VARSITY 'KA' ADMISSION PROGRAM-2020

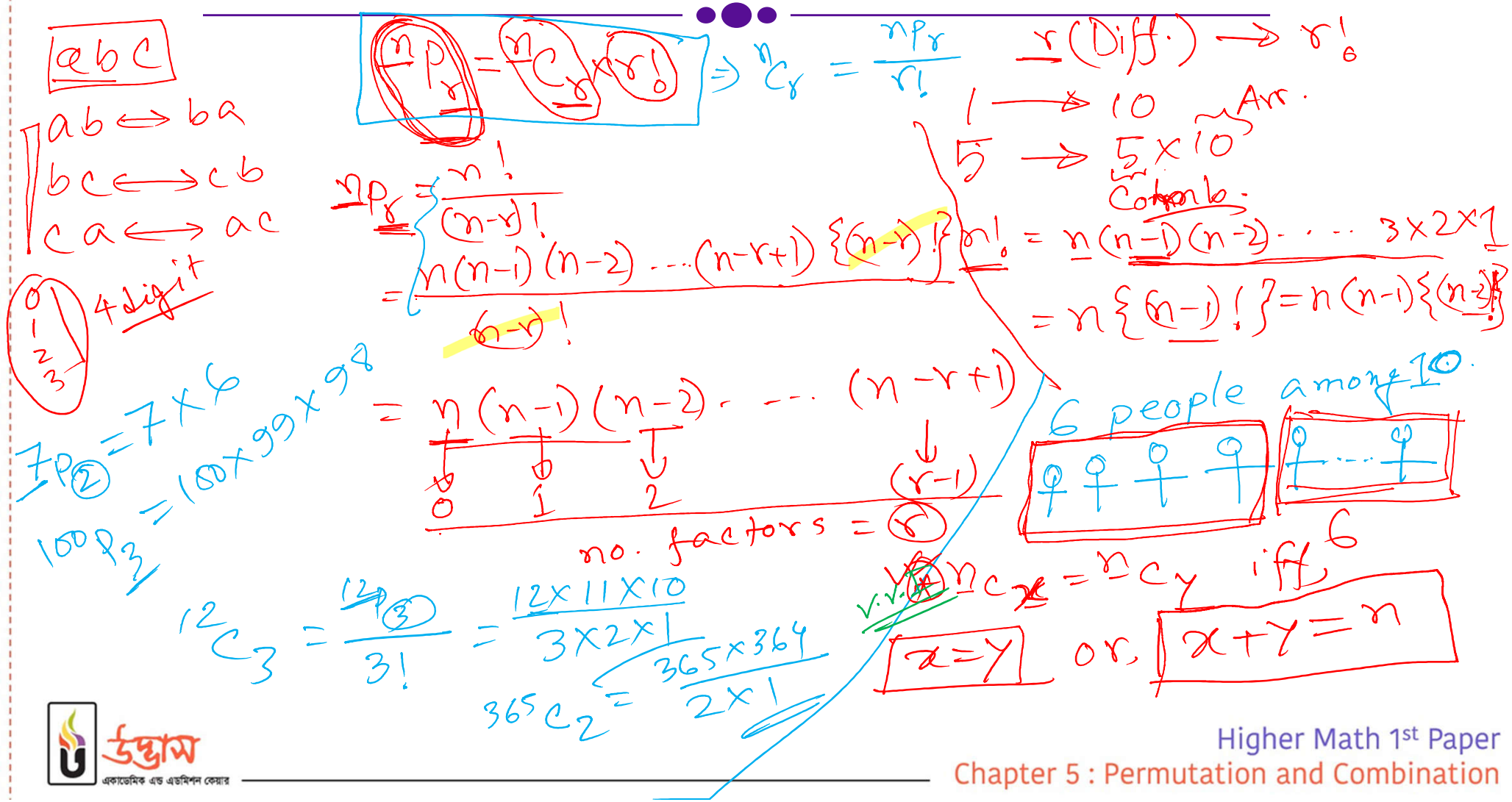
HIGHER MATH

Lecture : M-01

Chapter 05 : Permutation and Combination

উদ্ভাস
একাডেমিক এন্ড এডমিশন কেয়ার

Introduction



Poll Question 01

If ${}^{15}C_3 = {}^{15}C_x$ find value of x-

(a) 12

(b) 3

(c) Both a & b

(d) None

If ${}^{n}C_x = {}^{n}C_y$, then, $x = y$ or $x + y = n$

${}^{15}C_3 = {}^{15}C_x$

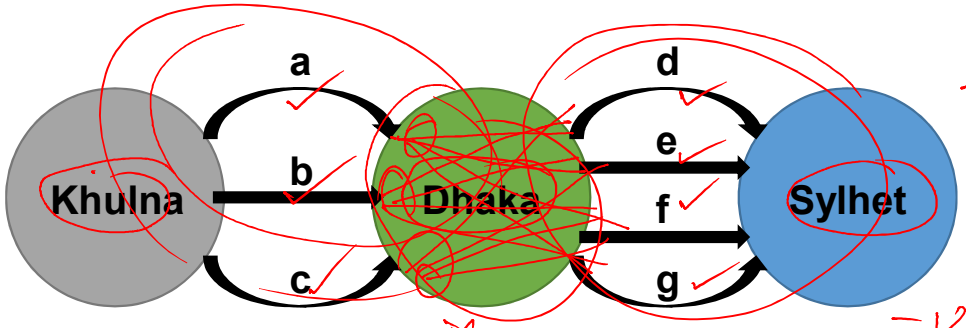
$x = 3$

$3 + x = 15$

$\Rightarrow x = 12$

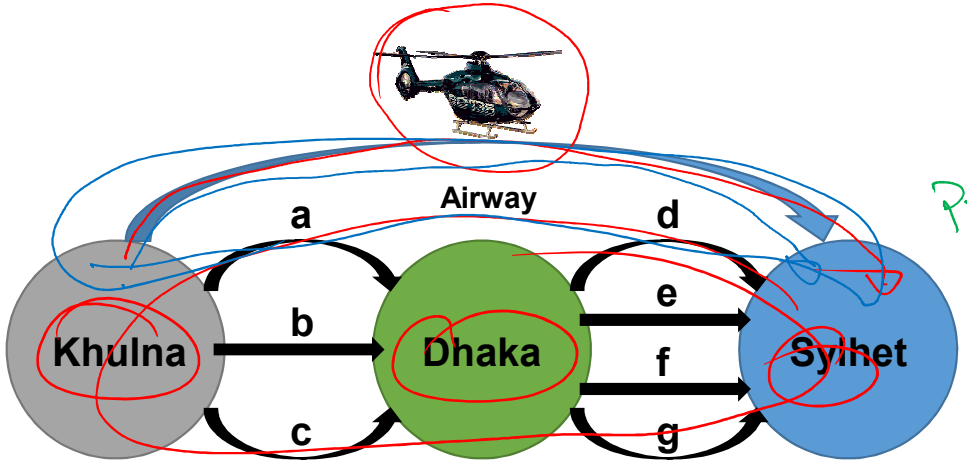
Fundamentals of Permutation

Rule of Product:



No of Roads = 3 × No of Roads = 4 = 12

Rule of Sum:



No of Roads = 3 × No of Roads = 4 = 12

Permutation of objects when all objects are not unique or different or distinct

Number of ways in which n things can be arranged taking them all at a time, when p of the things are exactly alike of 1st type, q of them are exactly alike of a 2nd type, r of them are exactly alike of a 3rd type and the rest all are distinct is: $\frac{n!}{p! \times q! \times r!}$

How many arrangements can be made out of the letters of the word 'ENGINEERING'?

$$\frac{11!}{3!3!2!2!1!}$$

ENGR

$^{11}P_4$

$3!3!2!$ wrong!!

Some caste issues

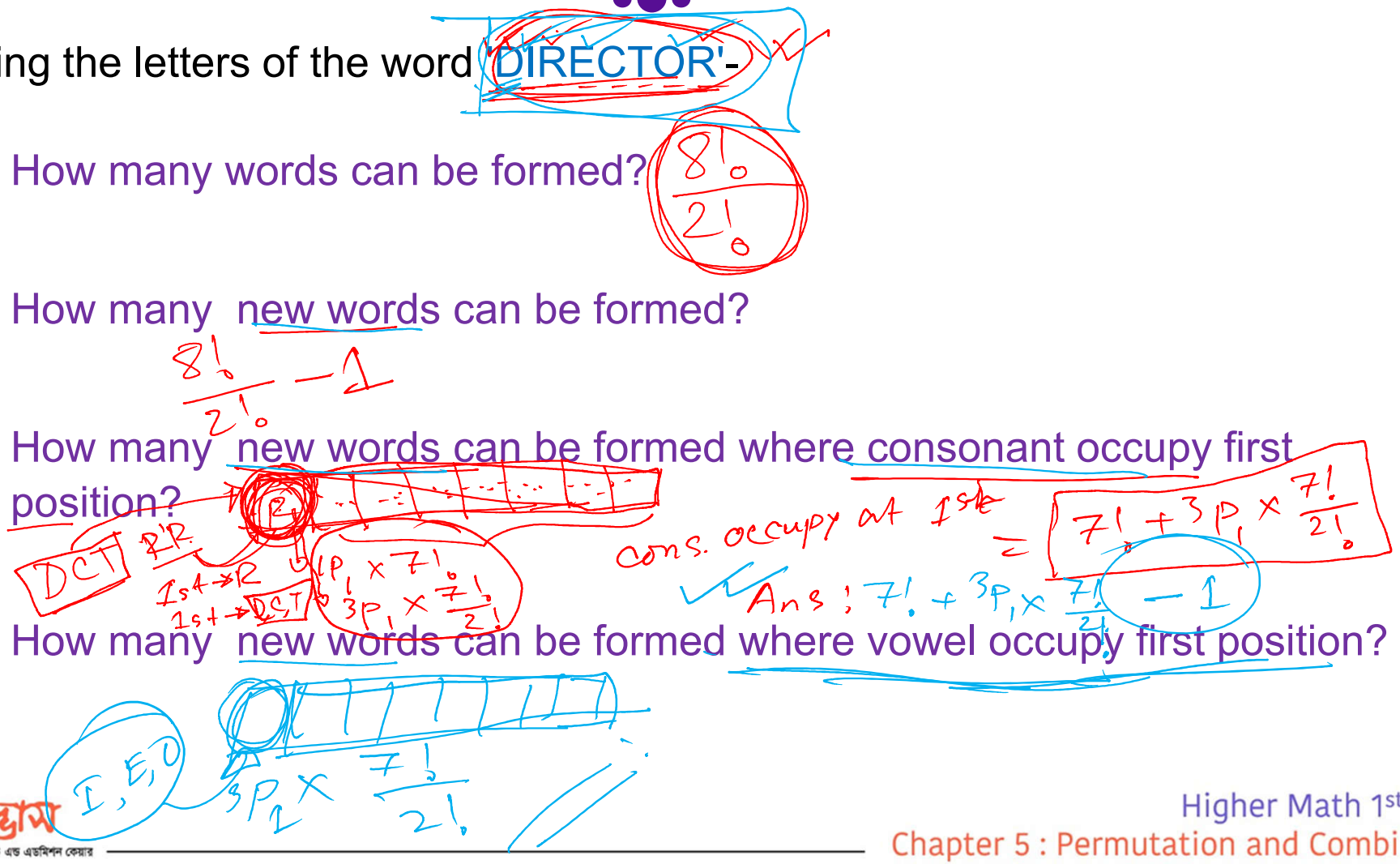
Taking the letters of the word 'DIRECTOR'-

- How many words can be formed?
- How many new words can be formed?
- How many new words can be formed where consonant occupy first position?
- How many new words can be formed where vowel occupy first position?
- How many words can be formed where all vowels remain (come) together?
- How many words can be formed where all vowels don't remain (come) together?
- How many words can be formed where any two vowels don't remain (come) together?
- How many words can be formed where positions of vowels remain unchanged?
- How many words can be formed where vowels and consonants don't change their relative position?
- How many words can be formed where positions of vowels don't change their order?
- How many words can be formed where 'R' occupy last place?

Some caste issues

Taking the letters of the word 'DIRECTOR'-

- How many words can be formed?
- How many new words can be formed?
- How many new words can be formed where consonant occupy first position?
- How many new words can be formed where vowel occupy first position?



