

UNIVERSITY OF OSLO

Faculty of mathematical and natural sciences

Exam in : INF1000 — Introductory course in object-oriented programming
Day of exam : Friday, December 5, 2003
Time : 09.00 – 12.00
Number of pages: 11 pages
Appendices : None
Allowed to bring with you : All written and printed material

- Read through the entire examination set and check that your examination set contains all 11 pages before you answer any questions. If you miss any information, you may make your own assumptions as long as they are in accordance with the spirit of the exam. Such assumptions must be explained.
- You write your answers directly into these pages, not on separate sheets of paper. This applies to all questions, both multiple choice questions and questions where you are asked to write program code. In the questions where you are asked to write program code, we recommend that you first make a draft on a separate sheet of paper and then write your answer on this examination form at the appropriate place.
- Some of the questions are multiple choice questions. For these questions, you should mark all the correct alternatives with a cross (×) in the corresponding box. For these questions you score depending on how many boxes that are correct (i.e. that contain a cross when that is correct and does not contain a cross when that is correct).
- If you have marked an alternative with a cross and you later determine that you do not want a cross there, you can write "REMOVE" immediately to the left of the box.
- Remember to write hard enough to make all copies readable. Other pages of the examination set should not be positioned under the page you fill in.

Part 1 (suggested used of time: 45 min - 60 min)

1) Which of these statements are correct regarding a *variable declared in an object method*?

- Before we make an assignment to the variable, it does not contain a value
- It may have an access modifier (e.g. private or public)
- Other object methods in the same class have access to the variable
- Object methods in other classes have access to it through dot-notation

2) Which of these statements are correct regarding an *object variable*?

- Before we make an assignment to the variable, it does not contain a value
- It may have an access modifier (e.g. private or public)
- Object methods in the same class have access to the variable
- Object methods in other classes have access to it through dot-notation if the variable is declared as public.

3) How many integers are there allocated memory for (i.e. what is the length of the array we get) when this program sentence is executed: `int[] tallene = new int[100];`

- Memory is allocated for 99 integers
- Memory is allocated for 100 integers
- Memory is allocated for 101 integers

4) Suppose we have the following program instructions:

```
for (int i = 0; i < 100; i++) {  
    for (int j = 0; j < 99; j++) {  
        System.out.println("Eksamen");  
    }  
}
```

How many times is the text "Eksamen" printed out?

Answer:

5) Suppose we have the following program instructions:

```
for (int i = 0; i < 3; i++) {  
    for (int j = 0; j <= i; j++) {  
        System.out.println("INF 1000");  
    }  
}
```

How many times is the text "INF 1000" printed out?

Answer:

6) Suppose we have the following program instructions:

```
int alder = 4;  
int nyalder = alder--;  
alder += nyalder;  
alder++;
```

What is the value of the variable `alder` when these sentences have been executed?

Answer:

- 7) Suppose we have a program where one of the classes have, among other things, this declaration of an object variable:

```
HashMap personer = new HashMap();
```

The class contains, among other things, methods for inserting objects of class Person (with a suitable key, e.g. a social security number) into the HashMap and for traversing all objects of class Person in the HashMap. The latter method should call a method skrivUt() in each object in the HashMap and looks like this:

```
void skrivAlle() {
    Iterator liste = personer.values().iterator();
    while (liste.hasNext()) {
        ....
        b.skrivUt();
    }
}
```

The contents of the while-loop above is not complete. Which of the alternatives below can the unfinished part of the loop (...) be replaced by, in order to make the method work as described?

- Person b = it.next();
- Person b = (Person) it.next();
- Person b = liste.next();
- Person b = (Person) liste.next();
- Bil b = (Bil) it.next();
- None of the above alternatives

- 8) Suppose the following program sentences are executed:

```
int i = 11;
int j = i;
int k = 32;

if (k > j * i || k < i) {
    System.out.println("A");
} else {
    if (k < j * i && k > i) {
        System.out.println("B");
    } else {
        System.out.println("C");
    }
}
```

What does the above program sentences print out on the screen?

- A
- B
- C
- AB
- Nothing is printed on the screen

9) Suppose the following array is declared in a method in a program:

```
int[] a = new int[77];
```

Suppose the array is then filled with values that are read from file, and that the following variable declaration is done: `int sum = 0;` Which of the alternatives below will give as result that `sum` contains the sum of all elements in the array `a`?

- ```
int i = 0;
while (i < a.length) {
 sum = a[i]; i++;
}
```
- ```
int i = 0;
while (i < a.length) {
    sum += a[i];
}
```
- ```
int i = 0;
while (i < a.length) {
 sum += a[i]; i++;
}
```
- ```
int i = 0;
while (i++ < a.length) {
    sum += a[i-1];
}
```
- ```
for (int i = 0; i < a.length; i++) {
 sum += a[i];
}
```
- ```
for (int i = 1; i <= a.length; i++) {
    sum += a[i-1];
}
```
- ```
for (int i = 0; i < a.length; ++i) {
 sum = sum + a[i];
}
```

10) Suppose that the following program sentences are executed:

```
int i = 11;
int k = i/3;
```

What value does the variable `k` obtain above after the execution of these sentences?

