Exercises on Recursion

Exercise 1

Write a function *up(int n)* that does print out all numbers from 0 to *n* using recursion.

Exercise 2

Write a function called *specialSum(int n)* with one parameter of type int and a return value of type int. The function should calculate the sum of all even numbers (2, 4, 6...) from 1 to the given parameter.
If the parameter is smaller than 1, return 0.

Exercise 3

Try to understand what the function 'rec' does and try to write a new function 'iter' doing the same as 'rec' using iteration (loops). The header of the new function 'iter' should be the same as the one of 'rec' (same parameters and same return value)

```
private static int rec(int x, int y) {
        if (x < 0) {
           return rec(-x, y);
        }
        if (y < 0) {
           return rec(x, -y);
        }
        if (x == 0) {
           return 0;
        }
        if (x > y) {
           return rec(y, x);
        }
        if (x == y) {
           return x;
        }
        return rec(x, y - x);
}
```

Exercise 4

> *"In mathematics, the **Fibonacci numbers** are the numbers in the following integer sequence, called the **Fibonacci sequence**, and characterized by the fact that every number after the first two is the sum of the two preceding ones:*
>
> *1,1,2,3,5,8,13,21,34,55,89,144,…"*

Write a function called fibonacci(int n) with the parameter n that does print out the first n numbers of the fibonacci sequence.
Don't use any loops!

Exercise 5

Implement a function called '*drawDiamond*' taking a parameter int called h.
This function should print a diamond like this, where h is the 'height' of the diamond, so for e.g. h=9:

```
    1
   222
  33333
 4444444
555555555
 4444444
  33333
   222
    1
```

You are going to need odd numbers to do this, so just print 'No valid input!' if an even number or a number smaller than 0 is given. In case of 0 just leave the function right away without printing anything.

This time try to avoid loops whenever possible!
(it's hard, but possible, to solve this exercise without using any loops!)
You will certainly have to write additional functions.