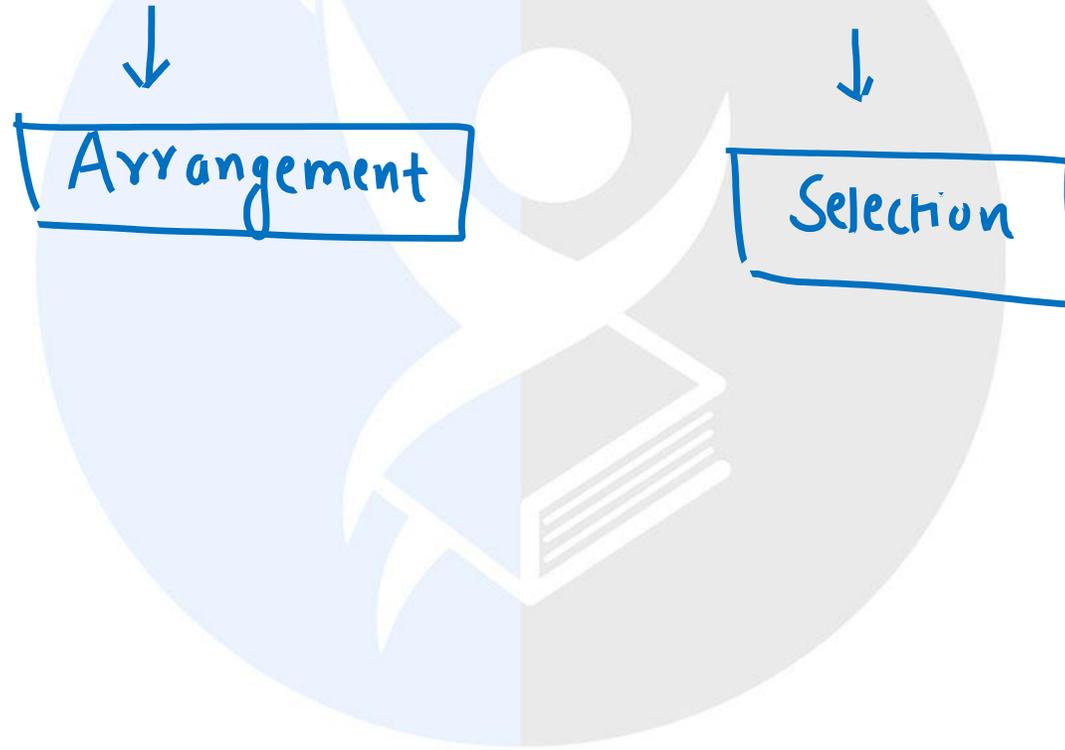


GENERAL APTITUDE

Permutation and combination

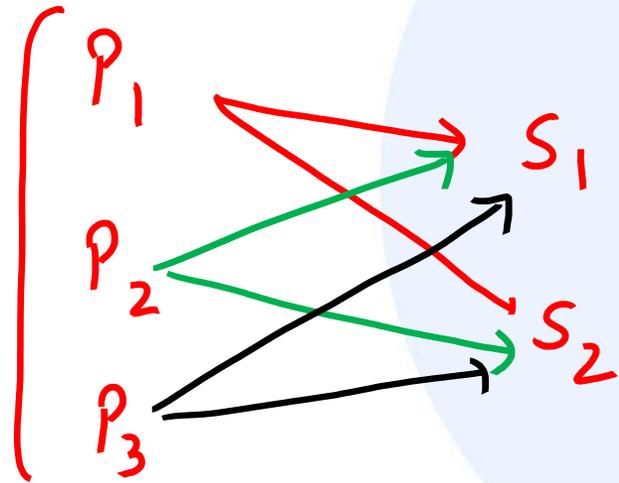
Voice ?





