1.In how many ways can 5 digit even numbers be formed from the digits 0,1,2,....,9 such that none of the digits being repeat?

SOLUTION : To find the number of ways to form 5 digit even numbers from the digits 0,1,2,…,9 such that none of the digits are repeated, we need to use the concept of permutation and combination. According to the search results[1](https://www.geeksforgeeks.org/permutations-and-combinations/), permutation is the act of arranging objects or numbers in order, and combination is the way of selecting objects or numbers from a group without considering the order.

Since we are asked to form 5 digit even numbers, we need to consider two cases:

Case 1: The last digit is 0. In this case, we have 9 choices for the first digit (any digit from 1 to 9), 8 choices for the second digit (any digit except 0 and the first digit), 7 choices for the third digit (any digit except 0 and the first two digits), and 6 choices for the fourth digit (any digit except 0 and the first three digits). Therefore, by the multiplication principle, the number of ways to form a 5 digit even number ending with 0 is:

9 x 8 x 7 x 6 x 1 = 3024

Case 2: The last digit is not 0. In this case, we have 4 choices for the last digit (2,4,6 or 8), 8 choices for the first digit (any digit except 0 and the last digit), 7 choices for the second digit (any digit except 0 and the first two digits), 6 choices for the third digit (any digit except 0 and the first three digits), and 5 choices for the fourth digit (any digit except 0 and the first four digits). Therefore, by the multiplication principle, the number of ways to form a 5 digit even number not ending with 0 is:

4 x 8 x 7 x 6 x 5 = 6720

Hence, by adding the two cases, we get the total number of ways to form a 5 digit even number from the given digits as:

3024 + 6720 = **9744**

2.In how many ways can the letters of the word "ACTION" such that,

(a) All the vowels are together

(b) Vowels are never together

To find the number of ways to arrange the letters of the word “ACTION” such that:

(a) All the vowels are together (b) Vowels are never together

We need to use the concept of permutation of letters. [According to the search results1](https://getcalc.com/statistics-letters-permutations.htm), permutation of letters within a word are the different ways of arranging the letters in a given word. To calculate the number of permutations of a word, one can use the formula n!, where n is the number of letters in the word.

(a) All the vowels are together

In this case, we can treat the two vowels A and I as a single unit. Then, we have 5 units to arrange: {AI, C, T, O, N}. The number of ways to arrange these 5 units is 5!, which is 120. However, we also need to consider the internal arrangement of A and I within the unit. There are 2 ways to arrange them: {AI} or {IA}. Therefore, by the multiplication principle, the total number of ways to arrange the letters such that all the vowels are together is:

5! x 2 = 120 x 2 = **240**

(b) Vowels are never together

In this case, we can use the complement method. We can first find the total number of ways to arrange the letters without any restriction, and then subtract the number of ways to arrange them such that all the vowels are together (which we found in part (a)). The total number of ways to arrange 6 letters without any restriction is 6!, which is 720. The number of ways to arrange them such that all the vowels are together is 240. Therefore, by the subtraction principle, the number of ways to arrange them such that vowels are never together is:

6! - 240 = 720 - 240 = **480**