

**CLASS-10+1 CH-7 PERMUTATIONS & COMBINATIONS**  
**EX-7.1 BOOK-NCERT TOPIC- Fundamental Principle of Counting**

**Fundamental Principle of Counting**

"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  $m \times n$ ."

Permutation  $\rightarrow$  Arrangement  
 Combination  $\rightarrow$  Selection

$$\begin{aligned} \text{Total Shirts} &= 3 \\ \text{Pants} &= 2 \\ &= 3 \times 2 = 6 \end{aligned} \quad \begin{aligned} (S_1, S_2, S_3) \\ (P_1, P_2) \end{aligned}$$

$$\begin{bmatrix} S_1 P_1 & S_3 P_1 & S_2 P_2 \\ S_2 P_1 & S_1 P_2 & S_3 P_2 \end{bmatrix}$$

The above principle can be generalised for any finite number of events. For example, for 3 events, the principle is as follows:

"If an event can occur in  $m$  different ways, following which another event can occur in  $n$  different ways, following which a third event can occur in  $p$  different ways, then the total number of occurrence of the events in the given order is  $m \times n \times p$ ."

$$\begin{aligned} \text{Shirts} &= 3 \quad \text{Pants} = 2 \quad \text{Tie} = 2 \\ &= 3 \times 2 \times 2 = \underline{\underline{12}} \end{aligned}$$

Permutation (arrangement)  
abc

$$n=3 \quad r=3$$

$$\begin{bmatrix} abc \\ acb \\ bac \\ bca \\ cab \\ cba \end{bmatrix} \quad \begin{aligned} &\text{Six arrangements} \\ &\text{order matters} \end{aligned}$$

$$\begin{aligned} &\underline{abc} \\ &n=3 \quad r=2 \end{aligned}$$

$$\begin{bmatrix} ab \\ ba \\ bc \\ cb \\ ca \\ ac \end{bmatrix} \quad \text{6 arrangements}$$

Combination (selection)

abc

$$n=3 \quad r=3$$

abc / bac / cab /  
 selection matters  
 but order of  
 letters does not matter

abc

$$n=3 \quad r=2$$

$$\begin{bmatrix} ab \\ bc \\ ca \end{bmatrix} \quad \underline{\underline{3}} \text{ selection}$$

ab  
ba  
bc  
cb  
ca  
ac

6 arrangements

$n=3$

$r=2$

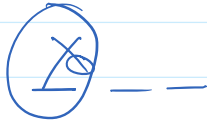
ab  
bc  
ca

3 selection

### EXERCISE 7.1

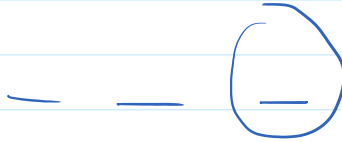
1. How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that

- (i) repetition of the digits is allowed? ✓
- (ii) repetition of the digits is not allowed?



Sol

(i)

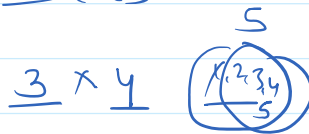


Total no. of digits = 5

First place can be filled in 5 ways  
2nd " " " " " 5 "  
3rd " " " " " 5 "

$$= 5 \times 5 \times 5$$
$$= 125$$

(ii)



First place can be filled in 5 ways  
2nd " " " " " 4 ways  
3rd " " " " " 3 ways

$$= 5 \times 4 \times 3$$
$$= 60$$

Ans

2. How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated?

Sol

Total no. of digits given = 6

We are to find 3-digit even no. using the digits 1, 2, 3, 4, 5, 6

$$\begin{array}{c} 6 \times 6 \times 3 \\ \hline \end{array} \quad \begin{array}{c} \textcircled{2, 4, 6} \end{array}$$

342

unit place	can be filled in	3 ways
tens place	" "	6 ways
Hundred	" "	6 ways

$$\begin{aligned} \text{Total no. of ways} &= 3 \times 6 \times 6 \\ &= 36 \times 3 \\ &= 108 \end{aligned}$$

✓

3. How many 4-letter code can be formed using the first 10 letters of the English alphabet, if no letter can be repeated?

Sol

Total no. of letters given = 10 (A to J)  
By FPC

$$1 \times 8 \times 9 \times 10$$

$$= 7 \times \underline{8} \times 9 \times \underline{10}$$

$$= 72 \times 10 \times 7$$

$$= 720 \times 7$$

$$= 5040$$

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
<u>A</u>	<u>B</u>	<u>C</u>	<u>E</u>
<u>A</u>	<u>B</u>	<u>C</u>	<u>F</u>
<u>A</u>	<u>B</u>	<u>C</u>	<u>G</u>
—	—	—	<u>H</u>
—	—	—	<u>I</u>
—	—	—	<u>J</u>

4. How many 5-digit telephone numbers can be constructed using the digits 0 to 9 if each number starts with 67 and no digit appears more than once?

Sol <sup>no. of</sup> Total digits given = 10 (i.e. from 0 to 9)

$$\begin{array}{c} 6 \quad 7 \quad \_ \quad \_ \quad \_ \\ + \quad + \quad \_ \quad \_ \quad \_ \\ \hline \end{array}$$

Total Remaining digits =  $10 - 2$   
8 (0, 1, 2, 3, 4, 5, 8, 9)

By FPC

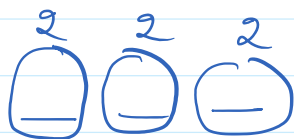
$$= \underline{6} \times \underline{7} \times \underline{8}$$

$$= 42 \times 8$$

$$= \underline{336}$$

5. A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there?

Sol



1st place can be filled in 2 ways  
2nd " " " 2 "  
3rd " " " 2 way

By FPC

$$= 2 \times 2 \times 2$$

$$= 8 \checkmark$$

$$S = \{ HHH, HHT, HTH, THH, TTT, TTH, THT, HTT \}$$

H.S

6. Given 5 flags of different colours, how many different signals can be generated if each signal requires the use of 2 flags, one below the other?

Activate Wi  
Go to Settings

Same as example 4