Recursion

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What is Recursion

Recursion is a method of solving a problem where the solution depends on solutions to smaller instances of the same problem. To do these tasks the recursion involves a function calling itself.

Example

```
static int factorial(int n){
 if (n == 0)
   return 1;
 else
   return(n * factorial(n-1)); //RECURSION
```

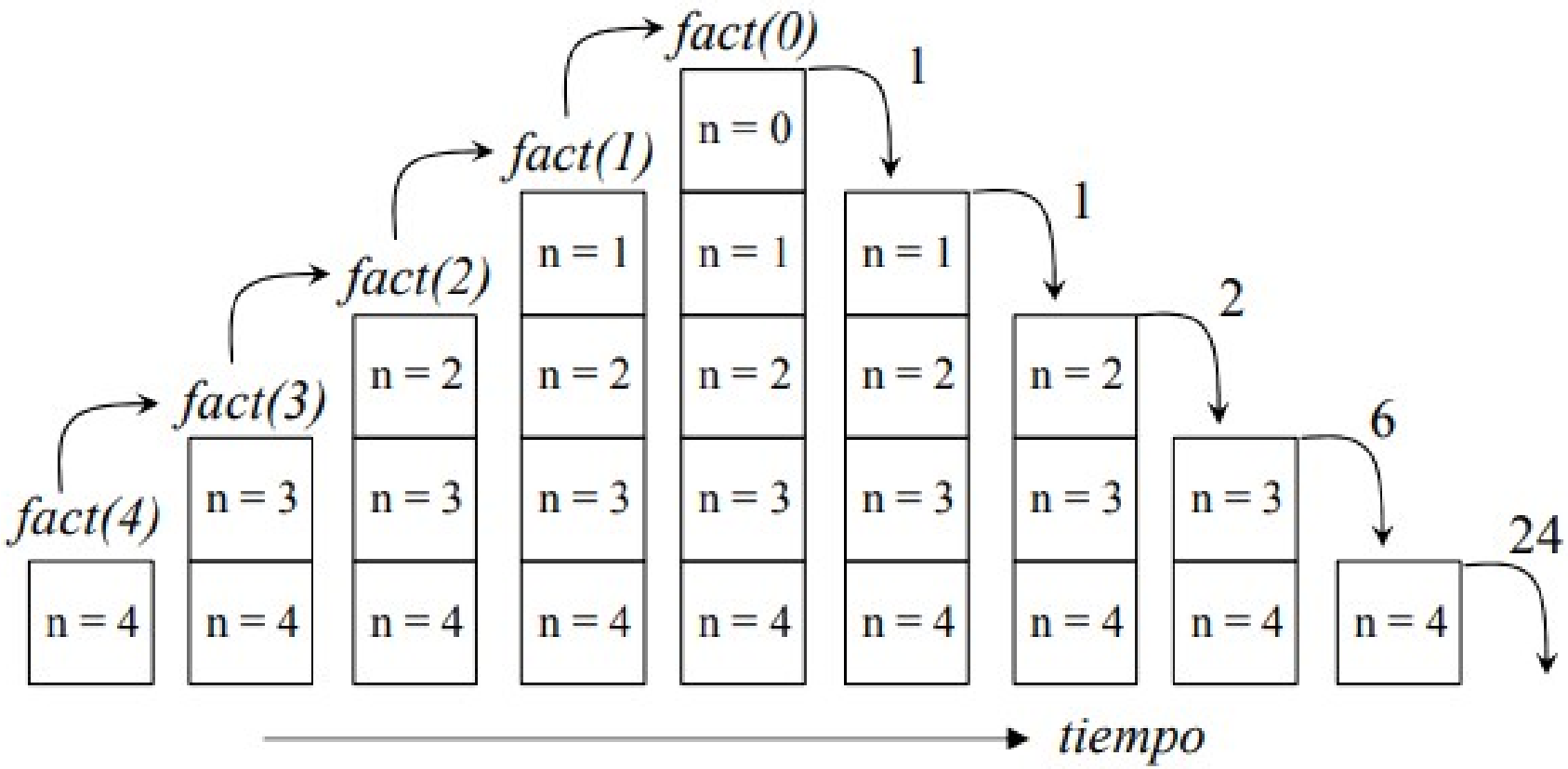
How Recursive methods works

To write a recursive method you need to know two parts:
A base case and a general case. The first one will make the recursive method reach an end, and the second one it is the operation.