Some caste issues

Taking the letters of the word 'DIRECTOR'-

- How many words can be formed where all vowels remain (come) together?
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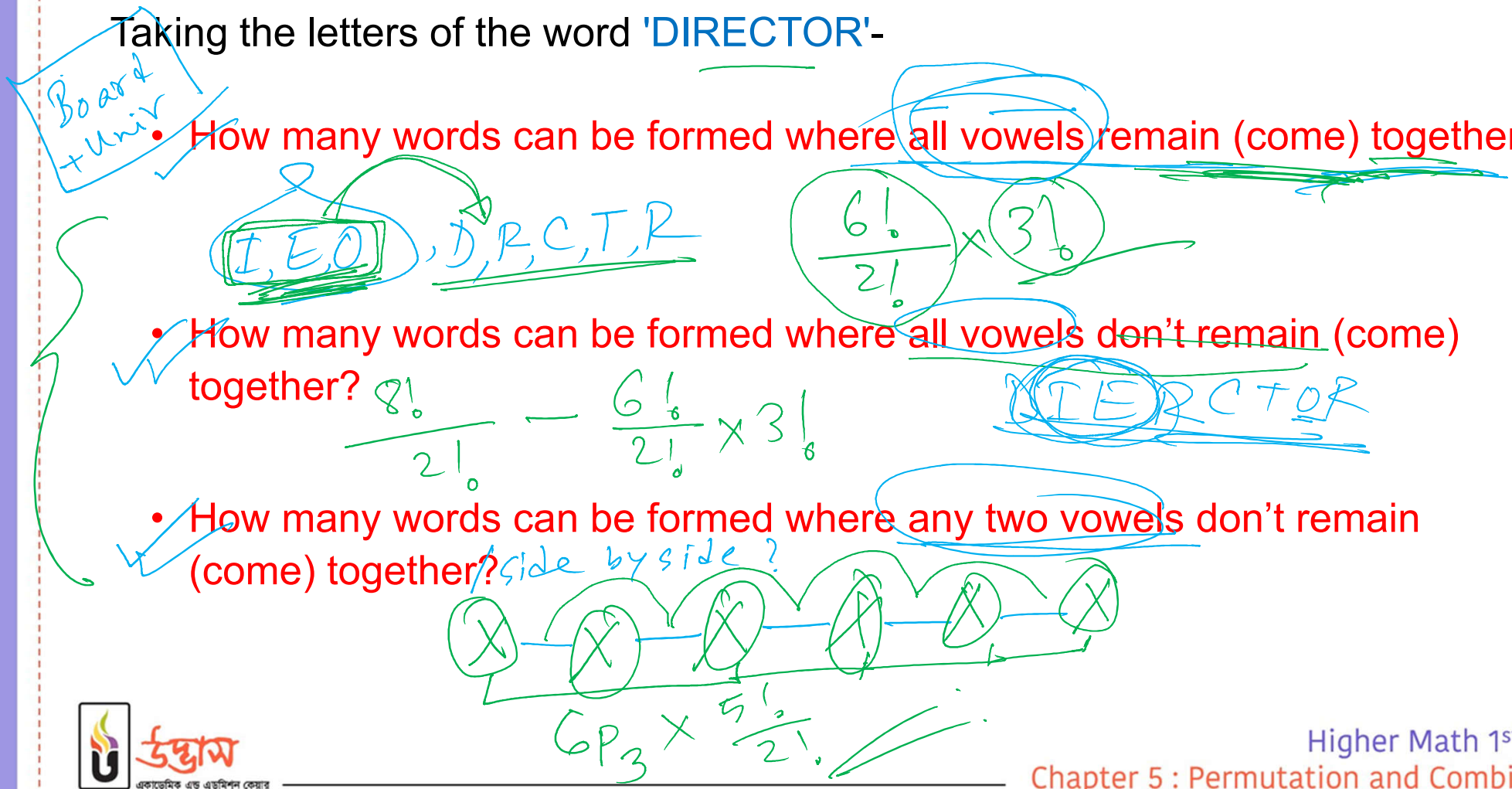
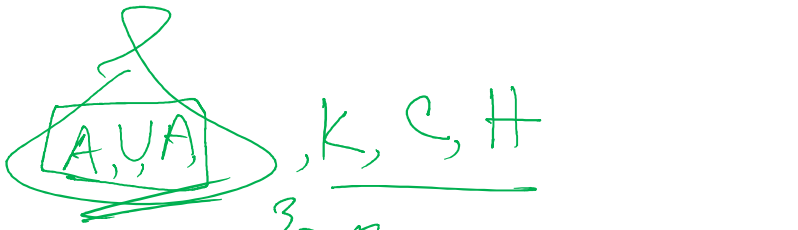


Poll Question 02

In how many ways the letters of the word 'KACHUA' can be arranged such that all vowels come together?

(a) 24
(b) 72
(c) 144
(d) 8



$$4! \times \frac{3!}{2!}$$

$$= 24 \times 3 = 72$$

Some caste issues

Taking the letters of the word 'DIRECTOR'-

- How many words can be formed where positions of vowels remain unchanged?

$\frac{5!}{2!}$

- How many words can be formed where vowels and consonants don't change their relative position?

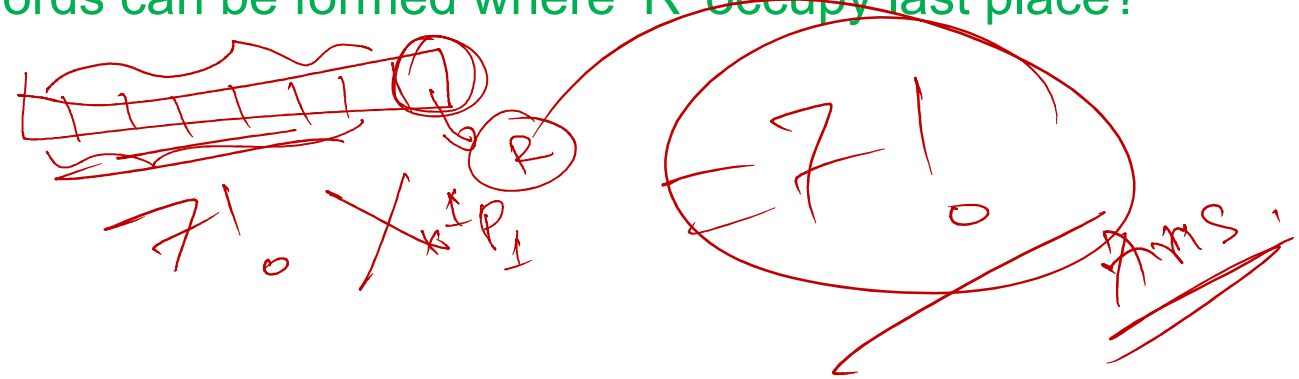
$3! \times \frac{5!}{2!}$

Some caste issues

Taking the letters of the word 'DIRECTOR'-

- How many words can be formed where positions of vowels don't change their order?

