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THE ESSENCE AND MEANING OF THE FIBONACCI NUMBERS

There are many not simple and very interesting problems in the elementary mathematics, which are not associated with the proper name, but have a nature of the "mathematical folklore". These problems often have a few different solutions. Sometimes a few such problems are united in one, and sometimes one problem disintegrates on the series of more simple. So, it is difficult to distinguish, where one problem ends and other begins. The theory of the Fibonacci numbers is just the same. Nowadays, this theory is one of the most beautiful and used parts of elementary mathematics. It is witnessed by the creation of a Fibonacci mathematical association in the USA that has issued the journal "The Fibonacci Quarterly" since 1963, where the results of researches of modern mathematicians, related to the Fibonacci sequence, are published. This theory is developed as a result of solving the following problem:

"Someone noticed the pair of rabbits in the determined location, barriered from all sides by a wall, to know, how many pairs of rabbits will be born here for a year, if nature of rabbits is such, that the pair of rabbits gives birth to the second pair in a month, and rabbits bear on the second month after the birth". [4, c.22]

Thus, if to solve and to fix every posterity, then such sequence will be got 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, where $U_{n+1} = U_n + U_{n-1}$, $U_1 = 1, U_2 = 1$, a range is named the Fibonacci sequence in honor of the author.

Meantime, in the treatise of the Indian mathematician Narajany "Bidzaganity", written in the middle of the 14th century, a problem about the count of herd of cows and heifers, that originate from one cow, that brings to the interesting recurrent sequence of Fibonacci is examined.

Narajan problem. A cow annually brings a heifer. Every heifer, beginning from the fourth year of the life, at the beginning of the year also brings a heifer. How many cows and calves will be in 20 years?

We'll get the same 1, 1, 1, 2, 3, 4, 6, 9, 13, …. , where $U_{n+1} = U_n + U_{n-2}$, $U_1 = 1, U_2 = 1, U_3 = 1.$ [3, c. 31-33]

There is another interesting sequence that is named the sequence of Fibonacci – Narajan and represents the reproduction of penguins. The following problem is as its origin:

The female of penguins annually lays one egg, from which a nestling-female pips, that beginning from the fifth year of life, it annually sits a nestling-female. How many penguins will be in 15 years? [2, c.49]

1, 1, 1, 1, 2, 3, 3, 5, 7, 10, 14, …, where $U_{n+4} = U_{n+3} + U_n$, a $U_1 = 1, U_2 = 1, U_3 = 1, U_4 = 1.$ [4, c.24-25]

There are many numerical conformities in the wild life, in particular in spiral forms that world of nature is so rich in: basis of leaves connects with a stem on a spiral that passes between two nearby leaves : $\frac{1}{3}$ complete turn in hazel, $\frac{2}{5}$ – in oak, $\frac{3}{8}$ – in poplar and pear, $\frac{5}{13}$ – in willow. Cells on a fir-tree cone, on a pineapple, seeds of sunflower are placed by spirals, thus an amount of spirals of every direction, as a rule, is the Fibonacci numbers.

Research of the Fibonacci numbers and their properties is of interest from the point of view of principles of cognition of the world unity, as in the wild life there are many phenomena that are described by the sequences of the Fibonacci numbers. One of the most important consequences of these properties is existence of so-called Fibonacci coefficients, that is, permanent correlations of different sequence members. In the wild life, architecture, fine art, mathematics, physics, astronomy, biology and many other areas there were found conformities to law, that were described by the Fibonacci numbers or coefficients.

Studying of this theme is up-to-date especially now, as the Fibonacci sequence is used in all methods of technical analysis. Modern science considers also, that Universe develops on so-called gold spiral that is built exactly by means of gold coefficient (it is a number 0,618, to that aspires the relation of every number to the following for increase of sequence number of the members of the Fibonacci sequence). [5, c.3-5]

So, the Fibonacci – Narajan sequence is one of the most interesting historical problems, that needs a long-term study.

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