TP 01: Basic Programming Exercises

Jean-Sébastien Coron

Université du Luxembourg

1 Factorial

Write a program `fact` that computes $n! = n \cdot (n-1) \cdots 2 \cdot 1$. For example, $5! = 120$.

2 Binary Decomposition

Write a program that outputs the binary decomposition of an integer, starting with the least significant bit.

3 Divisor

Write a program that outputs the list of divisors of an integer n given as input.

```
$ divisor 24
1 2 3 4 6 8 12 24
```

4 Prime

Write a program that determines whether an integer is prime or not. Modify your program to output the list of prime integers between 1 and 100.

5 Fibonacci Sequence

We define the sequence $u_0 = 1$, $u_1 = 1$, $u_n = u_{n-1} + u_{n-2}$ fir $n \geq 2$. Write a program that computes the n first terms of the Fibonacci sequence.

6 Euclid's Algorithm

Write a program `gcd` taking as input 2 integers and outputting their gcd, using Euclid's algorithm.

```
$ gcd 12 15
3
```

7 Decomposition

Write a program `factor` taking as input an integer n and outputting its factorization, using the naive algorithm. For example, for $150 = 2^1 \cdot 3^1 \cdot 5^2$:

```
$ factor 150
(2,1) (3,1) (5,2)
```

8 Multiplicative inverse

Write a program `inverse` taking as input deux integers a and n, and outputting the multiplicative inverse of a modulo n if it exists, using Euclid's extended algorithm.

```
$ inverse 5 7
3
$ inverse 2 6
2 has no inverse modulo 6
```