

## Fibonacci

Leonardo of Pisa, also called Fibonacci, was born in Pisa, in Italy, about the year 1170. His father was a diplomat in North Africa, and Leonardo traveled a great deal as a young man. In 1202 he was back in Pisa and had published his first book, *Liber Abaci*. It was the first book to introduce Hindu-Arabic numerals, the kind we use today, to Europe.

- 1) Before *Liber Abaci*, people in Europe used Roman numerals to write numbers. Find out how Roman numerals work and write some numbers in Roman numerals.
- 2) Is the Roman numeral system a place value system? What does that mean? Why did people find the Hindu-Arabic system better?
- 3) The most famous math problem in *Liber Abaci* concerns some rabbits who reproduce according to mathematical rules. Here it is: Assume a “pair” always means a male/female pair, and that each pair, after they’re two months old, will give birth to one new pair every month. (And assume none of the rabbits die.) If you start with a new-born pair on January 1<sup>st</sup>, how many pairs will you have at the end of a year? To help solve this problem, make a function chart that starts like this:

month	number of pairs
January	1
February	1
March	2
April	3

- 4) The numbers that come up in that problem about rabbits from 1202 are now known as the Fibonacci sequence: 1, 1, 2, 3, 5, 8, 13.... Can you state a rule for continuing this sequence? Can you write down the first twenty terms in the sequence?
- 5) What happens if you calculate the ratio of each Fibonacci number to the preceding one?  $1/1 = 1.0$ ;  $2/1 = 2.0$ ;  $3/2 = 1.5$ ;  $5/3 = 1.6$  Make a chart. What do you notice?
- 6) What happens if you square a Fibonacci number, and compare that to the product of its neighboring numbers? For example,  $8^2$  compared to  $5 \times 13$ .
- 7) The Fibonacci numbers can be found in nature. (For example, in pineapples!) Do some research to find some examples.
- 8) What more can you learn about the Fibonacci numbers?

Have fun!