

Lab 7

CSC 113 - Recursion
College of Computer and Information Science
King Saud University

1- Factorial n!

Write a recursive method that computes n! `factorial(int n): int`

$$n! = \begin{cases} 1 & \text{if } n = 0, \\ (n-1)! \times n & \text{if } n > 0 \end{cases}$$

2- Fibonacci numbers

This infinite sequence starts with 0 and 1, which we'll think of as the zeroth and first Fibonacci numbers, and each succeeding number is the sum of the two preceding Fibonacci numbers. Thus, the second number is $0 + 1 = 1$.

And to get the third Fibonacci number, we'd sum the first (1) and the second (1) to get 2. And the fourth is the sum of the second (1) and the third (2), which is 3. And so on.

n:	0	1	2	3	4	5	6	7	8	9	10	11	...
nth Fibonacci:	0	1	1	2	3	5	8	13	21	34	55	89	...

`fib(int n): int n`

Implement a method to takes n and returns nth Fibonacci number

To better performance, first do a quick brainstorming and determine:

Base case:

Recursive case:

Then write the code!

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3- Reversing a string

Giving that reversing a string can be done by an iterative loop:

```
String str = "Type a string to reverse: ";
int index = str.length() - 1;
while(index >= 0) {
    System.out.print(str.substring(index, index + 1));
    index--;
}
```

Note that we used "print" not println to print only one character.

Write a code to do that but using recursion. (Complete the method printReverse)

```
public static void main (String[] args)
{
    String line = "Type a string to reverse";
    printReverse(line);
}

public static void printReverse(String str) {

}
```

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```
public int factorial(int n) {  
    if(n == 1) {  
        return 1;  
    } else {  
        return n * factorial (n - 1);  
    }  
}
```

```
public int fib(int n) {  
    if(n <= 1) {  
        return n;  
    } else {  
        return fib(n - 1) + fib(n - 2);  
    }  
}
```

```
public static void main (String[] args)  
{  
    String line = "Type a string to reverse";  
    printReverse(line);  
}  
  
public static void printReverse(String str) {  
    System.out.print(str.substring(str.length() - 1));  
    if(str.length() > 1)  
        printReverse(str.substring(0, str.length() - 1));  
}
```

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```
public class Rec {

    public int factorial(int x){
        if(x == 1)
            return 1;
        else
            return x * factorial(x - 1);
    }

    public int fib(int x){
        if(x <= 1)
            return x;
        else
            return fib(x - 1) + fib(x - 2);
    }
    public void printReverse(String str){

        System.out.print(str.substring(str.length() - 1));
        if(str.length() > 1)
            printReverse(str.substring(0, str.length() - 1));
    }

}

//////////

public class test {

    public static void main(String[] args) {

        Rec a = new Rec ();
        System.out.println(a.factorial(5));
        System.out.println(a.fib(6));
        a.printReverse("abdulmajeed");
    }

}
```