# Introduction to Computer Science Application

## Final Exam

Ugo Dal Lago* Marco Di Felice†

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**Exercise 1.**
Given a function `fun`, defined as follows:

```
def fun(a,b):
    if (a>10):
        return a+fun(a-1,b)
    elif (a<5):
        return a+fun(a+1,b)
    else:
        return b
```

Decide what is the value of the following three expressions: `fun(3,7)`, `fun(12,3)` and `fun(6,9)`

**Exercise 2.**
What is the output of the following program?

```
a=[[5,10,2],1,2]
b=a[0]
a[2]=b[1]
b[1]=[1,7,8]
c=b[2]
(a,b)=(b,a)
print a
print b
print c
```

**Exercise 3.**
Write a function `splitList` which takes two arguments, a list `l` and a natural number `n`, and returns a third list `r`. `r` is obtained by splitting `l` into pieces of length (at most) `n` and preserving the order. For example `splitList([1,4,12,2,3,7,8],2)` should return `[[1,4],[12,2],[3,7],[8]]`.

**Exercise 4.**
A teacher keeps track of grades in a registry, which can be modeled by a dictionary `grades`. If a student's name is a string `a`, then `grades[a]` is a list of floating point numbers between 0 and 10, representing the grades obtained by `a`. Write

(i) A function `Insufficient(grades)` which, given a registry `grades` returns the number of students which have at least one insufficient grade (a grade is considered insufficient if if it strictly less than 6).

(ii) A function `Average(gradesone,gradestwo)` which returns a registry obtained by merging two registries `gradesone` and `gradestwo`.

**Exercise 5.**
Bidimensional matrices of natural numbers can be easily represented as nested lists. For example, the matrix

$$\begin{pmatrix} 7 & 4 & 3 \\ 5 & 1 & 11 \end{pmatrix}$$

can be represented as the list `[[7,4,3],[5,1,11]]`. Write a function `transposeMatrix` which transpose the matrix in input. For example `transposeMatrix([[7,4,3],[5,1,11]])` should return the list `[[7,5],[4,1],[3,11]]`.

*dallago@cs.unibo.it
†difelice@cs.unibo.it