Fundamental Principle of Counting:

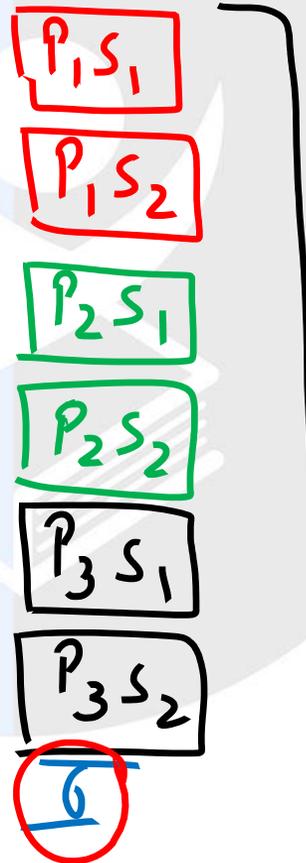
Mohan has 3 pants and 2 shirts. How many different pairs of a pant and a shirt, can he dress up with?



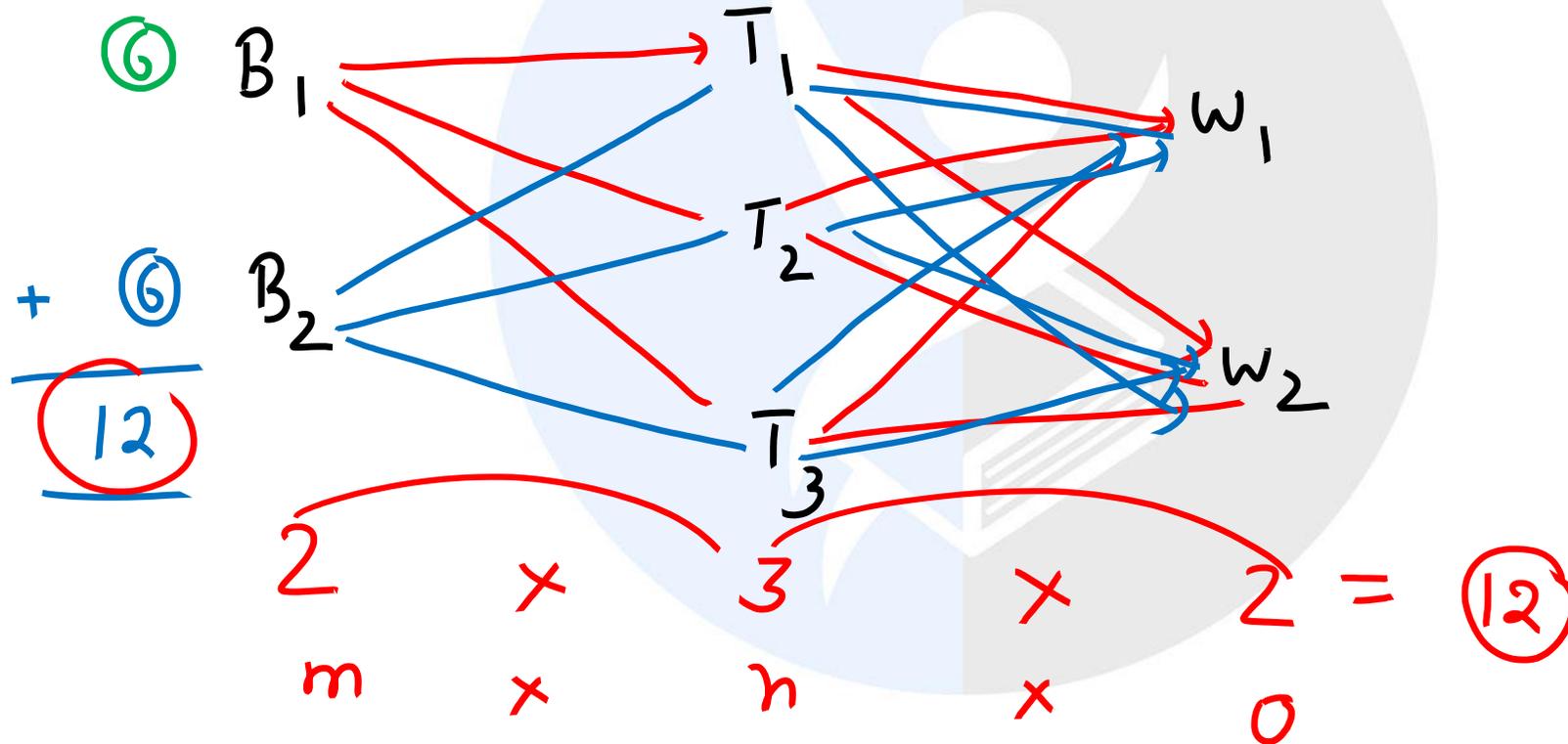
$$m=3$$

$$n=2$$

$$m \times n = 3 \times 2 = 6$$

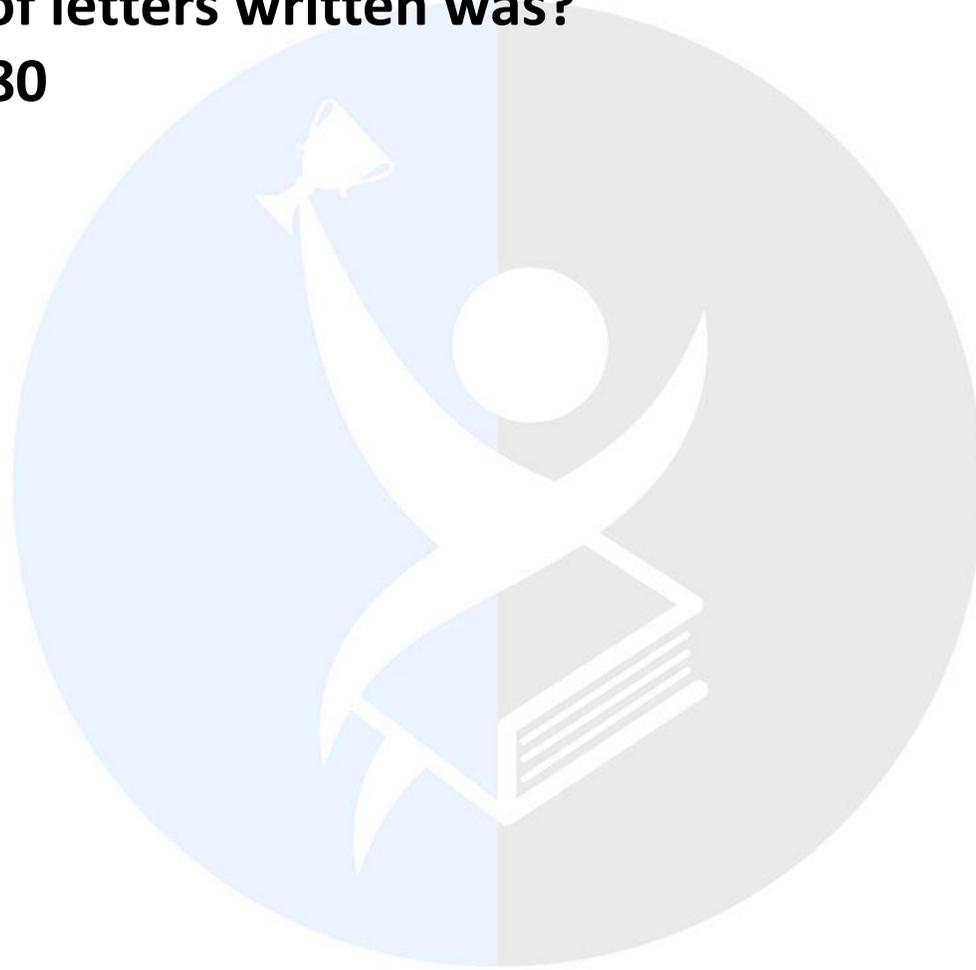


Shabnam has 2 school bags, 3 tiffin boxes and 2 water bottles.
In how many ways can she can carry these items ?



During a summer vacation, of 20 friends from a hostel, each wrote a letter to each of all others. The total number of letters written was?

(1) 20 (2) 400 (3) 200 (4) 380



Fundamental principle of counting or simply the multiplication principle.