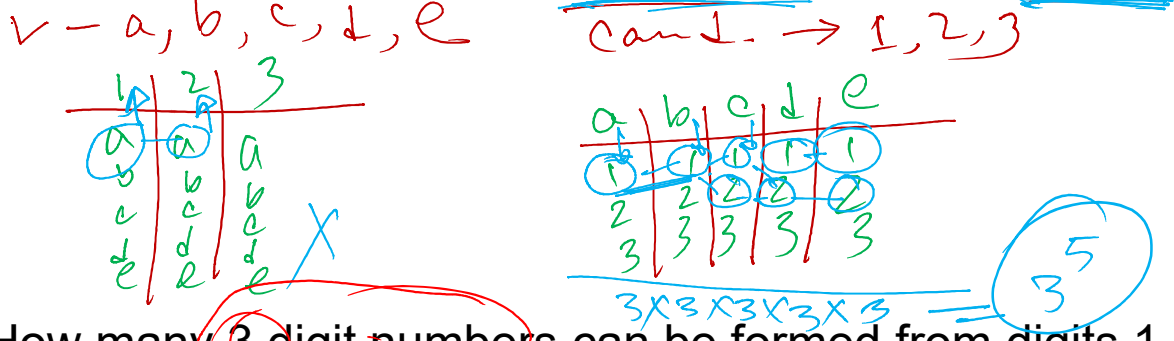
- How many words can be formed where 'R' occupy last place?



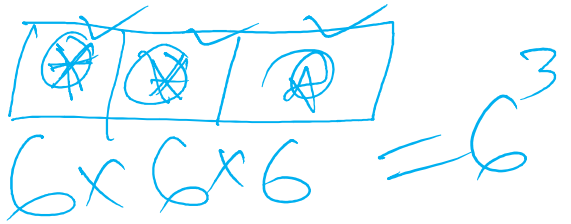
Permutation with repetition

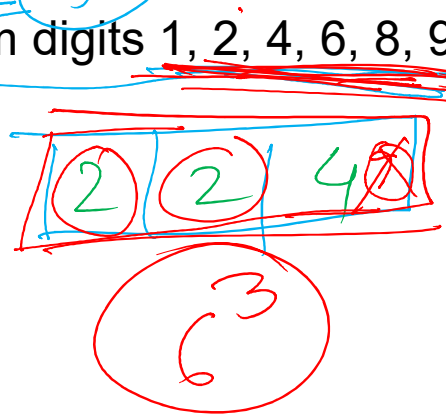
❖ Number of permutations of n distinct things taking r at a time when each thing may be repeated any number of times is = n^r

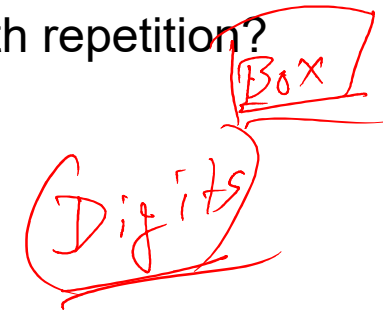
- In how many different ways 5 member can vote 3 person?



- How many 3 digit numbers can be formed from digits 1, 2, 4, 6, 8, 9 with repetition?







Poll Question 03

A Grameenphone number starts with 017 or 013.

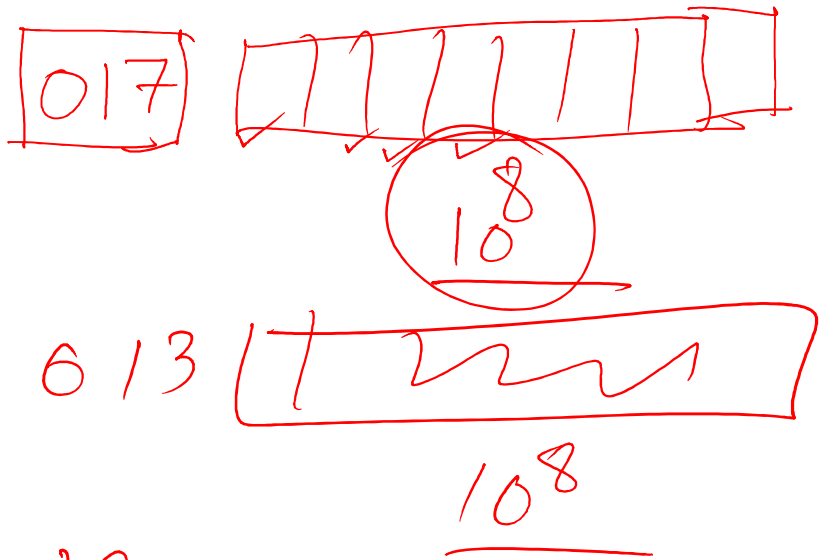
How many connections can Grameenphone provide?

