

THE FIBONACCI SEQUENCE

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ABSTRACT. This exposition is meant to introduce the students of Math 102Q - Problem Solving to the notion of the Fibonacci sequence. Only the basic properties of the sequence are presented, and they are presented at the level accessible to a student in Math 102.

INTRODUCTION

Originally described in India circa 450 or 200 BCE and named after Leonardo of Pisa, the *Fibonacci sequence*, in a nutshell, is the sequence

$$\{1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, \dots\},$$

which has a very specific formula.[?] Each entry in the sequence is obtained by adding the two previous entries in the sequence. For example, we start with 1. Since 1 has no numbers before it in the sequence, the term following 1 is $1 + 0 = 1$. Secondly, the next term, following the second 1 in the sequence, is $1 + 1 = 2$. Subsequently, each term after 2 is found by adding the two terms that come before it.

This concept will be very important for Exam 2 as there are multiple problems that we will work on that use this concept. For example, *Jumping Frogs* and *Dominoes* both use the Fibonacci sequence.

SOME (MORE INTENSIVE) INTERESTING FACTS

We define the Fibonacci sequence (Fibonacci numbers) with a formula: $F(1) = 1$ and $F(n) = F(n - 1) + F(n - 2)$ for $n > 1$. This is an example of a *recursive function*; that is, terms depend on the terms that come earlier in the sequence.

The Fibonacci sequence has several occurrences in mathematics, such as connections to the golden ratio, and in nature. Please see the references below for more information on the Fibonacci numbers.

REFERENCES

- [1] Wikipedia, *Fibonacci Number*, http://en.wikipedia.org/wiki/Fibonacci_number.
- [2] Pravin Chandra and Eric W. Weisstein, *Fibonacci Number* at MathWorld.