Faculty of Exact Sciences — examination Inleiding Programmeren
Vrije Universiteit — December 16th, 2013 time: 2:45 hours

Problem 1.

a) Let the class A and B be

```
class A:
    MAX = 1000

    def __init__ (self, a_int):
        self.getal = 0 if a_int > MAX else a_int

    def add (self, increment):
        self.getal += increment
        if self.getal > A.MAX:
            self.getal = 0

class B:
    def __init__ (self, a_int):
        self.getal = a_int
        self.a = A(self.getal)

    def replace (self, a_obj):
        self.a = a_obj
```

Further we have a program with the following statements

```
a = A(23);
b = B(17);

def show (a_obj, b_obj):
    print '%d %d' % (a_obj.getal, b_obj.a.getal)
```

What will be printed when the following code is executed in this program?

```
show(a, b)
a.add(8)
show(a, b)
a2 = a
show(a2, b)
a = b.a
show(a, b)
b.replace(a2)
show(a, b)
a2.add(2013)
show(a, b)
```

b) Give, using range(), the statements that generate the following lists.

1- [0, 1, 2, 3, 4]
2- [100, 101, 102, 103, 104]
3- [100, 102, 104]

What lists are generated by the following slices?
The value of m is [1, 2, 3, 4, 5, 6, 7, 8, 9].

4- m[3:4]
5- m[3:-1]
6- m[3:]

c) The following heading of a method ln_plus_1() is given

```
def ln_plus_1 (x, number_of_terms)
```

The parameter x contains a float value and the parameter number_of_terms contains an int value. This method should calculate ln(x+1) using number_of_terms terms. In mathematics the definition is as follows:

ln(x+1) = x - 1/2.x^2 + 1/3.x^3 - 1/4.x^4 + 1/5.x^5 - ....

x^n is the notation for "x to the power n". The number of terms that should be used for the calculation is given by number_of_terms. Implement this method without using the operator ** or any method from the module math.
Assume: number_of_terms >= 1.

d) The following code is given

```
p = 3
q = 7

def show (a, b):
    print '%d, %d' % (a, b)

def m1(x):
    global p
    p *= 2
    q = p + x
    show(p, q)
    return q

def m2(y):
    p = y+2
    q = m1(p)
    show(p, q)
    return p-q

show(p, q)
q = m1(p)
show(p, q)
p = m2(q)
show(p, q)
```

What will be printed when this program is executed?

Problem 2.

a) The following classes are given.

```
class Plant:

    def __init__ (self, a_string, a_boolean1, a_boolean2):
        self.family = a_string
        self.using_wind = a_boolean1
        self.weed = a_boolean2


class BotanicGarden:

    def __init__ (self):
        self.plant_list = []
```

Write a method add() for the class BotanicGarden that can be used to add 1 Plant to the botanic garden.

b) Add to the class BotanicGarden a method

```
def select_family (self, a_string)
```

which, in a new BotanicGarden-object, returns all the plants that are of the family a_string.

Program sub problems in separate methods in the correct class.
Use constants when necessary.

c) The following method can be assumed to be present in the class BotanicGarden. It can be used without having to program it.

```
def select_using_wind (self)
```

This method returns, in a new BotanicGarden-object, all the plants that use the wind as their means of reproduction.

Now add to the class BotanicGarden a method

```
def select_family_and_using_wind (self, a_string)
```

This method should return all the plants that are using the wind for reproduction and are of family a_string.
Program the method select_family_and_using_wind() without using a while-statement, a for-statement or a do-while-statement.

d) Add to the class BotanicGarden a method

```
def weed (self)
```

This method should remove all weeds from the botanic garden.

An element e in a list m can be removed with the command “m.remove(e)”.

grade:

Problem	a	b	c	d	total
1.	5	4	4	5	18
2.	4	4	5	5	18
					-- +
					36

The grade E follows from the total T using the formula: E = T / 4 + 1