- `k` obtains the value 3
- `k` obtains the value 3,67
- `k` obtains the value 4
- none of the alternatives above

11) Suppose that we have declared the following object method in a class:

```
void dobleVerdi(int k) {
 k = k * 2;
}
```

In another object method in the same class, we have the following program sentences:

```
int k = 12;
dobleVerdi(k);
System.out.println("The value of k is " + k);
```

What does the last sentence above print out?

- The value of k is 12
- The value of k is 24
- The value of k is 6

12) Suppose that the following program is executed:

```
class Studentregister {
 public static void main(String[] args) {
 Student s = new Student("Ole", "Karl Johans gt 1"),
 Student p = new Student("Marit", "Karl Johans gt 2");
 System.out.println(s.getName() + " og " + p.getName());
 }
}

class Student {
 String name = "Grete";
 String address = "Blindernveien 3";

 Student (String name, String address) {
 this.name = name;
 this.address = address;
 }

 String getName() {return name;}
}
```

What is printed out on the screen?

- Grete og Grete
- Ole og Ole
- Marit og Marit
- navn og navn
- Ole og Marit
- s.getName() og p.getName()
- Marit og Ole
- None of the alternatives above



- 3) The method below is supposed to print out on screen the two parameters on two separate lines, such that the text string that is first in lexical order is printed on the first line and the other text string is printed on the second line. Fill in the contents of the method.

```
void printOutSorted(String text1, String text2) {
```

```
}
```

- 4) On the next page, you find an unfinished program for administering internet sites (internet pages). For each internet site the program will store the name of the page (e.g. "Homepage of INF1000"), the internet address (e.g. <http://www.ifi.uio.no/inf1000>), and a textual description of the page (e.g. "This internet page is useful for everyone following the course INF1000"). The program is supposed to have functionality for registering information about a new internet page, remove information about a page, and print out on screen an overview of all the registered internet pages. The program as developed so far is found on the next page.

The questions you are to answer for this problem (4-A, 4-B, and 4-C) are found after the program.

```

import easyIO.*;
import java.util.*;

class NetPageProg {
 public static void main (String[] args) {
 NetPageOverview no = new NetPageOverview();
 no.commandLoop();
 }
}

class NetPageOverview {
 In keyboard = new In();
 HashMap netpages = new HashMap();

 int readCommand() {
 int k = 0;
 while (k < 1 || k > 4) {
 System.out.println("1: Register a new net page");
 System.out.println("2: Remove a net page");
 System.out.println("3: Make an overview of all net pages");
 System.out.println("4: Quit");
 k = keyboard.inInt();
 }
 return k;
 }

 void commandLoop() {
 boolean notFinished = true;
 while (notFinished) {
 switch (readCommand()) {
 case 1: insertPage(); break;
 case 2: removePage(); break;
 case 3: makeOverview(); break;
 case 4: notFinished = false;
 }
 }
 }

 void insertPage() {
 // Read name, internet address and description from terminal, create a new object of class
 // NetPage and put it in the HashMap 'netpages' with the address as the key.
 }

 void removePage() {
 // Read a text string from terminal. Then go through all keys in the HashMap 'netpages' to
 // find all internet pages with address that either contains the text string or is identical to
 // the text string. For each such internet page, the program should ask the user whether it
 // should be removed, and if the user answers yes the internet page is removed from the
 // HashMap 'netpages'. If e.g. the text string "uio.no" is read, the program should in turn
 // present to the user each registered net page with "uio.no" as (part of) the address and
 // ask whether the internet page should be removed from the register.
 }

 void makeOverview() {
 // Run through all registered internet pages and print out on screen the contents of each.
 }
}

class NetPage {
 private String name;
 private String netaddress;
 private String description;

 NettSted(String name, String netaddress, String description) {
 this.name = name;
 this.netaddress = netaddress;
 this.description = description;
 }

 void printOut() {
 System.out.println("Name: " + name);
 System.out.println("Net address: " + netaddress);
 System.out.println("Description: " + description);
 }
}

```





4-C) Fill in below the missing program code for the method removePage() :

```
void removePage() {
 System.out.print("Address: ");
 String address = keyboard.inWord("\n");
```

```
}
```

- 5) (This question should be answered after answering all other questions). The method below is supposed to print out on screen the values of the three parameters in increasing order, and the method should not use arrays. The method should first swap the values in a, b og c such that  $a \leq b \leq c$ , and then print out on screen the value of a, b and c (in that order, and with the three numbers on three seperate lines). Fill in below the missing program code for the metod:

```
void PrintOutSorted2 (int a, int b, int c) {
```

```
}
```