“If an event can occur in m different ways, following which another event can occur in n different ways, then the total number of occurrence of the events in the given order is

“ $m \times n$ ”

Example 1. Find the number of 4 letter words, with or without meaning, which can be formed out of the letters of the word ROSE, where the repetition of the letters is not allowed.

Arrangements = $4 \times 3 \times 2 \times 1 = 24$

$4 \times 3 \times 2 \times 1 = 4!$

$5! = 5 \times 4 \times 3 \times 2 \times 1$

└ 4

$3 \times 2 \times 1 = 6$

(EAR)

E	A	R
E	R	A
A	R	E
A	E	R
R	A	E
R	E	A

How many 3-digit numbers can be formed from the digits 1, 2, 3, ~~4~~ and 5 assuming that

(i) repetition of the digits is allowed?

(ii) repetition of the digits is not allowed?

(i)

$$\boxed{5 \times 5 \times 5} = 125$$

(ii)

$$\boxed{5 \times 4 \times 3} = 60$$

5 5 1
5 5 5

PERMUTATIONS AND COMBINATIONS

→ Arrangement

→ Selection

$${}^{15}C_{11}$$

What Is the Difference Between Permutation and Combination?

$${}^{10}P_5$$

The permutation is the number of different arrangement which can be made by picking r number of things from the available n things.

but

$${}^{15}C_3$$

The combination is the number of different groups of r objects each, which can be formed from the available n objects.

Permutations

Definition : A permutation is an arrangement in a definite order of a number of objects.

$${}^n P_r = \frac{n!}{(n-r)!}$$

(161)

! factorial
3

$${}^5 P_3 = \frac{5!}{(5-3)!}$$

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

$$= \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = 60$$



Find the number of permutations of the letters of the word **ALLAHABAD**

A → 4
L → 2

$$\Rightarrow \frac{9!}{4! \cdot 2!} = \frac{9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4!}{4! \cdot 2}$$