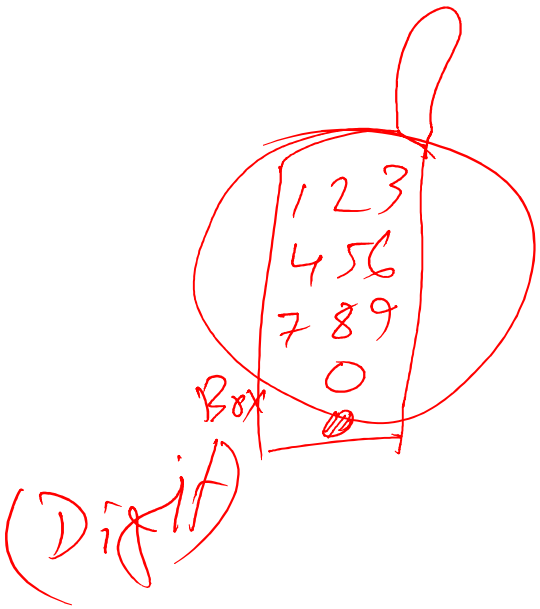
(a) $^{10}P_8$

(b) 10^8

(c) $^{10}C_8$

(d) 2×10^8

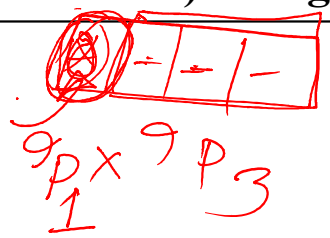
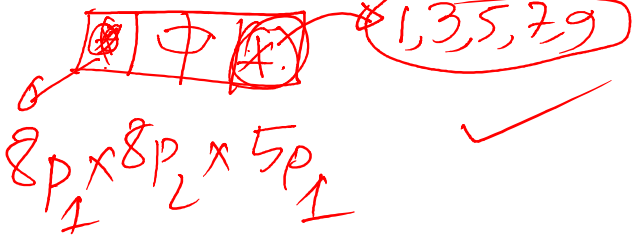
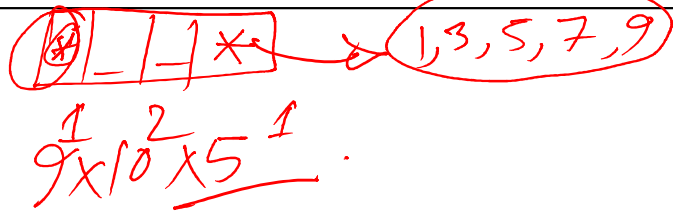




$a+a=2a$

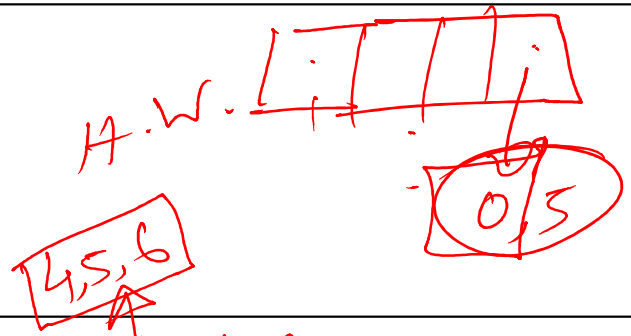
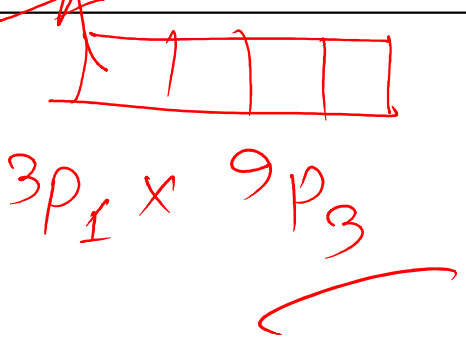
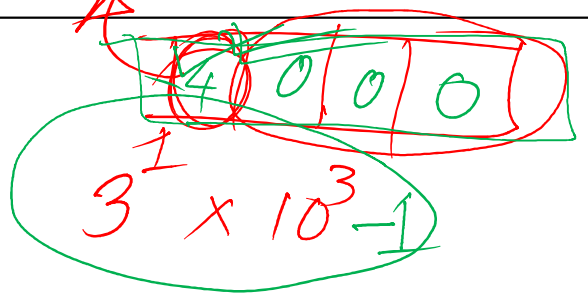
Related To Formation Of Numbers

From the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 using a digit- (i) once, (ii) multiple times-

Condition/Question	i) Using once	ii) Using multiple times
(a) (a) How many 4 digit numbers can be formed?		
(b) (b) How many odd 4 digit numbers can be formed?		
(c) (c) How many even 4 digit numbers can be formed?	H.W.	H.W.

Related To Formation Of Numbers

From the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 using a digit- (i) once, (ii) multiple times-

Condition/Question	i) Using once	ii) Using multiple times
(d) How many 4 digit numbers can be formed which are divisible by 5?		
(e) How many numbers can be formed which are greater than 4,000 but less than 7,000?		

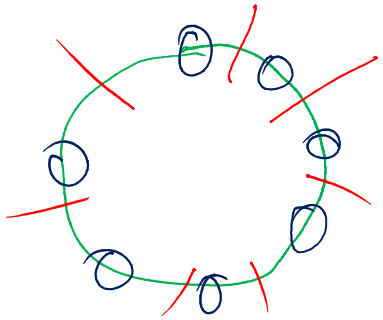
Circular permutations:

- Number of circular permutations (arrangements) of $\boldsymbol{n}$ distinct things = $(n-1)!$
- Number of circular permutations (arrangements) of n distinct things, when clockwise and anticlockwise arrangements are not different (i.e., when observations can be made from both sides) $=\frac{(n-1)!}{2}$
- In how many ways 13 person can be seated around a round table?

- How many chain can be made using10 stones of distinct color or shape?

Math related to circular table

In how many ways 7 students of science group and 5 students of arts group can be seated around a circular table such that none of the students of arts group sit together?



