COMP 248 EE – Final Exam

Instructions:

Date: Thursday June 14th, 2012
Time: 14:00 – 17:00 (3:00 hours)

Only ENCS-approved calculators (with the ENCS sticker) are allowed.
No other electronic devices (including cell phones) are allowed.
No books, papers or extra notes are allowed.
Answer directly on this questionnaire.

Identification:

Last Name: _____

First Name :   _____

Student ID :   _____

Signature: _____

Marking scheme (for the instructor's use only):

QUESTION 1	QUESTION 2	QUESTION 3	QUESTION 4	QUESTION 5	QUESTION 6	TOTAL
_____ 12	_____ 18	_____ 8	_____ 13	_____ 15	_____ 34	_____ **100**

Question 1 (8×1.5pts=12pts) Assume the following declarations:

```
int i = 1;
char a = 'd';
boolean isEasy = false;
String s = "Question1";
int [] a1 = {1, 0, 2};
int [] a2 = {1, 0, 2};
```

For each of the following expressions, indicate its value and its type.

	Expression	Type of the expression	Value of the expression
1.1	`'f' >= 'a' && a == 'a'`		
1.2	`a1[i++]`		
1.3	`(double)7 / 2`		
1.4	`a1.length > 2 ? a1[1]+1 : a1[1+1]`		
1.5	`a1 == a2`		
1.6	`(s.charAt(4) != 'e') || isEasy`		
1.7	`(char)('f'+4)`		
1.8	`a2[a1[2]]`		

Question 2 (9×2pts=18pts) Multiple choice questions – Circle <u>only one answer</u>.

1.1	What is the value of `result` after executing the following Java statements?
	
	``java
	int a, b, c, d, result;
	a = 4;
	b = 12;
	c = 3;
	d = 5;
	result = d % a * c + b % a + a;
	``
	
	a) 13
	b) 11
	c) 9
	d) 7
	e) None of the above

1.2	What does the following statement print?
	
	``java
	System.out.print("ABC".compareToIgnoreCase("abA"));
	``
	
	a) 0
	b) a positive integer
	c) a negative integer
	d) ABA
	e) ABC

1.3	What is the last line printed by the following program segment?
	
	``java
	int count = 0;
	do
	{
	    System.out.println("Java");
	}
	while (count++ < 3);
	System.out.println(count);
	``
	
	a) 0
	b) 1
	c) 3
	d) 4
	e) None of the above

1.4	What will be the value of `x` after the following code is executed?
	
	``java
	int x = 70;
	while (x < 100)
	{
	    x += 10;
	}
	``
	
	a) 90
	b) 100
	c) 110
	d) This is an infinite loop

1.5 What does this fragment display on the screen?

```
int[] array = {1, 4, 3, 6, 8, 2, 5};
int what = array[0];
for (int index=0; index < array.length; index++)
{
   if (array[index] > what)
      what = array[index];
}
System.out.println(what);
```

a) 1
b) 5
c) 1 4 3 6 8 2 5
d) 8

1.6 What integer values could you enter to terminate the following while loop?

```
System.out.print("Enter an integer: ");
int number = myKeyboard.nextInt();
while (number < 100 && number > 500)
{
      System.out.print("Enter another integer: ");
      number = myKeyboard.nextInt();
}
```

a) Integers less than 100 or greater than 500
b) Integers in the range 100–499
c) Integers in the range 100–500
d) The boolean condition can never be true

1.7 Assume the following class:

```
public class Circle
{
   private double radius;

   public Circle(double radius)
   {
     this.radius = radius;
   }
}
```

The following statement in the `main()` means:

```
Circle[] x = new Circle[10];
```

a) `x` is an array of ten int values.
b) `x` is a reference to an array and each element in the array can hold a `Circle` object.
c) `x` is an array of ten `Circle` classes.
d) `x` contains a reference to an array and each element in the array refers to ten `Circle` objects.
e) None of the above

1.8 What is the output of the following code?

```java
public class Test
{
   public static void main(String[] args)
   {
      int[] a = {1, 2};
      swap(a[0], a[1]);
      System.out.println(a[0] + "--" + a[1]);
   }

   public static void swap(int n1, int n2)
   {
      int temp = n1;
      n1 = n2;
      n2 = temp;
   }
}
```

a) 1--1
b) 2--1
c) 2--2
d) None of the above

1.9 Assume the following code. Which statement is <u>not</u> true?

```java
public class Sphere
{
   private double radius;
   public  double x;
   private double y;
   private double z;
}
```

a) x is available to code that is written outside the Sphere class.
b) radius is not available to code written outside the Sphere class.
c) radius, x, y , and z are called members of the Sphere class.
d) z is available to code that is written outside the Sphere class.