$$\frac{40 \times 9 \times 21}{2}$$

$$\Rightarrow 840 \times 9 = 7560$$

Ans ✓

Ans **ELEPHANT**

$$\frac{8!}{2!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3}{2}$$

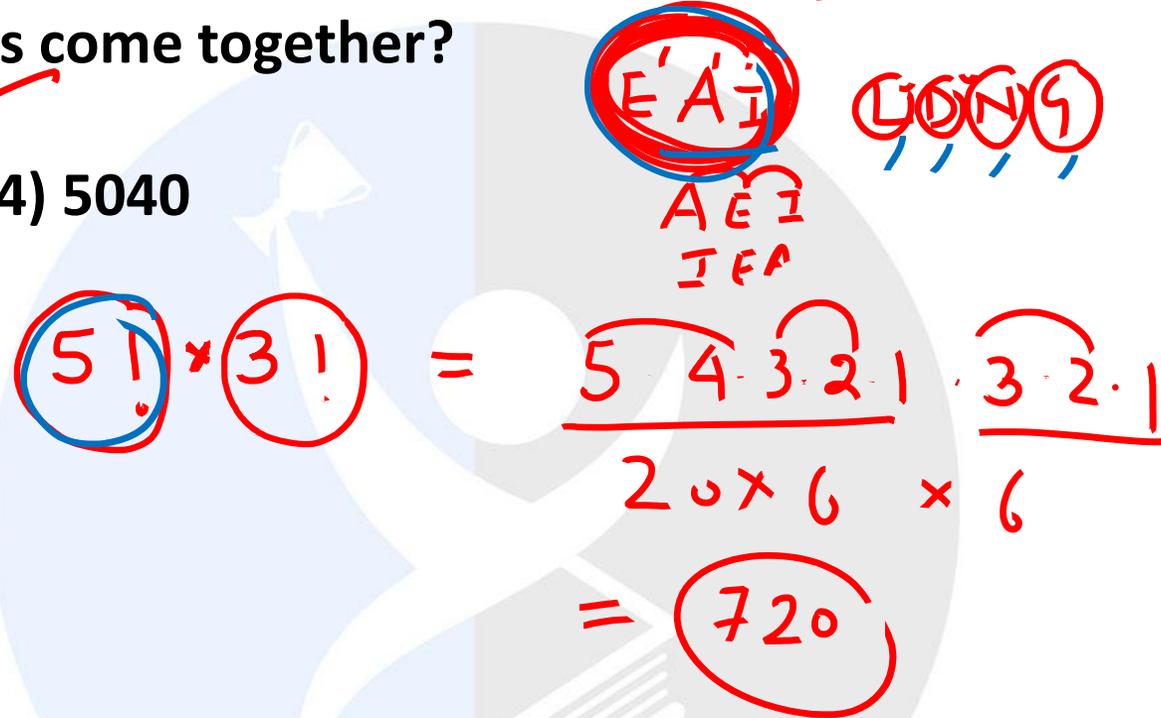
$$= \frac{40 \times 42 \times 12}{2}$$

$$= 40 \times 504$$

$$= 20160$$

In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

- (1) 360 (2) 480 (3) 720 (4) 5040



$$5! \times 3! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1$$

$$= 20 \times 6 \times 6 = 720$$

Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that

1 7 7 1 1 1 7

(i) all vowels occur together (ii) all vowels do not occur together = Total Arrangements - All the vowels come together

(AUE) D G H T R

$$\Rightarrow (6!) \times 3!$$

$$\Rightarrow 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1$$

$$30 \times 12 \times 12$$

$$30 \times 144 = 4320$$

Ans

$$= 8! - 4320$$

$$= (8) \cdot 7 \cdot (6) \cdot (5) \cdot (4) \cdot (3) \cdot (2) \cdot 1$$

$$40 \times 12 \times 12 \times 7$$

$$40 \times 144 \times 7$$

$$40 \times 1008$$

$$40320$$

$$- 4320$$

$$\underline{\underline{36000}}$$

Combinations

$${}^n C_r = \frac{n!}{r!(n-r)!}$$

Suppose we have 4 different objects A, B, C and D and we need to make combinations by taking 2 at a time.

$${}^n C_r = \frac{n!}{r!(n-r)!}$$

Trick

$${}^{11} C_9 = {}^{11} C_2 = \frac{11 \cdot 10}{2} = 55$$

$$\frac{9!}{4!(9-4)!}$$

$${}^6 C_2 = \frac{6 \cdot 5}{2 \cdot 1} = 15$$

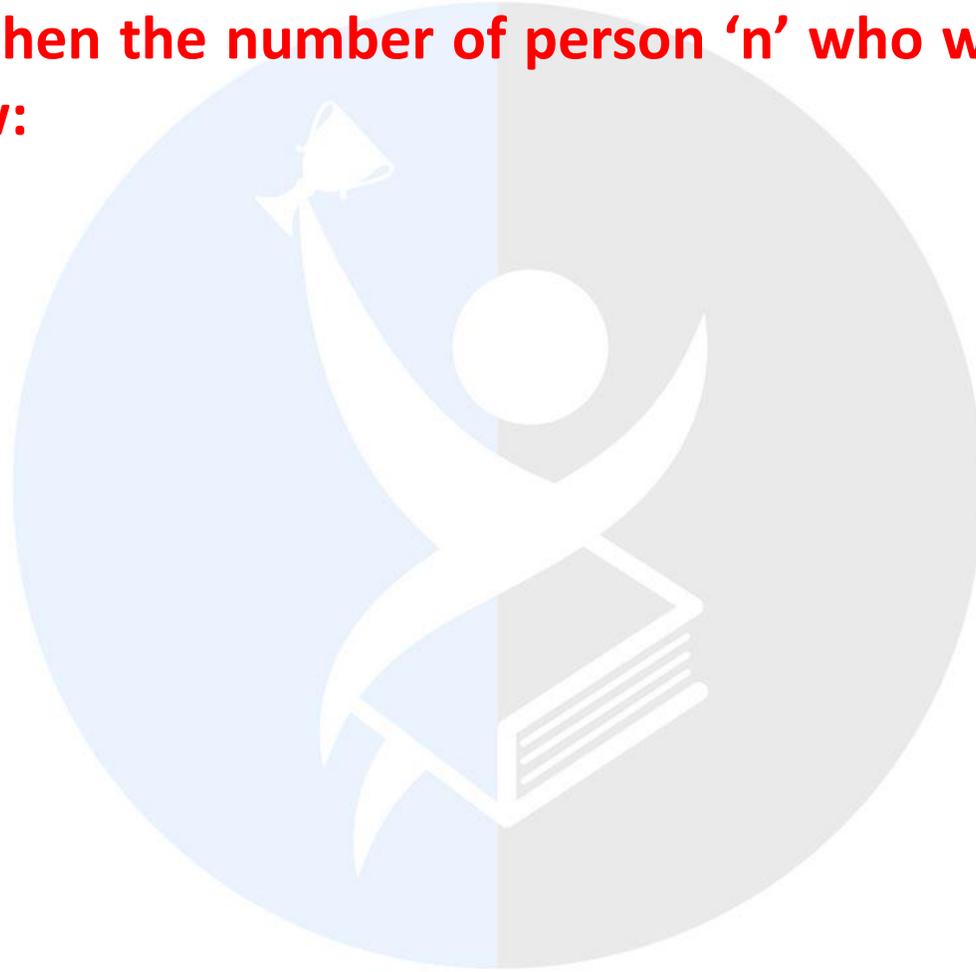
$${}^9 C_4 = \frac{9 \cdot 8 \cdot 7 \cdot 6}{4 \cdot 3 \cdot 2 \cdot 1} = 126$$