$(7-1)! \times {}^{7}P_5$

Form group on several condition

01. In how many ways a group of 15 people can be made choosing from 40 people?

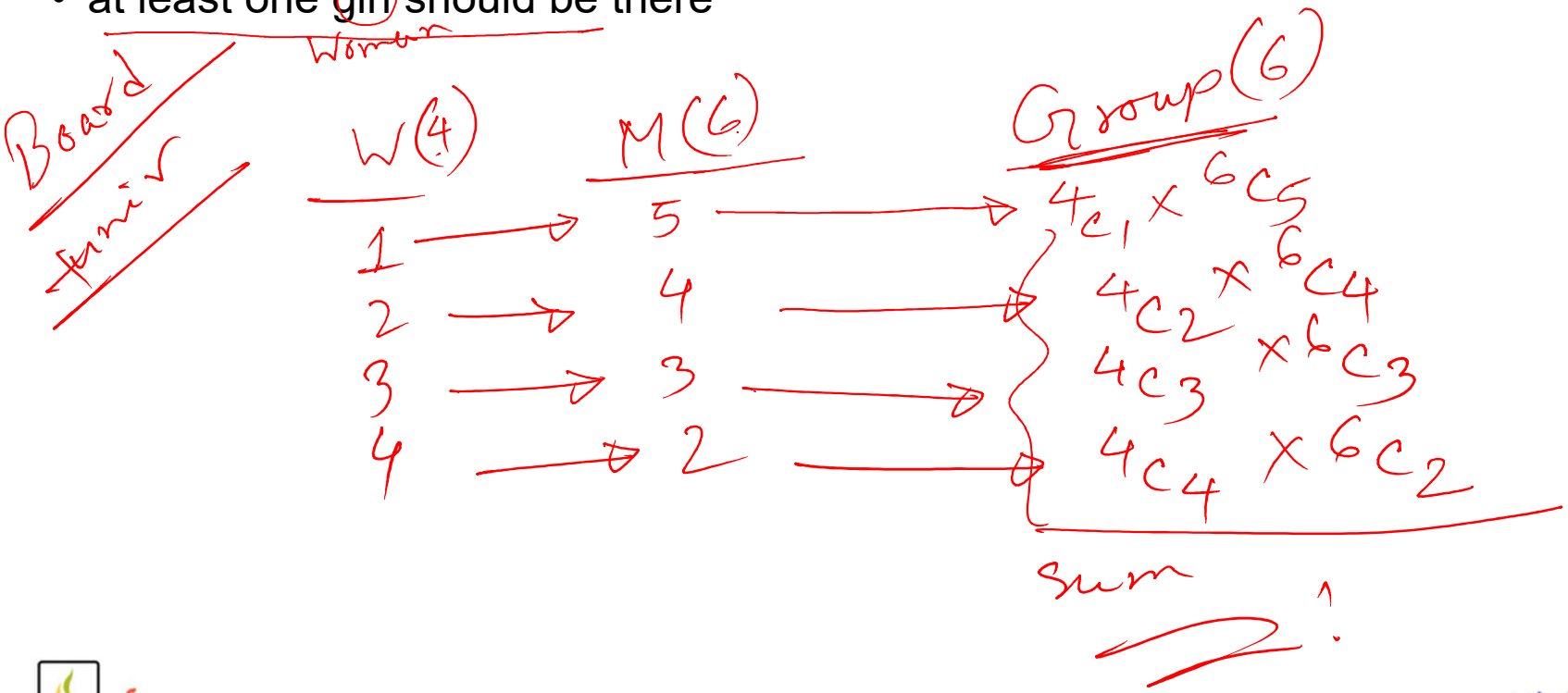
Case – 1: If Ashik is in the group: $^{39}C_{14}$;

Case – 2: If Ashik is not in the group: $^{39}C_{15}$;

Form group on several condition

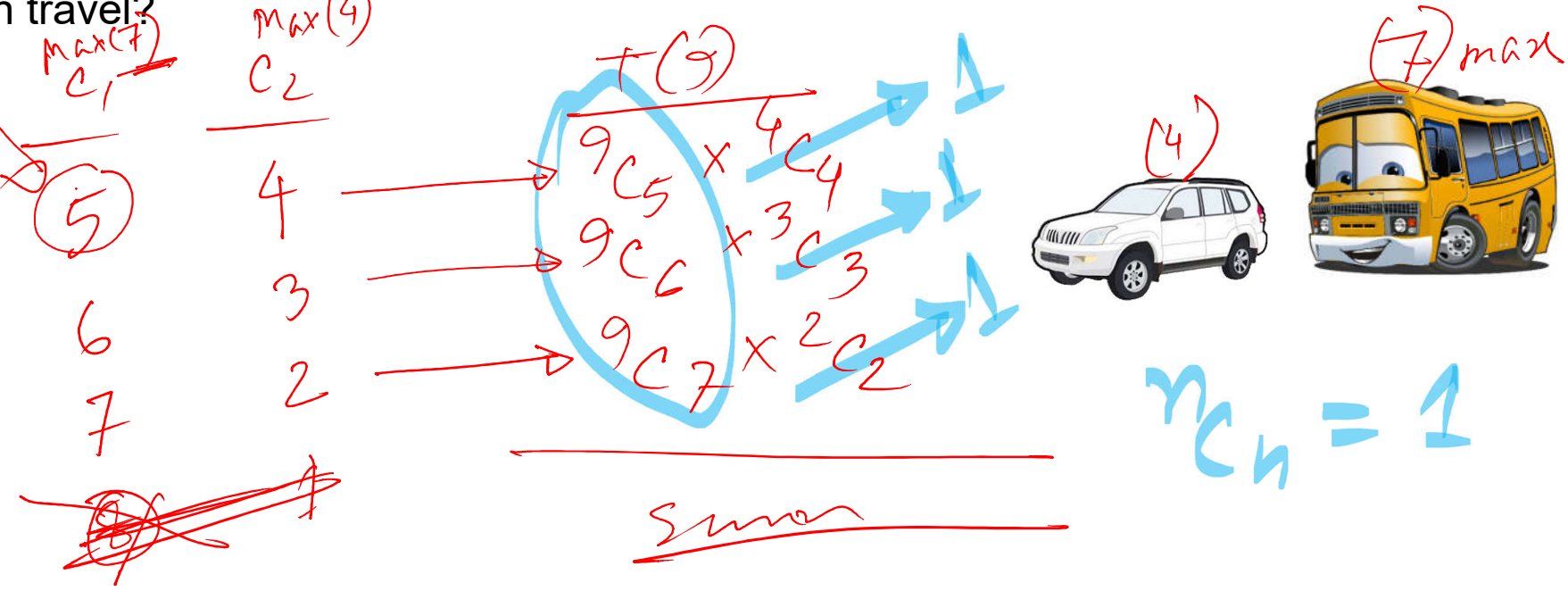
From a group of 10 person including 4 women, 6 persons are to be selected. In how many ways can it be done?- such that:

