What is a Fibonacci Sequence?

The Fibonacci Sequence is one of the most famous formulas in mathematics. Each number in the sequence is the sum of the two numbers that precede it.

So, the sequence goes:

$0, 1, 1, 2, 3, 5, 8, 13, 21, 34.....$

Generic Mathematical Notation

Any number at position n in the series can be calculated using the following equation:

$F_n = F_{n-2} + F_{n-1}$

By default, the first and second number in the sequence are 0 and 1

$F_1 = 0$

$F_2 = 1$

$F_3 = F_1 + F_2 = 1 + 0 = 1$

$F_4 = F_2 + F_3 = 1 + 1 = 2$

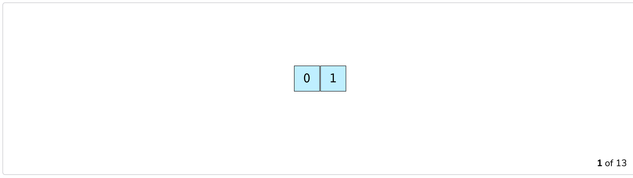
$F_5 = F_3 + F_4 = 1 + 2 = 3$

$F_6 = F_4 + F_5 = 2 + 3 = 5$

$F_7 = F_5 + F_6 = 3 + 5 = 8$

$F_8 = F_6 + F_7 = 5 + 8 = 13$

Below is a visualization for the computation of the first eight elements in the Fibonacci Sequence:



Implementing the Code

Change the value of the `input` variable to generate a different Fibonacci series for that value.

```
class FibonacciClass {

    private static int fibonacci(int n) {
        // Base case
        if (n <= 1) {
            return n;
        }
        // Recursive case
        else {
            return (fibonacci(n-1) + fibonacci(n-2));
        }
    }

    public static void main( String args[] ) {
        int input = 5;
        System.out.println("Fibonacci sequence for the first " + input + " elements is:");

        // Loop to print all the fibonacci sequence elements
        int i = 0;
        while (i < input) {
            System.out.print(fibonacci(i) + " ");
            i++;
        }
    }
}
```

Run Save Reset

Understanding the Code

In the code above, the `fibonacci` method is a recursive method, since it calls itself in the method body. Below is an explanation of the above code:

Driver Method

- Inside the `main` method, we have defined two integer variables, `i` and `input`.
- `i` is used as an iterator, and `input` is the number up to which the Fibonacci Sequence will be generated.
- The `while` loop runs for a total of `input` number of times and prints all the Fibonacci Sequence numbers up to the number stored in the input. For example, when `input` is 5, the `main` code will print the first 5 numbers of the Fibonacci Sequence.

Recursive Method

- The return type of this method is `int` since all the values in the Fibonacci sequence are integers.
- This method takes an integer, `n`, as the input argument.

Base Case

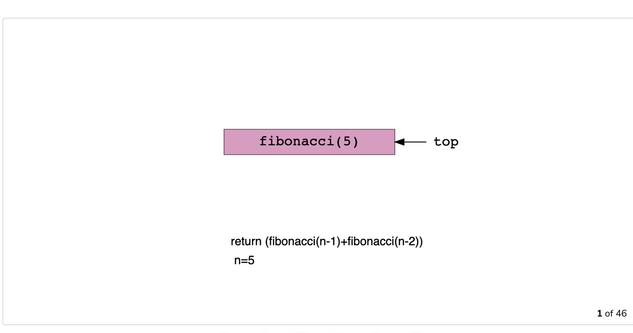
- The base case of the method is defined on **line 5** where the method will terminate and return `n` when the `if` condition of `n<=1` is met.

Recursive Case

- If the base case condition does not compute as true, the method then enters the `else` block (from **line 9 to line 11**), where it recursively calls itself with the input arguments "`fibonacci(n-1)` + `fibonacci(n-2)`", as can be seen on **line 10**. The input arguments correspond with the equation for finding a general term in the Fibonacci Sequence.

  $F_n = F_{n-2} + F_{n-1}$

Understanding through a Stack



Now that you have learned some basic mathematical computations using recursion, let's move on to a challenge. You will be asked to write a basic recursive code to find the greatest common divisor of two numbers.