Question 3 (**8pts**) What is the output of the following program segment?

```java
int[] myArray = {4, 0, 9, 2, 6, 3, 5, 7, 8, 2};
int left, right;
int last = myArray.length-1;

for (int i = 0; i < myArray.length; i++)
   System.out.print(myArray[i]);

for (left = 0, right = last-1; left < right; )
{
   while (myArray[left] > myArray[last])
      left++;
   while (myArray[right] < myArray[last])
      right--;

   System.out.print("\n" + left + " " + right + "\n");

   int temp = myArray[left];
   myArray[left] = myArray[right];
   myArray[right]= temp;

   for (int i = 0; i<myArray.length; i++)
      System.out.print(myArray[i]);
}
```

Answer:

```
4092635782
1 8
4892635702
3 7
4897635202
7 7
4897635202
```

Question 4 (13pts)

A- (10pts) Write a public static method called `product_n` that takes an integer `n` as parameter and returns the product of the n first integers. For example, if `n` is 4, your method should compute and return 24 (because 1×2×3×4= 24).
Note: If the value of `n` is zero or is negative, your method should return zero.

Answer:

B-(3pts) Assume that you are in the same class as the method declared in part **A** above, and you can call and use the method `product_n` that you declared above. Write the appropriate instructions to call your method and display "YES" if the product of 1 to 50 is greater than 1000; and display "NO" otherwise.
Answer:

Question 5 (15pts) The inner product (or dot product) of 2 vectors (or 2 arrays) is the sum of the product of the corresponding elements of the 2 arrays. For example, the inner product of the 2 arrays:

1.0	2.0	3.0	-4.0	-5.0	-6.0

and

5.0	1.5	2.0	2.5	3.0	3.5

is -32, because $(1.0×5.0) + (2.0×1.5) + (3.0×2.0) + (-4.0× 2.5) + (-5.0×3.0) + (-6.0×3.5) = -32$

Complete the following program to determine and display on the screen the inner product of 2 arrays. The program should declare 2 arrays of doubles, ask the user to enter the values of the arrays, then call your method `innerProduct` and display the result on the screen. You method `innerProduct` should be `static`.

Answer:

```java
import java.util.Scanner;
public class Question5
{
   public static void main(String[] args)
   {
      // declare 2 arrays called array1 and array2 of 100 doubles each




      // read from the keyboard the values of each element of the arrays
      Scanner key = new Scanner(System.in);
      System.out.print("Enter all 200 doubles?");








      // call the static method innerProduct (that you will define below)
      // and display the result






   } // end of main


   // on the next page, define the method innerProduct
```

```
   // define the method innerProduct here
   // you can assume that the 2 arrays will have the same length and
   // will have at least 1 element each


























}  // end of Question 5
```

Question 6 (34 pts) Assume that we want to write a program to manipulate musical notes. ♫

A- (22pts) Making sure that encapsulation is not violated; write the definition of the class
`MusicalNote`. Your class should contain:

The following attributes:
- **a)** one of 7 solfège syllables (DO, RE, MI, FA, SOL, LA, TI).
  A syllable can be represented by an integer value between 1 and 7 (e.g. 1 for DO, 2 for RE,...).

- **b)** a duration (a positive integer value)

The following methods:
- **c)** A default constructor with no argument that creates a note to DO-1 (i.e. syllable=DO and duration=1).

- **d)** A second constructor that accepts a syllable and a duration. If the syllable is not valid (it must be between 1 and 7), it is assigned the value DO; if the duration is not valid (it must be >0), then it is assigned the value 1. This constructor should call the mutators defined below.

- **e)** Appropriate mutator methods to set the values stored in an object's attributes. If the syllable is not valid (it must be between 1 and 7), it is assigned the value DO; if the duration is not valid (it must be >0), then it is assigned the value 1.

- **f)** Appropriate accessor methods to get the values stored in an object's attributes.

- **g)** A method called `shorten`. Each time this method is called, it shortens the duration of a note by 1 unit. The method should first check to make sure the note's duration does not go below 1; in that case, the duration remains 1. No value is returned.

- **h)** A method called `toString`. This method formats the instance variables as you wish (e.g. syllable-duration, like 1-4 for DO-4 or 3-4 for MI-4). Make sure that your method follows the standard use of the `toString` method.

- **i)** A method called `sameSyllable` that returns `true` if the syllables of the calling object and the passed object are the same; otherwise, it should return `false`.

- **j)** A method called `equals` that returns the `true` if the content of all of the data members of the calling object and the passed object are the same and the boolean `false` otherwise.

Answer:

For questions **B** to **G**, write the statement(s), which would appear in the driver program, to perform the requested tasks.
Note: You can only use the member methods listed in part **A** of this question.

B. (1pt) Declare 2 MusicalNote objects: note1 whose initial value is FA-6 (1-6) and note2 for which you don't have the details yet.

C. (2pts) Write the statement(s) to shorten note1 by 15 units. Once it has been shortened, display its duration (only its duration).

D. (2pts) Write the statement(s) which will display on the screen the content of all instance variables of the object note1.

E. (2pts) Assuming that an object `note3` has been declared, write the statement(s) to determine which object `note1` and `note3` has the longest duration and display an appropriate message. It is possible that both notes have the same duration.

F. (2pts) Assuming that an object `note4` has been declared, write the statement(s) to determine whether the data members of `note1` and `note4` contain the same information and display an appropriate message.

G. (3pts) Create an array called `myTune` of 600 `MusicalNote` objects. For each note, ask the user for the syllable and the duration and create the object with this data.

End of the exam