- at least one girl should be there



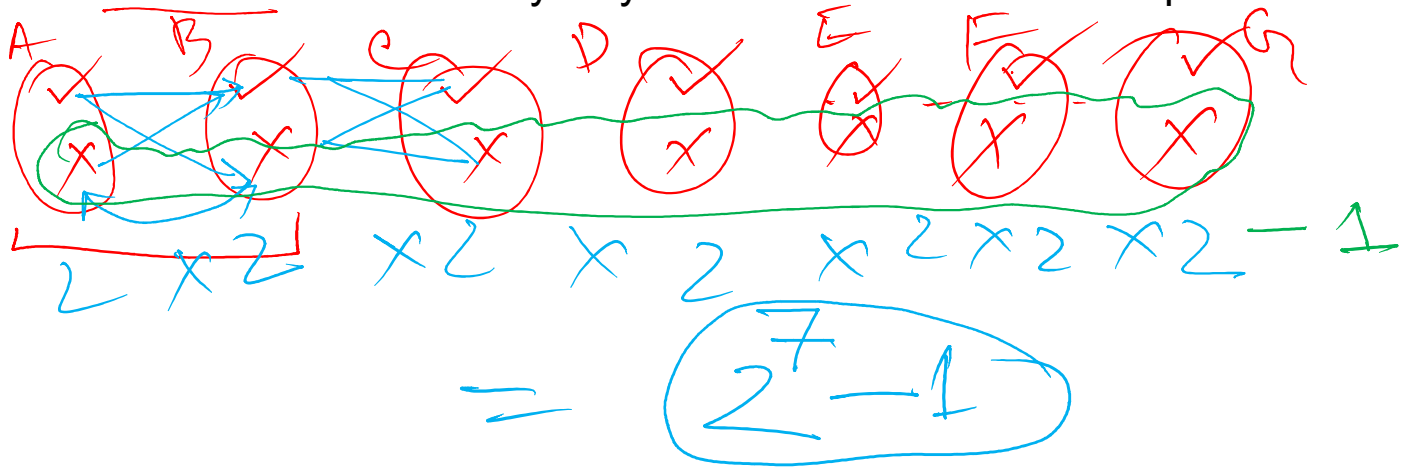
Form group on several condition

A group of 9 persons can travel by two car, one car cannot accommodate more than 7 persons and the another cannot accommodate more than 4 persons. In how many ways the can travel?

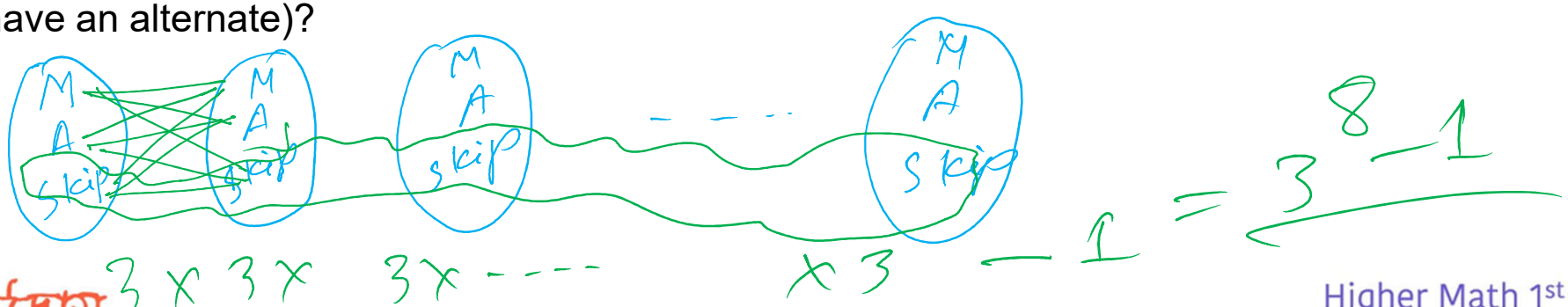


Related To The Selection Of One Or Multiple Objects

01. One has 7 friends. In how many ways he can invite one or multiple friends of him?



02. How many ways are there to choose one or multiple questions from 8 questions (each question have an alternate)?



Geometry related problem.

- How many _____ can be formed using the vertex points of a polygon of 10 arms?

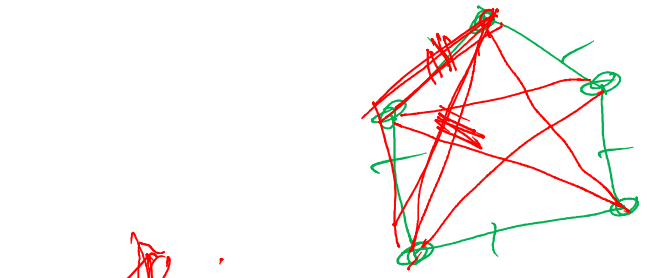
straight line = ${}^{10}C_2$

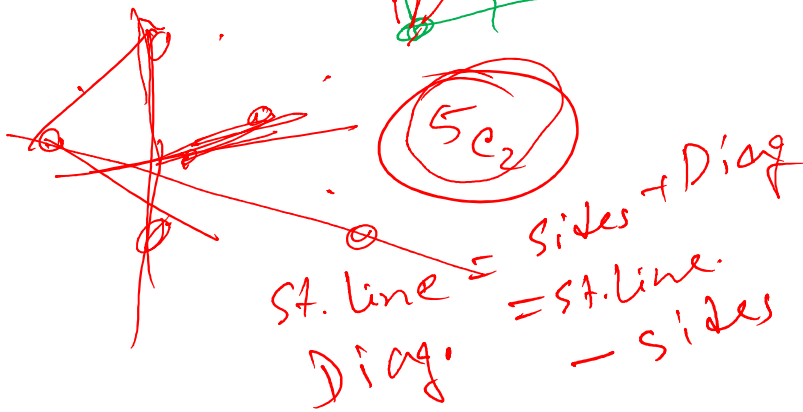
Arm = 10

Diagonal = ${}^{10}C_2 - 10$

Triangle = ${}^{10}C_3$

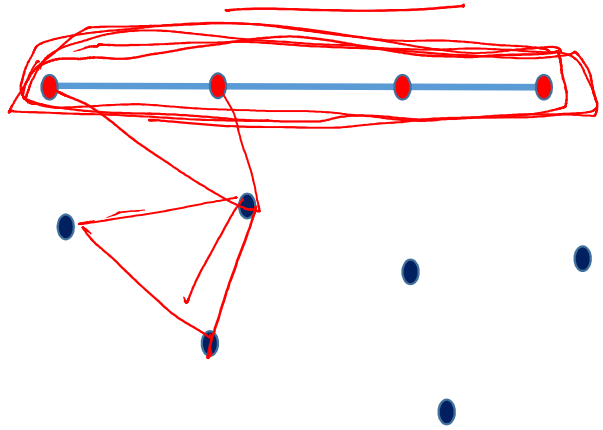
Quadrilateral = H.W.