$${}^7 C_3 = \frac{7 \cdot 6 \cdot 5}{3 \cdot 2 \cdot 1} = 35$$

$${}^9 C_7 = {}^9 C_2 = \frac{9 \cdot 8}{2} = 36$$

In a party, every person shakes hands with every other person. If there was a total of H handshakes in the party, then the number of person 'n' who were present in the party can be calculated as below:

$$H = \frac{n(n - 1)}{2}$$



0 How many different salads can be made from cauliflower, tomatoes, onions, potatoes and carrots?

- (1) 16 (2) 28 (3) 31 (4) 32

Different Salads \Rightarrow

$$\begin{aligned}
 & \textcircled{1} \quad 5 + \textcircled{2} \quad 5C_2 + \textcircled{3} \quad 5C_3 + \textcircled{4} \quad 5C_4 + \textcircled{5} \quad 1 \\
 & \textcircled{5} + \frac{5 \cdot 4 \cdot 2}{2} + \frac{5 \cdot 4 \cdot 2}{2} + 5 + 1 \\
 & 5 + 10 + 10 + 5 + 1 \\
 & = \textcircled{31}
 \end{aligned}$$

$5C_3 = 5C_2$
 $9C_7 = 9C_2$

① A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done? How many of these committees would consist of 1 man and 2 women? ②

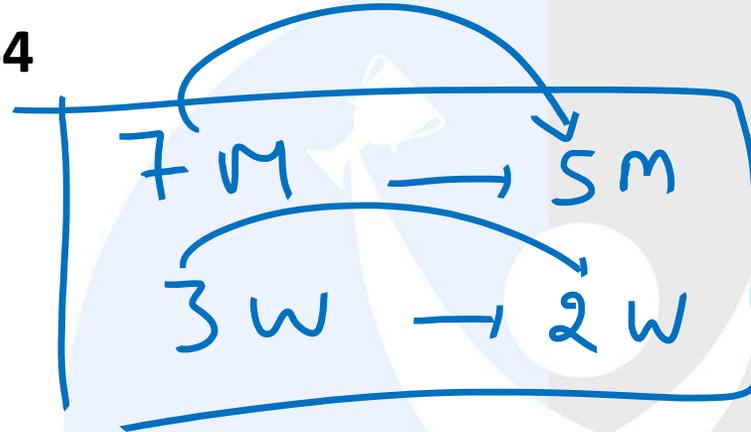
$${}^5C_3 = {}^5C_2 = \frac{5 \cdot 4^2}{2} = 10$$

men women

$${}^2C_1 \cdot {}^3C_2 = \frac{2}{1} \cdot \frac{3}{1} = 6$$

In how many ways can a group of 5 men and 2 women be made out of total of 7 men and 3 women?

