Week 12

Write and run your programs with IDLE editor. Submit finished programs to CodeGrade. Note that some tasks have several steps (A, B, C, …) in CodeGrade.

IMPORTANT: End each input-command string with a newline symbol \n. For example:
`variable = input("Some text:\n")`

For all the following functions, write a main program that calls the recursive function in question according to the given examples.

Task 1. Write a recursive function `integer_sum(n)` to calculate the sum of the positive integers `n + (n-2) + (n-4)...` until `n - i < 1` (terms below 1 are not counted).

Example run 1.

```
Give a non-negative integer n:
10
n + (n-2) + (n-4) + ... = 30
```

Example run 2.

```
Give a non-negative integer n:
751
n + (n-2) + (n-4) + ... = 141376
```

Task 2: Implement a recursive function `power(x ,n)` to calculate `x` power to `n`, where n is a non-negative integer and `x` is a floating point number (can be negative).

Example run 1.

```
Give a float x:
2.2
Give a non-negative integer n:
0
2.2 power to 0 is 1
```

Example run 2.

```
Give a float x:
2.0
Give a non-negative integer n:
20
2.0 power to 20 is 1048576.0
```

Example run 3.

```
Give a float x:
-3.0
Give a non-negative integer n:
15
-3.0 power to 15 is -14348907.0
```

Task 3: Write a recursive algorithm `reverse_string(S)` which reverses the given string `S`.

Example run 1.

```
Give a string to reverse:
supercalifragilisticexpialidocious
Original String: supercalifragilisticexpialidocious
Reversed String: suoicodilaipxecitsiligarfilacrepus
```

Task 4. Create a recursive function `gcd(a,b)` to compute the greatest common divisor (GCD) of two positive integers `a` and `b`. GCD is the largest positive integer that divides two integers without leaving a remainder. You should use the idea that if `a > b`, then

`gcd(a,b) = gcd(b,a-b).`

This is the way how the parameters always get smaller. When `a` and `b` become equal, then `a` is the GCD.

The method is based on the fact that if `d = gcd(a,b)`, it means that `d` is the largest integer that divides both `a` and `b`. Therefore, `a = k*d` and `b = l*d`, for some integers `k` and `l`, where `l > d`. Now `gcd(b,a-b) = gcd(ld,kd-ld) = gcd(ld,(k-l)d) = d`.

Example run 1.

```
Give two positive integers separated by comma:
121, 220
gcd(121,220) = 11
```