Geometry related problem.

- Find the number of triangles, straight lines that can be formed using 10 points in a plane such that 4 points are collinear?



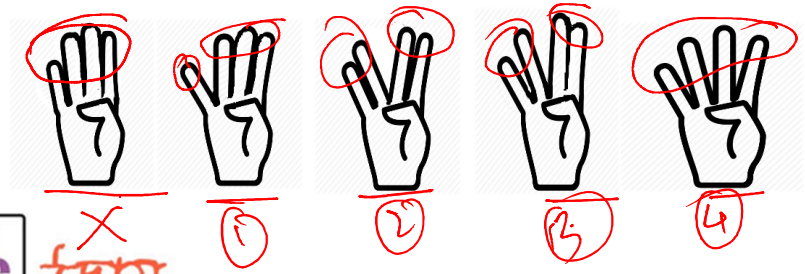
Tri° $^{10}C_3 - {}^4C_3$

St. Lines! $^{10}C_2 - {}^4C_2 + 1$

Related To The Combined Problems Of Permutation & Combination

Find the no. of selection that can be formed taking 4 letters from the word "ENGINEERING".

Ways	Examples	Number of Combinations
1I + 1S	EEER	$^2C_1 \times {}^4C_1$
2D	EEGG	$^4C_2$
1D + 2S	EEGR	$^4C_1 \times {}^4C_2$
4S	ENGR	$^5C_4$



T → 2
D → 4
S → 5

Poll Question 04

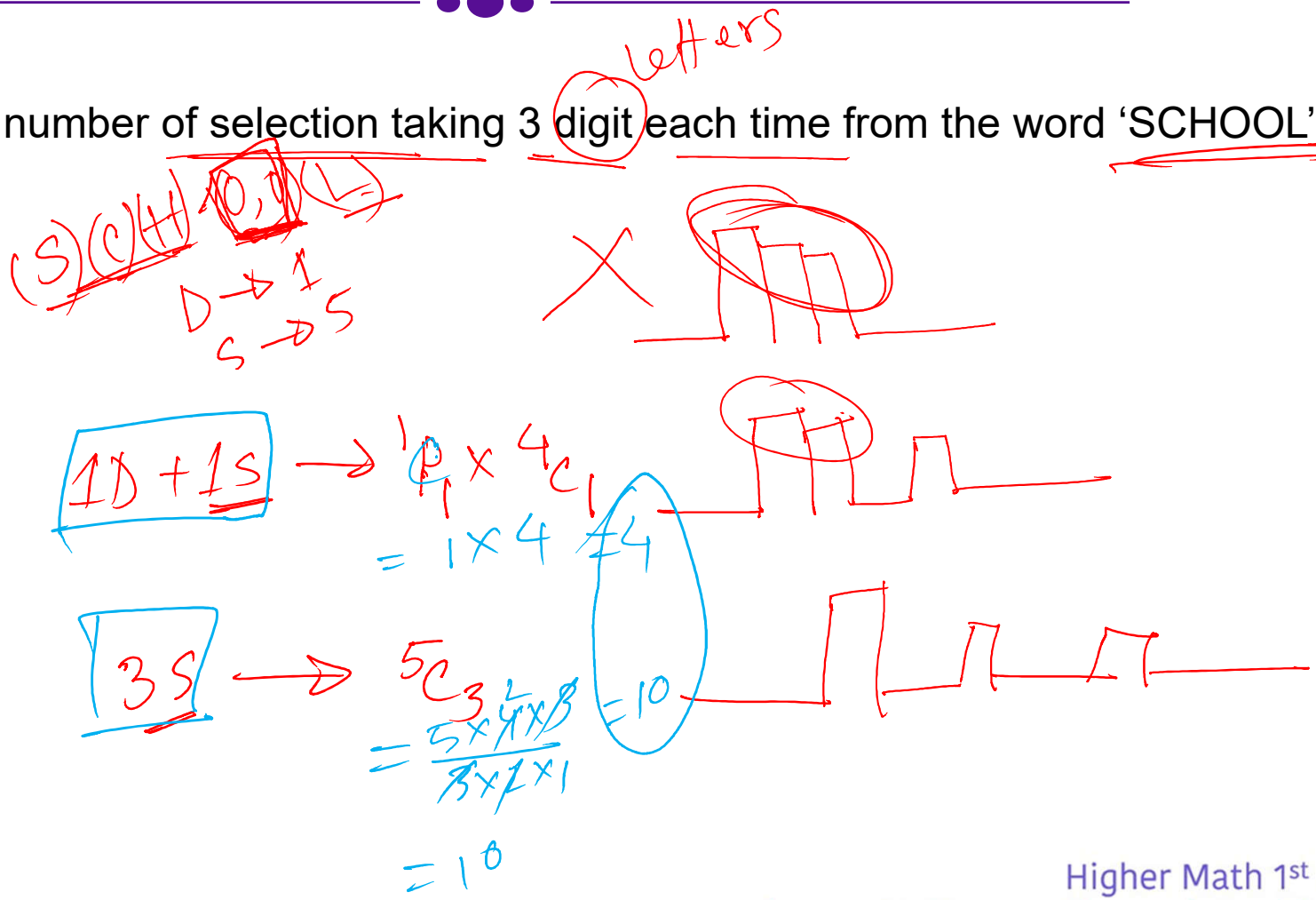
Find the different number of selection taking 3 digit each time from the word ‘SCHOOL’-

(a) 10

(b) 14

(c) 4

(d) 15



না বুঝে মুখস্থ করার অভ্যাস প্রতিভাকে ধ্বংস করে