



FREIE UNIVERSITÄT BOZEN  
LIBERA UNIVERSITÀ DI BOLZANO  
FREE UNIVERSITY OF BOZEN · BOLZANO

Fakultät für Informatik

Facoltà di Scienze e tecnologie informatiche

Faculty of Computer Science

## Introduction to Programming

Written Examination

**23.9.2016**

<b>FIRST NAME</b>		<b>LAST NAME</b>	
<b>STUDENT NUMBER</b>		<b>SIGNATURE</b>	

### Instructions for students:

Write First Name, Last Name, Student Number and Signature where indicated. If not, the examination can not be marked.

Do not speak to any other student during the examination. If you speak to another student, your examination will be cancelled.

Use a pen, not a pencil.

Write neatly and clearly.

Reply to the following questions. You cannot consult any material.

1. When **executing** a program, the processor reads each program instruction from

- A) secondary memory (storage)
- B) the Internet
- C) registers stored in the processor
- D) main memory
- E) could be any of these

2. If in the following statements the casting to `float` is **removed** would this raise an exception? Explain what would happen with and without the casting and what would be printed by the third statement in the two cases:

```
int total = 45;
float result = (float) total / 7;
System.out.println (result);
```

3. Write the output of these statements:

```
int base = 1;
int count = 3;
if (count < 4 || ++base < count)
    System.out.println(count);
System.out.println(base);
```

4. Write the output of these statements:

```
int a = 2;
System.out.println(++a + Math.pow(a, 2));
a = 2;
System.out.println(Math.pow(a, 2) + ++a);
```

5. Is the following code syntactically correct? If yes, write the output of these statements:

```
Integer num10 = 4;
Integer num20 = num10;
num10 = new Integer(5);
System.out.println(num20.intValue());
```

6. Assuming that c1 and c2 are Boolean variables, create a truth table for the expression:

$(!c1 \parallel c2) \&\& (c1 \parallel !c2)$

7. Which of the following statements is completely true?
- A) If a class is declared to be abstract then every method in the class is abstract and must be overridden
  - B) If a class is declared to be abstract then some methods in the class may have their bodies omitted
  - C) If a class is declared to be abstract then all methods in the class must have their bodies omitted
  - D) If a class is declared to be abstract then all the instance variables must be overridden when a concrete class is derived from the abstract base class

8. What is printing the following code?

```
public static void main (String[] args)
{
    int lDigit, number = 7689, res=0;

    do
    {
        lDigit = number % 10;
        res = (res * 10) + lDigit;
        number = number / 10;
    }
    while (number > 0);

    System.out.println (res);
}
```

9. What is printing the following code?

```
for(int i = 9; i > 0; i--){
    for(int j = i; j < 9; j++){
        System.out.print("_");
    }
    for(int j = i; j > 0; j--){
        System.out.print(i);
    }
    System.out.println();
}
```

10. What is printing the following code?

```
public class ParameterTester {

    public static void main(String[] args) {
        ParameterModifier modifier = new ParameterModifier();
        String a1 = "111";
        Num a2 = new Num(222);
        Num a3 = new Num(333);
        int a4 = 444;

        modifier.changeValues(a1, a2, a3, a4);

        System.out.println("a1\\ta2\\ta3\\ta4");
        System.out.println(a1 + "\\t" + a2 + "\\t" + a3 + "\\t" + a4 + "\\n");
    }

    private static class ParameterModifier {
        public void changeValues(String f1, Num f2, Num f3, int f4) {
            f1 = "555";
            f2.setValue(888);
            f3 = new Num(777);
            f4 = 999;
        }
    }

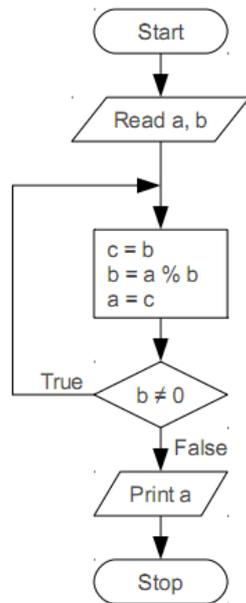
    private static class Num {
        private int value;

        public Num(int update) {
            value = update;
        }

        public void setValue(int update) {
            value = update;
        }

        public String toString() {
            return value + "";
        }
    }
}
```

11. What is printing the algorithm described in the flowchart below when  $a=8$ ,  $b=3$  and when  $a=12$ ,  $b=10$ ?



12. Write a convenient equals method (overriding the equals method defined in the class Object) for the class declared below:

```
public class Bicycle {  
    private int cadence;  
    private int gear;  
    private int speed;  
}
```

13. An int array stores the following values. Use the array to answer these next questions.

9	4	12	2	6	8	18
---	---	----	---	---	---	----

Show the array state after the **third** pass of the Insertion Sort algorithm? A “pass” is defined as one execution of the code in the **for** loop.

```
//-----  
// Sorts the specified array of objects using the insertion  
// sort algorithm.  
//-----  
public static void insertionSort (Comparable[] list)  
{  
    for (int index = 1; index < list.length; index++)  
    {  
        Comparable key = list[index];  
        int position = index;  
  
        while (position > 0 && key.compareTo(list[position-1]) < 0)  
        {  
            list[position] = list[position-1];  
            position--;  
        }  
  
        list[position] = key;  
    }  
}
```

14. Given the following method:

```
public void differentArray(float[] x)
{
    x = new float[99];
    x[0] = 26.9f;
}
```

what is the output after the following code is run?

```
float[] xx = new float[99];
xx[0] = 0.0f;
differentArray(xx);
System.out.println("xx[0] = " + xx[0]);
```

15. What is printed?

```
public class Inherit
{
    abstract class Figure
    {
        void display( )
        {
            System.out.println("Figure");
        }
    }

    abstract class Rectangle extends Figure
    {
    }

    class Box extends Rectangle
    {
        void display( )
        {
            System.out.println("BOX");
        }
    }

    Inherit( )
    {
        Figure f = new Box( );
        f.display( );
        Rectangle r = (Rectangle) f;
        r.display( );
    }

    public static void main(String[] args)
    {
        new Inherit( );
    }
}
```

16. 1) Interface classes cannot be extended but classes that implement interfaces can be extended. True or False? Explain.

17. Write a recursive method that prints the numbers 1...n (where n is the int parameter of the method) in ascending order:

```
public void asc(int n) {  
    ...  
}
```

18. Write a recursive function to perform exponentiation return  $x^m$ , assuming  $m \geq 0$

```
public int exp(int x, int m) {  
}
```