FIBONACCI AND GCD

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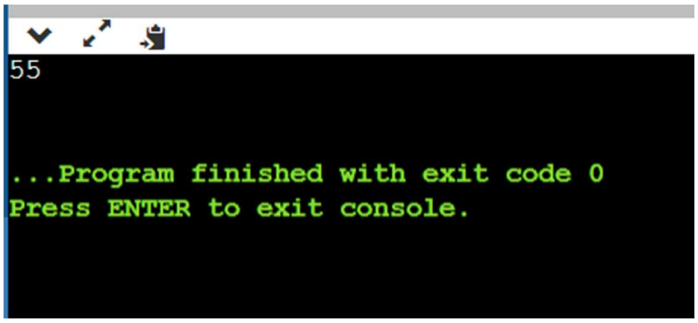
Fibbonaci:

Using Naïve algorithm:

```
 class Main
{
   static int fib(int n)
   {
   if (n <= 1)
      return n;
   return fib(n-1) + fib(n-2);
   }

   public static void main (String args[])
   {
   int n = 10;
   System.out.println(fib(n));
   }
}
```

OUTPUT:



Using DP:

```
class Main
{
```

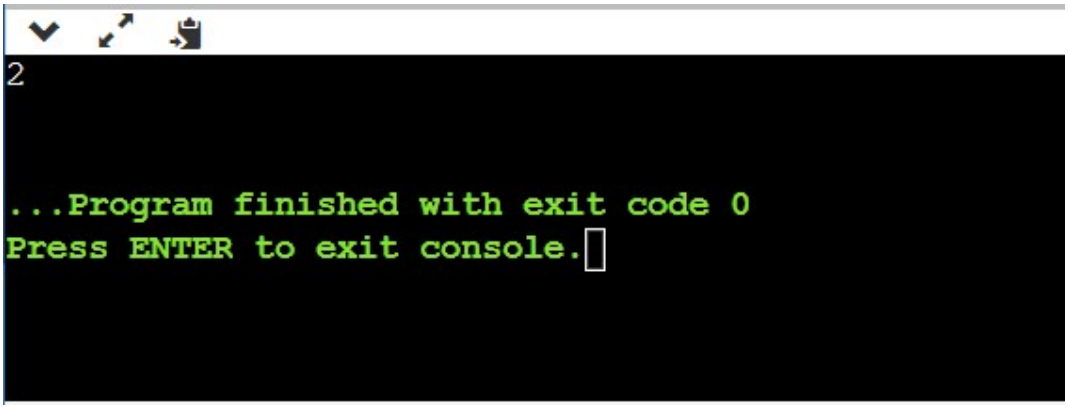
```
static int fib(int n)
        {

        int f[] = new int[n+2];



        f[0] = 0;
        f[1] = 1;

        for (int i = 2; i <= n; i++)
        {
                f[i] = f[i-1] + f[i-2];
        }

        return f[n];
        }

        public static void main (String args[])
        {
                int n = 20;
                System.out.println(fib(n));
        }
}
```

GCD:

Using Navie Algorithm:

```
import java.lang.Math;
import java.util.Scanner;
public class Main{
  static int GCD(int a,int b){
    int maximum=Math.max(a,b);
    int currentNumber=maximum-1;
    while(currentNumber>1){
      if((a%currentNumber==0)&&(b%currentNumber==0)){
        return currentNumber;
      }else{
        currentNumber--;
      }
    }
    return 1;
  }
  public static void main(String[] args){
    System.out.println(GCD(20,42));
  }
```

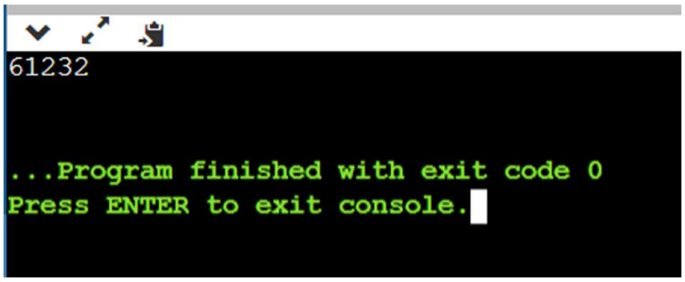
}



Using Euclidean Algorithm:

```
import java.util.*;
import java.lang.*;

class Main
{

    public static int gcd(int a, int b)
    {
        if (a == 0)
            return b;

        return gcd(b%a, a);
    }


    public static void main(String[] args)
    {
        System.out.println(gcd(3918848,1653264));
    }
}
```

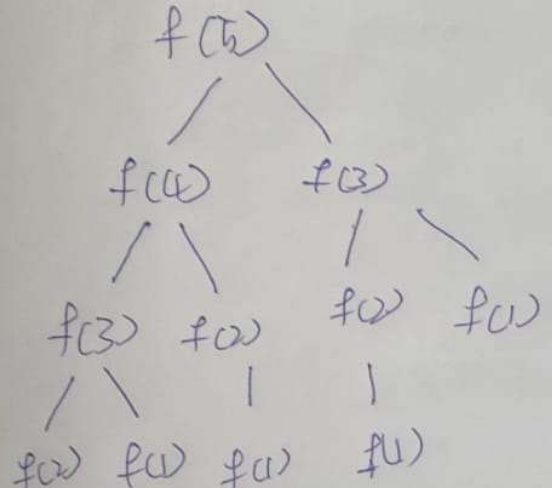
OUTPUT:



ANALYSIS:

Fibonacci :-

① using Navie approach :-



Here, it almost calling the method function at 2^n times

$\therefore O(2^n)$

② using DP :-

Here we are saving the value of f(5), f(4) etc in an array. So at worst case we call it at O(n) times

GCD:

1) using navie algorethum:

Here, we are calling the function for n times then time complexity is O(n)

2) using Euelieden algorithum:

Here, we are calling the function for every % of a reminder. So, time complexity is O(logn)