Example : How many 4 digit even numbers greater than 3000 can be formed using the digits 0 to 6 without repetition?

The digit 2 cannot occupy the first place from the left.

1. Last digit is 0 or 2:

4 ways x 5 ways x 4 ways x 2 ways (0 or 2)

¾/5/6

= 160 numbers

B. Last digit is 4 or 6:

   3 ways x 5 ways x 4 ways x 2 ways ( 4 or 6)

   3/5/4or 6

= 120 numbers

Total answer = 160+120 = 280 numbers

Example : How many 4 digit numbers divisible by 4 can be formed using the digits 0 to 6 without repetition:

The number formed by the last 2 digits must be divisible by 4.

Last 2 digits : 04, 12, 16, 20, 24, 32, 36, 40, 52, 56, 60, 64

We need to separate all the cases where 0 is one of the last 2 digits.

1. 04, 20, 40, 60 : 4 cases

Let us take any one of these 4 cases: example 04

5 ways x 4 ways x digit 0 x digit 4 : 20 numbers where the last 2 digits will be 04.

Similarly there will be 20 numbers for 20,40 and 60

Total = 20 x 4 = 80 numbers

B. 12,16,24,32,36,52,56,64 : 8 cases

Let us take any one of these 8 cases : example 12

4 ways x 4 ways x digit 1 x digit 2 : 16 numbers where the last 2 digits is 12.

Total = 16 x 8 = 128 numbers

Total = 80+128 = 208 numbers

Example : How many 5 digit numbers can be formed using the digits 2 to 6 without repetition such that the number formed is divisible by 11?

Difference between the sum of the digits at the odd places and the sum of the digits at the even places must be 0 or a multiple of 11.

2,3,4,5 and 6 : 2+3+4+5+6 = 20

2+3+5 = 10 and 4+6 = 10

\_O\_\_ x \_\_\_\_ x \_\_O\_\_\_ x \_\_\_\_ x \_\_O\_\_

We will have digits 2,3 and 5 at the odd places. This can be done in 3! ways = 6 ways

We will have 4 and 6 at the even places. This can be done in 2! Ways = 2 ways

Total numbers = 6 x 2 = 12 numbers

By 3 : sum of the digits must be divisible by 3

By 4 : number formed by the last 2 digits is divisible by 4

By 5 : last digit is 0 or 5

By 6 : if the number is divisible by both 2 and 3

By 8 : If the number formed by the last 3 digits is divisible by 8

By 9 : sum of all the digits is divisible by 9

By 11 : difference between the sum of the digits at odd places and the sum of the digits at even places is either 0 or a multiple of 11

By 12 : if the number is divisible by both 3 and 4

By 7 : Unit's place x 2 subtracted from the remaining number

If this is divisible by 7, the original number is also divisible by 7