Factorization of the numbers of the form n + n ^ 2

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The sum of the natural numbers plus their respective square can be expressed in the form:

$n^2 + n$

For example, for the number 14, its sum plus its square is equal to:

$14 + 14^2 = 210$

This number can be factored in a special way:

Its factors can be grouped into two blocks:

One of the groups of factors is 14 which in this case can be factored as 2 and 7

The other group is formed $(14 + 1) = 15$ so the two remaining factors are 3 and 5

It is noteworthy that the factorization of these numbers maintains a symmetry between the two groups of factors since one is (n) and the other $(n + 1)$ and the two always appears.

It should be noted that factor 2 will always appear, since it is a consequence of making the sum of a natural and its square and dividing it by the number of terms.

That is, if we sum all numbers between 14 and 14^2 all the terms and divide it by $(14^2-14 + 1)$ we get that the sum is $(14 + 14^2) / 2$

In short, the numbers of the form $n^2 + n$ can always be divided by two, so factor 2 always appears.

So we will always divide the number $n^2 + n$ by 2

At this point there are two cases if (n) is even or if (n) is odd.

If n is even:

- The first group of factors is (n) / 2
The second group of factors is (n + 1)

If n is odd:

The first group of factors is (n)
The second group of factors is (n + 1) / 2

It can also be seen as the resolution of the 2nd degree equation $n ^ 2 + n-a = 0$

Where $a = (n ^ 2 + n)$

Where the positive root of the equation divided by two is a group of factors and the negative root is the other group of factors, if (n) it is even.

And where the positive root of the equation is a group of factors and the negative root divided by 2 is the other group of factors, if (n) it is odd.