- (1) 17 (2) 126 (3) 63 (4) 64



$$= \sqrt[7]{7C_5} \times \sqrt[3]{3C_2} = \sqrt[7]{7C_2} \times \sqrt[3]{3C_1} = \frac{7 \cdot 6}{2} \cdot \frac{3}{1} = 63$$

Same event

Rohit Dhoni has to select the Indian team consisting 4 bowlers, 6 batsmen and 1 wicket keeper for the finals among 6 bowlers, 8 batsmen and 3 wicket keepers. How many possible combinations can Dhoni have?

- ~~(1) 1260~~ (2) 1008 (3) 928 (4) 726

Ans
ways

\Rightarrow

$${}^6C_4 \times {}^8C_6 \times {}^3C_1$$

\Rightarrow

$${}^6C_2 \cdot {}^8C_2 \cdot {}^3C_1$$

$$= \frac{3 \cdot 6 \cdot 5}{2} \cdot \frac{4 \cdot 8 \cdot 7}{2} \cdot 3$$

$$20 \times 21 \times 3 = 60 \times 21 = 1260$$

Ans

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) 6760 (B) 13520 (C) 40560 (D) 1,05,456

Permutation

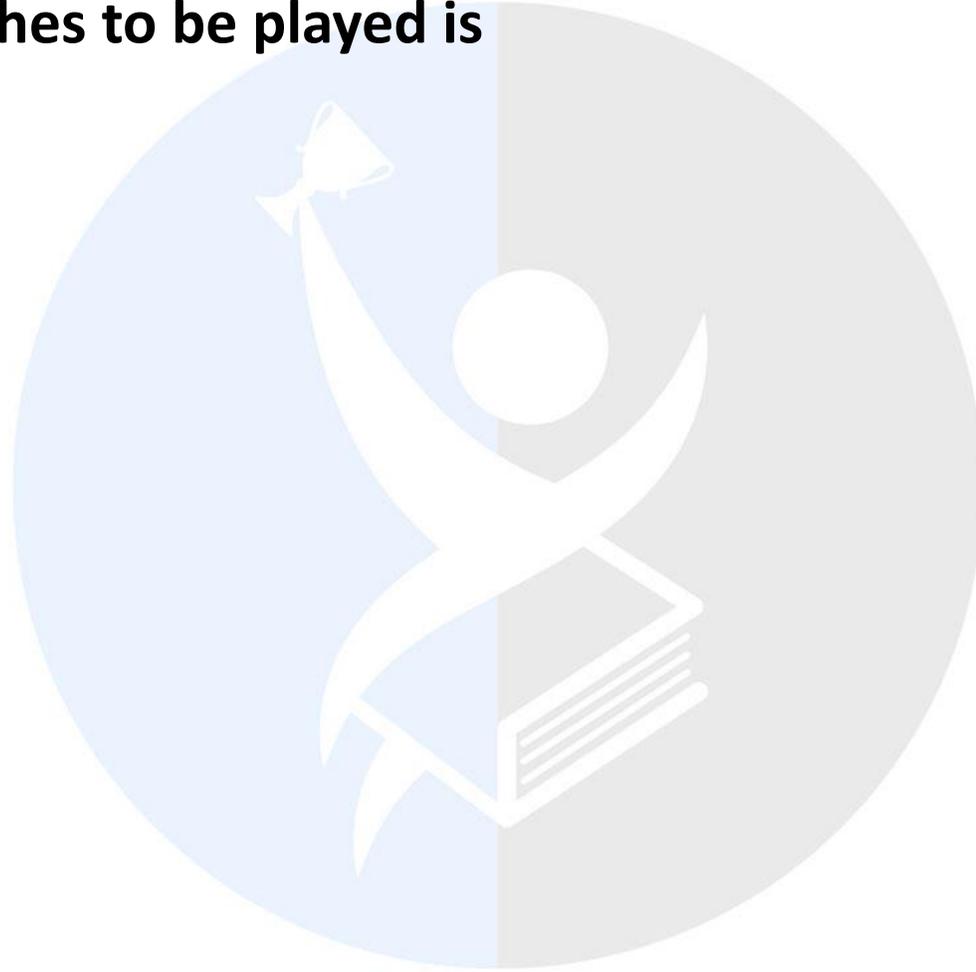


Q In a group of 11 persons each shakes hand with every other once and only once. What is the total number of such handshakes?

