

Homework 05 - fib of n

Focus: hash tables

Due: **Mon Feb 10, 2020 (bring to class)**

Reading:

- ❑ Sedgewick Java 2.3 Recursion, introcs.cs.princeton.edu/java/23recursion
- ❑ Prof Bill Recursion notes, wtkrieger.faculty.noctrl.edu/csc210-spring2020/docs/recursion_notes.pdf

thanks...yow, bill

Fibonacci coding

Step 1: Let's write some code to calculate the Fibonacci number, $F(n)$:

$$F_n = F_{n-1} + F_{n-2} \text{ for } n \geq 2, \text{ with } F_0 = 0 \text{ and } F_1 = 1$$

Write two methods to do this: 1) recursive, and 2) iterative. My simple solution will probably look something like this:

```
public class Homework05 {
    public static void main( String[] args) {
        // 1) say hello, then ask user for an int
        // 2) call fibRecursive and print the answer
        // 3) call fibIterative and print the answer
    }

    public static long fibRecursive( int n) {
        // code here, use recursion to calc Fib(n) and return
    }

    public static long fibIterative( int n) {
        // code here, use a loop to calc Fib(n) and return
    }
}
```

/ Hint: There's some helpful pseudocode in the Sedgewick section referenced above. */*

Once you're running, what is $Fib(10)$? $Fib(20)$? $Fib(40)$? What is $Fib(100)$? (yikes!)

Step 2: Let's add some code to time how long our two methods take to run. I prefer the method `System.currentTimeMillis()` for benchmarking. It goes something like this:

```
long start = System.currentTimeMillis();  
// call method to time  
long end = System.currentTimeMillis();  
long durationMillis = end - start;
```


Google for help. Also, if you find a better, funner way, then use it. And then you can show the rest of us.

Bonus: If the numbers in your Fib solution get too big for your program to handle, then google "java BigInteger". This is a class that can represent and do simple math operations on REALLY BIG integers.

This bonus step is *optional*, but BigInteger is really cool. Give it a try if you have time.

THE FIBONACCI SEQUENCE

| | |
|--|------------------------|
| 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377 | |
| 1 + 1 = 2 | 13 + 21 = 34 |
| 1 + 2 = 3 | 21 + 34 = 55 |
| 2 + 3 = 5 | 34 + 55 = 89 |
| 3 + 5 = 8 | 55 + 89 = 144 |
| 5 + 8 = 13 | 89 + 144 = 233 |
| 8 + 13 = 21 | 144 + 233 = 377 |

A portrait of the Italian mathematician Fibonacci, wearing a blue cap and a dark tunic, set against a light background.

PS - Fibonacci is an Italian mathematician, born in 1170 (gasp!),
en.wikipedia.org/wiki/Fibonacci