

# Languages and Algorithms for Artificial Intelligence

## Instructions about the written exam

The exam will be done on EOL, using ZOOM. Please read carefully the instructions about “How to take a written exam online via Zoom” at:

<https://www.unibo.it/en/services-and-opportunities/online-services/online-services-for-students-1/lessons-and-exams-online>

The exam will include 5 open-ended questions, and you will have 50 minutes to reply to them.

An example of 5 possible questions follows.

### Exercise 1:

Consider the following declarations:

```
val L1=List(1,7,15)
val L2=L1 flatMap (x => List(x+1,x+2))
```

What is the type and the value of L2?  
Justify your answer.

### Exercise 2:

Consider the following declaration:

```
val R=(1 to 10) filter (_%2 == 0) map (_+1)
```

What is the content of R?  
Justify your answer.

### Exercise 3:

Consider the following function:

```
def mystery(n:Int) =
  (1 to n) filter
    (x => (2 until x) forall (y => (x%y !=0)))
```

What does this function compute?  
Justify your answer.

### Exercise 4:

Consider the following declarations:

```
val L3=List(1,7,15)
val L4= (L3 foldRight 0) (_ - _)
```

What is the type and the value of L4?  
Justify your answer.

### Exercise 5:

Consider the following declarations:

```
def mystery3(x: Int): Int =
  if (x==1) 1
  else mystery3(x)

def mystery4(z: =>Int, k: Int, a: Int): Int =
  if (k==1) a
  else mystery4(z+1, k-1, a+1)
```

Describe how the evaluation of the following expression proceed:  
mystery4(mystery3(1),3,0)