(1) 110 (2) 121 (3) 55 (4) 66

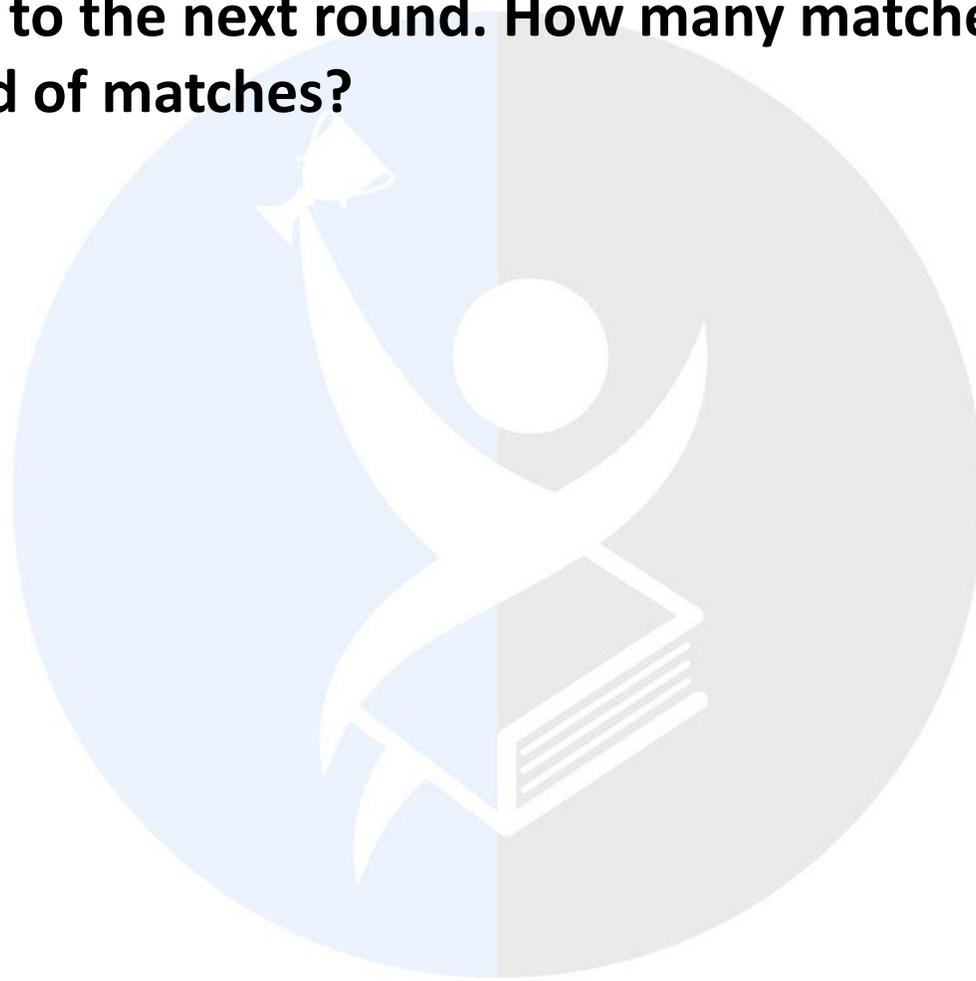


Ten teams participate in a tournament. Every team plays each of the other teams twice.
The total number of matches to be played is
(A) 20 (B) 45 (C) 60 (D) 90



Five teams have to compete in a league, with every team playing every other team exactly once, before going to the next round. How many matches will have to be held to complete the league round of matches?

(A) 20 (B) 10 (C) 8 (D) 5





HAPPY LEARNING

THANKS