Permutations and Combinations | Past Trends

Attempt	Easy	Moderate	Advance Level	Total
May 2018	**2**	**0**	**0**	**2**
Nov 2018	**2**	**2**	**0**	**4**
Jun 2019	**2**	**1**	**1**	**4**
Nov 2019	**3**	**2**	**0**	**5**
Nov 2020	**2**	**2**	**0**	**4**
Jan 2021	**3**	**2**	**2**	**7**
Jul 2021	**2**	**2**	**0**	**4**
Dec 2021	**4**	**1**	**0**	**5**
Jun 2022	**6**	**2**	**0**	**8**
Dec 2022	**4**	**0**	**0**	**4**

Combinations – Basics

Meaning	• The number of ways in which **smaller or equal** number of things are **selected** from a collection of things • where the **order** of selection or arrangement is **not important**, are called combinations.
Theorem	Number of Combinations when r **objects** are chosen out of n **different** objects $${}^{n}C_{r} = \frac{n!}{(n-r)!r!}$$ **Conditions:** $n \geq r$ and n is a positive integer
Linkage with Permutations	$${}^{n}C_{r} = \frac{{}^{n}P_{r}}{r!} \text{ or } {}^{n}P_{r} = {}^{n}C_{r} \times r!$$
Standard Result	$${}^{n}C_{0} = 1$$ $${}^{n}C_{n} = 1$$
Complimentary Combinations	$${}^{n}C_{r} = {}^{n}C_{n-r}$$
Combination to choose one or more objects	Combinations of **n** different things taking **one or more** out of n things at a time: $$2^{n} - 1$$
Number of ways to do things with choices	If a task is to be done n times with r choices for every task, then total ways of doing task = n^{r}
Special Formula	$${}^{n+1}C_{r} = {}^{n}C_{r} + {}^{n}C_{r-1}$$
Number of handshakes	$${}^{n}C_{2}$$

PYQ May 18

If ${}^{1000}C_{98} = {}^{999}C_{97} + {}^{x}C_{901}$ find x

a. 999 b. 998 c. 997 d. 1000

Ans: a

PYQ Nov 18

If ${}^{n}P_{r} = 720$ and ${}^{n}C_{r} = 120$, then r is

a. 3 b. 4 c. 5 d. 6

Ans: a

PYQ Nov 18

If there are 40 guests in a party. If each guest takes a handshake with all the remaining guests. Then the total number of handshakes is ____

a. 1600 b. 840 c. 1560 d. 780

Ans: d

PYQ Nov 18
PYQ Jun 22

If ${}^{n}C_{x} = {}^{11}C_{2x-4}$ and $x \neq 4$ then the value of ${}^{7}C_{x}$ =

a. 20 b. 21 c. 22 d. 23

Ans: b

PYQ Nov 19

How many different groups of 3 people can be formed from a group of 5 people?

a. 5 b. 6 c. 10 d. 9

Ans: c

PYQ Nov 19

In how many ways can 4 people be selected at random from 6 boys and 4 girls if there are to be exactly 2 girls?

a. 90 b. 360 c. 92 d. 480

Ans: a

PYQ Jan 21

A business house wishes to simultaneously elevate two of its six branch heads. In how many ways can these elevations take place?

a. 12 b. 3 c. 6 d. 15

Ans: d

Example 3 ICAI

An examination paper with 10 questions consists of 6 questions in Algebra and 4 questions in Geometry. At least one question from each section is to be attempted. In how many ways this can be done?

a. 1023 b. 945 c. 1718 d. 816

Ans: b

PYQ Jun 22

There are 5 questions each having four options. Then in how many different ways can we answer the questions?

a. 20 b. 120 c. 1024 d. 60

Ans: c

Geometry Based Formulas

No. of Straight Lines with the given n points	${}^{n}C_{2}$ 2 is used as we need to select two points to make a line
No. of Triangles with the given n points	${}^{n}C_{3}$ 3 is used as we need to select two points to make a line

No. of Straight Lines with the given n points where m points are collinear	${}^{n}C_{2} - {}^{m}C_{2} + 1$
No. of Triangles with the given n points where m points are collinear	${}^{n}C_{3} - {}^{m}C_{3}$
No. of Parallelogram with the given one set of m parallel lines and another set of n parallel lines	${}^{n}C_{2} \times {}^{m}C_{2}$ Selecting 2 lines from each set of parallel lines
No. of Diagonals with n sides	${}^{n}C_{2} - n$

PYQ May 18

The number of triangles that can be formed by choosing the vertices from a set of 12 points, seven of which lie on the same straight line is

a. 185 b. 175 c. 115 d. 105

Ans: a

PYQ Jun 22

If there are 6 points in a line and 4 points in another line. Find the number of parallelograms formed?

a. 80 b. 70 c. 90 d. 100

Ans: c

MTP Nov 19

The number of diagonals in a polygon of 6 sides

a. 9 b. 8 c. 6 d. 12

Ans: a

Exercise 5C Q 21

The Supreme Court has given a 6 to 3 decision upholding a lower court, the number of ways it can give a majority decision reversing the lower court is

a. 256 b. 276 c. 245 d. 226

Ans: