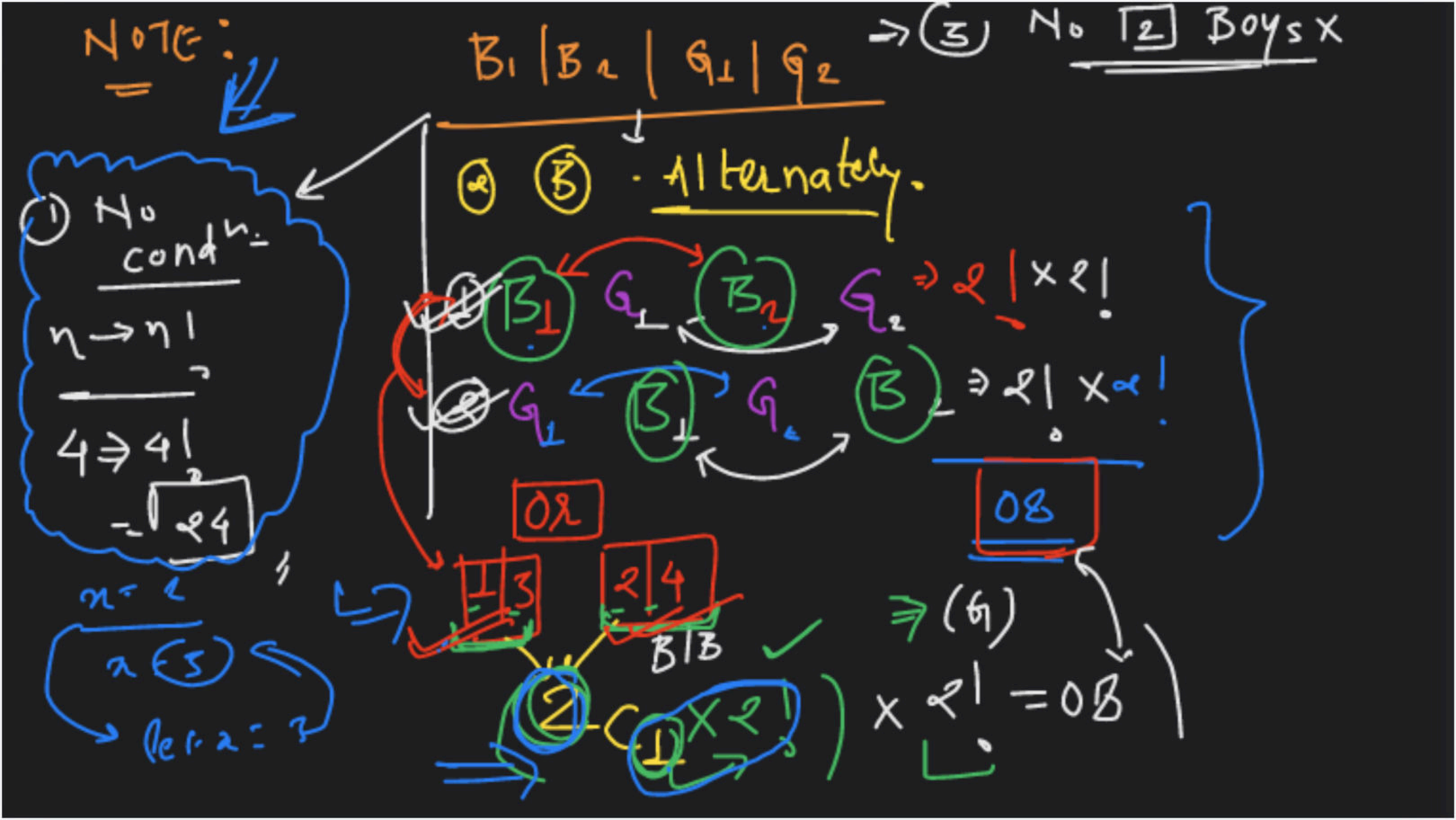
AEGNS.

A G N S E
E A G N S
E G A N S
S E G A N
S E G N A

① $(6C_3 \times 3!)(4C_2 \times 2!)$

② $(6C_3 \times 4C_2 \times 5!)$


$(6C_3 \times 5!) \times (4C_2 \times 3!)$
1
2
3
4
5



NOTE:

$B_1 | B_2 | G_1 | G_2$ → (3) No $\boxed{2}$ Boys ×

(2) (B) · Alternately.

(1) No condⁿ.

