Project Euler

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Contents

Chapter 1

Problem 1 (Multiples of 3 and 5)

$$sum = 3 * \frac{n(n+1)}{2} + 5 * \frac{n(n+1)}{2} - 15 * \frac{n(n+1)}{2} \tag{1.1}$$

- n is the number one less than given N
- 15 is subtracted because we are adding numbers which are multiples of 3 and 5 both.

Chapter 2

Problem 2 (Even Fibonacci Numbers)

- The Problem statement is to calculate the sum of the even numbers in the fibonacci series.
- The approach to give the even numbers in the Fibonacci series is as follows:
- we know that Fibonacci series is as follows:

$$F_n = F_{n-1} + F_{n-2} \tag{2.1}$$

$$1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, \cdots \tag{2.2}$$

- Thus the even numbers are repeated after two odd numbers.
- F_{n-3} and F_{n-6} are even Fibonacci digits in the series.
- Thus we need to transform the equation 2.1 into even Fibonacci digits.

$$F_n = F_{n-1} + F_{n-2} \tag{2.3}$$

$$F_{n-1} = F_{n-2} + F_{n-3} \tag{2.4}$$

$$F_{n-2} = F_{n-3} + F_{n-4} \tag{2.5}$$

$$F_n = F_{n-2} + F_{n-3} + F_{n-3} + F_{n-4} \tag{2.6}$$

$$F_n = 2F_{n-3} + F_{n-3} + F_{n-4} + F_{n-4} \tag{2.7}$$

$$F_n = 3F_{n-3} + 2F_{n-4} \tag{2.8}$$

we know that

$$F_{n-4} = F_{n-5} + F_{n-6} \tag{2.9}$$

$$F_{n-4} - F_{n-5} = F_{n-6} \tag{2.10}$$

By adding F_{n-3} on both sides

$$F_{n-3} + F_{n-4} - F_{n-5} = F_{n-6} + F_{n-3} \tag{2.11}$$

$$F_{n_4} + F_{n-5} + F_{n-4} - F_{n-5} = F_{n-6} + F_{n-3} \tag{2.12}$$

$$2F_{n-4} = F_{n-6} + F_{n-3} \tag{2.13}$$

- By substituting the following result in the equation of F_n

$$F_n = 3F_{n-3} + 2F_{n-4} \tag{2.14}$$

$$F_n = 3F_{n-3} + F_{n-6} + F_{n-3} \tag{2.15}$$

$$F_n = 4F_{n-3} + F_{n-6} \tag{2.16}$$

- Thus we obtained F_n only in terms of F_{n-3} and F_{n-6}
- we use this result in formulating the program.

Project Euler submissions