Example

```
static int factorial(int n){
 if (n == 0)
   return 1;      //BASE CASE
 else
   return(n * factorial(n-1)); //GENERAL CASE
```

Graphic Representation



Important aspects to be taken into consideration when using recursion and iteration

The computing load	Time of Ejecution and memory used.
Redundancy	Sometimes Recursion resolves the same problem multiple times.
Solution	Sometimes an iterative solution it is too complicate to find
Resultant code	Using recursion, the final code might be more concise, elegant and easy to read and understand

Comparation between Recursion and Iteration

Recursion

```
static int factorial(int n){
 if (n == 0)
   return 1;
 else
   return(n * factorial(n-1));
```

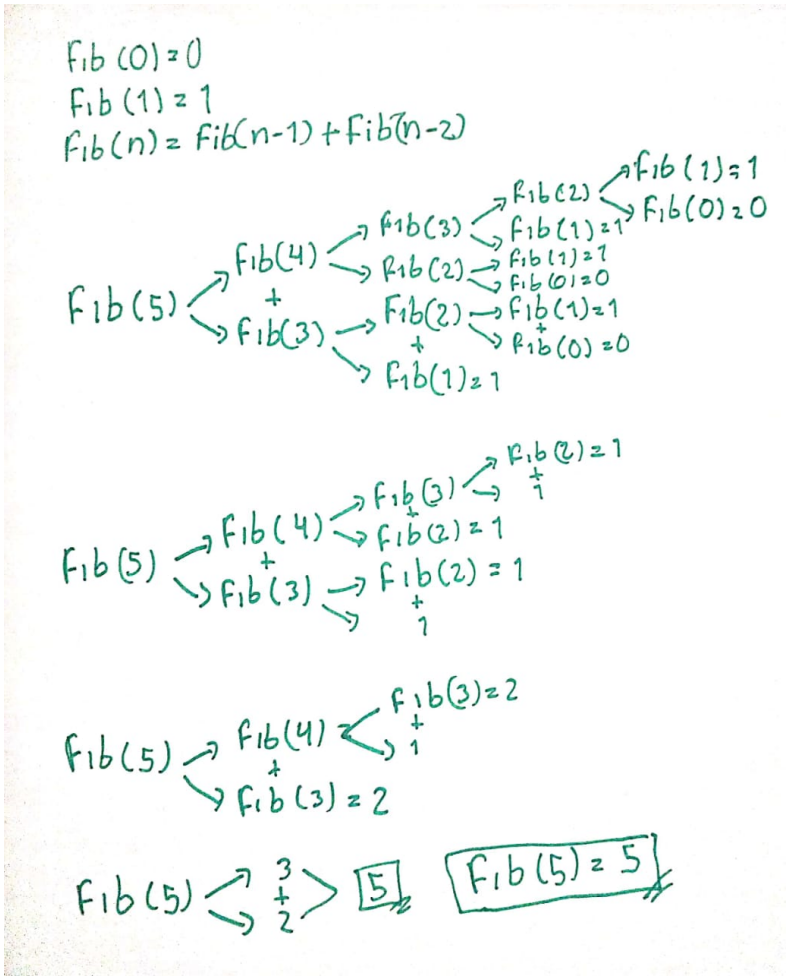
Iteration

```
public static int factorial(int n) {
if (n == 0) {
return 1;
}else  {
int factorial = 1;
for(int i=1;i<=n;i++) {
factorial = factorial * i;
}return factorial;
} }
```

Recursive Fibonacci sequence

```
public class basic_example1 {
public static void main(String[] args){

System.out.println(fibonacci(x));
}
public static int fibonacci (int n){
if (n<2) {
return n;
} else {
return fibonacci(n-1) + fibonacci(n-2);
}  }
}
```


Fib(0) = 0
Fib(1) = 1
Fib(n) = Fib(n-1) + Fib(n-2)
Fib(5)
Fib(4)
+
Fib(3)
Fib(3)
Fib(2)
Fib(1) = 1
Fib(2)
Fib(1) = 1
Fib(0) = 0
Fib(2)
Fib(1) = 1
+
Fib(0) = 0
Fib(1) = 1
Fib(5)
Fib(4)
+
Fib(3)
Fib(3)
Fib(2) = 1
+
1
Fib(2) = 1
Fib(2) = 1
+
1
Fib(5)
Fib(4)
+
Fib(3) = 2
Fib(3) = 2
+
1
Fib(5)
3
+
2
5
Fib(5) = 5

CONCLUSION

- Recursion is used in programming languages that do not have control structures. For example, functional programming languages.
- For the elaboration of recursion algorithms a knowledge of mathematical induction is necessary.
- Recursion is normally used for solving complex problems that would not be solved with iteration or would be very difficult to solve.

References - Web pages

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