$n \to n!$

$4 \Rightarrow 4!$

$= \boxed{24}$

$x = 2$

$x = 3$

let $x = 3$

(1) $B_1 \; G_1 \; B_2 \; G_2 \Rightarrow 2! \times 2!$

(2) $G_1 \; B_1 \; G_2 \; B_2 \Rightarrow 2! \times 2!$

$\boxed{08}$

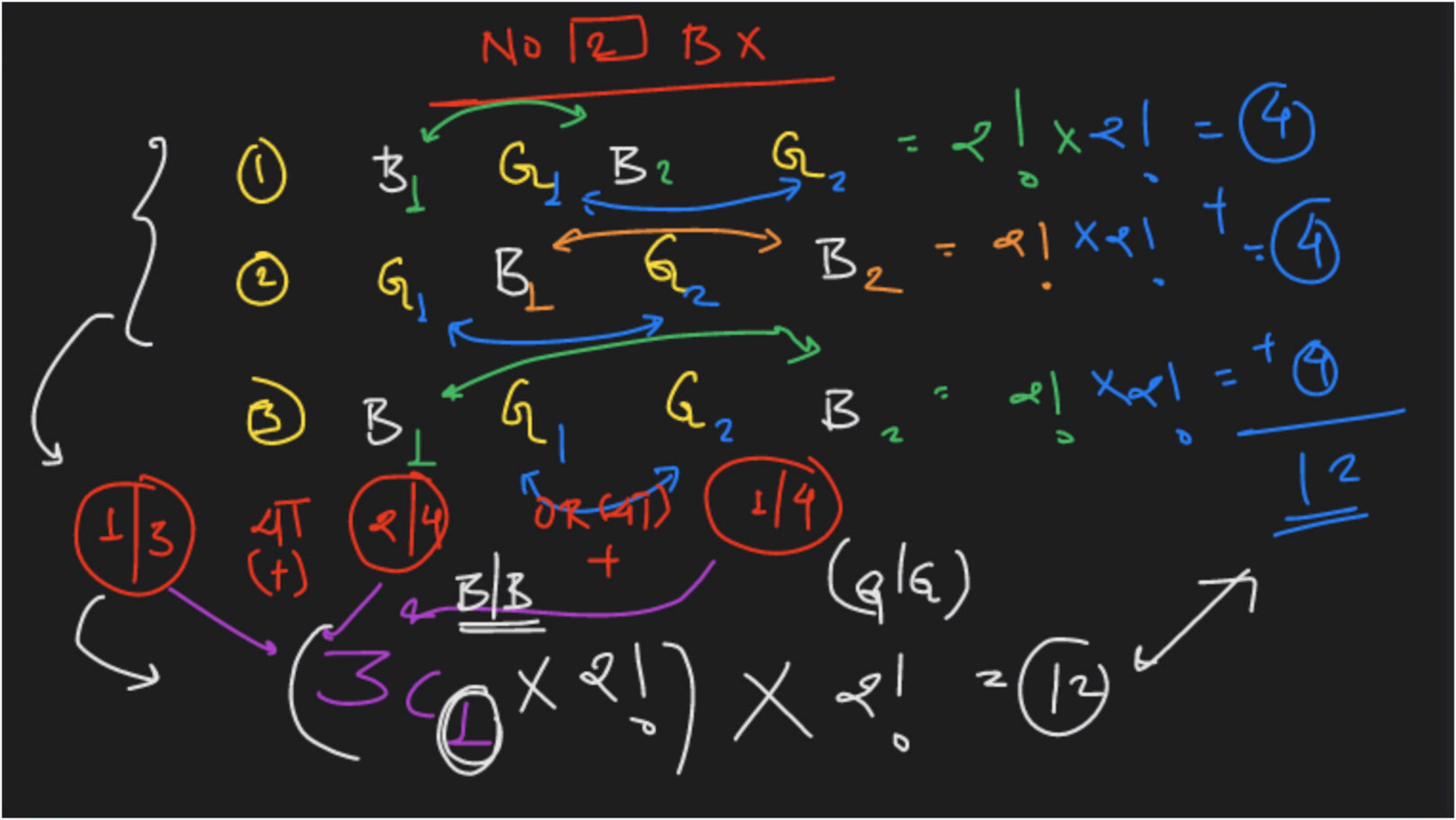
$\boxed{\text{Or}}$

$\boxed{1|3}$ $\boxed{2|4}$

B|B

$\Rightarrow (G)$

$(2 - C_1 \times 2!) \times 2! = 08$



No $\boxed{2}$ B X

① $B_1 \quad G_1 \quad B_2 \quad G_2 = 2! \times 2! = 4$

② $G_1 \quad B_1 \quad G_2 \quad B_2 = 2! \times 2! + = 4$

③ $B_1 \quad G_1 \quad G_2 \quad B_2 = 2! \times 2! = + 4$

$12$

1|3   4T (+)   2|4   OR (4T) +   1|4

B|B     (G|G)

$(3C_1 \times 2!) \times 2! = 12$

No BX

Pseudogap

~~B~~ G ~~B~~ G ~~B~~

$2! \times (3C_2 \times 2!) = 12$

$(G_1 | G_2)$

| 100 G | 50 B. |
|---|---|

$100! \times (101C_{50} \times 50!)$

G (B)

5G / 3B.

X G X G X G X G Y G X

$5! \times ({}^{6}C_{3} \times 3!)$

$(G_1 - G_5)$ $(B_1 - B_3)$

$m\,B \mid n-G$

Pseudograph

$$n! \times \left( {}^{n+1}C_m \cdot m! \right)$$

$(G)$ $(B)$

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# Agenda : Team Formation

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**Q.12** How many committees of 5 members each can be formed from 8 official and 4 non-official members in the following cases :

(A) Each consisting of 3 official and 2 nonofficial members.
(B) Each contains at least two non-official members.
(C) Each consisting of at most two official members.
(D) A particular official member is always included.
(E) A particular non-official member is never included.

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**Q.13** Out of 8 men and 10 women a committee consisting of 6 men and 5 women is to be formed. How many such committees can be formed when one particular man A refuses to be a member of the committee is which his boss B's wife is there?

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**Q.15** A three-member committee has to be formed a group of 9 people. How many such distinct committees can be formed?

(A) 27

(B) 72

(C) 81

(D) 84

[GATE 2018 : IIT Guwahati (CE Set – 2)]

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**Q.16** An e-mail password must contain three characters. The password has to contain one numeral from 0 to 9, one upper and one lower case character from the English alphabet. How many distinct passwords are possible?

(A) 6,760 (B) 13,520
(C) 40,560 (D) 1,05,456

[GATE 2018 : IIT Guwahati (EE Set – 1)]