Permutation Exercise 1

Question 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?

Question 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?

Question 3:

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

Question 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?

Question 5:

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

Question 6:

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

We can solve all these question on the basis of principle of mathematical counting

Solution 1

(i)In first case, repetition of digits is allowed.

Therefore, the units place can be filled in by any of the given five digits.

Similarly, tens and hundreds digits can be filled in by any of the given five digits.

Thus, by the multiplication principle, the number of ways in which three-digit numbers

can be formed from the given digits is 5 × 5 × 5 = 125

(ii)

In this case, repetition of digits is not allowed. Here, if units place is filled in first, then it

can be filled by any of the given five digits.

Therefore, the number of ways of filling the units place of the three-digit number is 5.

Then, the tens place can be filled with any of the remaining four digits and the hundreds

place can be filled with any of the remaining three digits.

Thus, by the multiplication principle, the number of ways in which three-digit numbers

can be formed without repeating the given digits is 5 × 4 × 3 = 60

We will learn in later part of chapter on how to solve these problem with the help of permutation formula

${}^{5}P_{3}$= =5!/(5-3)!= 60

Solution 2

As the number has to be even, the units place can be filled by 2 or 4 or 6 only i.e., the units place can be

filled in 3 ways.

The tens place can be filled by any of the 6 digits in 6 different ways and also the hundreds

place can be filled by any of the 6 digits in 6 different ways, as the digits can be repeated.

Therefore, by multiplication principle, the required number of three digit even numbers is

3 × 6 × 6 = 108

Solution 3

The first place can be filled in 10 different ways by any of the first 10 letters of the English alphabet following which, the second place can be filled in by any of the remaining letters in 9 different ways. The third place can be filled in by any of the remaining 8 letters in 8 different ways and the fourth place can be filled in by any of the remaining 7 letters in 7 different ways.

Therefore, by multiplication principle, the required numbers of ways in which 4 vacant places can be filled is $10 \times 9 \times 8 \times 7 = 5040$

Hence, 5040 four-letter codes can be formed using the first 10 letters of the English alphabet, if no letter is repeated.

We will learn in later part of chapter on how to solve these problem with the help of permutation formula

$^{10}P_4 = =10!/(10-4)!$

=5040

Solution 4:

It is given that the 5-digit telephone numbers always start with 67.

Therefore, there will be as many phone numbers as there are ways of filling 3 vacant Places

6,7, _, _, _

The three vacant places above will be filled by the digits 0 – 9, keeping in mind that the digits cannot be repeated.

The units place can be filled by any of the digits from 0 – 9, except digits 6 and 7.

Therefore, the units place can be filled in 8 different ways following which, the tens place can be filled in by any of the remaining 7 digits in 7 different ways, and the hundreds place can be filled in by any of the remaining 6 digits in 6 different ways.

Therefore, by multiplication principle, the required number of ways in which 5-digit

telephone numbers can be constructed is 8 × 7 × 6 = 336

We will learn in later part of chapter on how to solve these problem with the help of permutation formula

$^{8}P_{3}$= =8!/(8-3)!= 336

Solution 5:

When a coin is tossed once, the number of outcomes is 2 (Head and tail) i.e., in each

throw, the number of ways of showing a different face is 2.

Thus, by multiplication principle, the required number of possible outcomes is 2 × 2 × 2

= 8

Solution 6:

Each signal requires the use of 2 flags.

There will be as many flags as there are ways of filling in 2 vacant places in succession by

the given 5 flags of different colors.

The upper vacant place can be filled in 5 different ways by any one of the 5 flags following

which, the lower vacant place can be filled in 4 different ways by any one of the remaining

4 different flags.

Thus, by multiplication principle, the number of different signals that can be generated is

5 × 4 = 20.