King Fahd University of Petroleum and Minerals
College of Computer Sciences and Engineering
Information and Computer Science Department
Second Semester 2010/2011 (102)
ICS 102 - Introduction to Computing I

Solution of Major Exam 01

Monday, 21st March 2011
Time: 120 minutes

Name: **KEY**

ID#: | | | | | | | | | | |

G:

Please circle your section number below:

Section	01	02	03	04	05
Instructor	Baqais	Baqais	Al-Sukairi	Ghouti	Al-Sukairi
Day and Time	SM 07:00-07:50	SM 08:00- 08:50	SM 09:00 - 09:50	SM 13:10-14:00	SM 10:00-10:50

Question #	Maximum Marks	Obtained Marks	Remarks
1	20		
2	20		
3	20		
4	20		
5	20		
Total	**100**		

~Good Luck ~

***Q1.* [5 + 10 + 5 = 20 marks]**

a) What's wrong with the following code fragment? Circle all ***syntax*** (compilation) errors. Underline all ***logical*** and ***run-time*** errors. (Do not scratch inside the box otherwise)

```
Scanner MyKeyboard = Scanner(System.in);
System.out.print("Enter your ID and name: ");
int id = MyKeyboard.nextChar();
double name = kb.nextInt();
System.out.println("Your ID is: " + name.charAt(name.length()-1));
System.out.println("Your name is: + name.trim());
```

b) Write in the right column the output of the code in the left column:

Java code	Output

`System.out.println("Salam Shabab");`
`System.out.println("Welcome ICS 102");`
`System.out.print("\nJava");`
`System.out.println("Programming");`
	Salam Shabab
	Welcome ICS 102
	
	Java Programming

`int x = 4, y = 3;`
`String s = "Hello";`
`System.out.println(s + y + x);`
`System.out.println(x - y + s);`
`System.out.println(s + x * y);`
	Hello34
	1Hello
	Hello12

`String s = "The \"Exam\" is easy";`
`System.out.println(s.indexOf("e"));`
`System.out.println(s.charAt(5));`
`System.out.println(s.substring(14));`
`System.out.println(s. substring(4, 9));`
	2
	E
	Easy
	"Exam

`String s = "Java";`
`System.out.println(s.toUpperCase());`
`System.out.println(s.equals("java"));`
	JAVA
	false

c) Assume **myKeyboad** is a Scanner object as in:

Scanner myKeyboard = new Scanner(System.in));

For the following table, write the values of variables in the third column based on the input in the second column:

Java Code	Input	Values

`String n = myKeyboard.next();`
`int i = myKeyboard.nextInt();`
`double d = myKeyboard.nextDouble();`
	`ICS 102`
	`4`
		n = "ICS"
		i = 102
		d = 4.0

`String s = myKeyboard.nextLine();`
`String f = myKeyboard.next();`
`String l = myKeyboard.next();`
	`Java developer`
	`James Gosling`
		s = "Java developer"
		f = "James"
		l = "Gosling"

`int i = myKeyboard.nextInt();`
`String n = myKeyboard.nextLine();`
`String m = myKeyboard.nextLine();`
	`284652`
	`Tareq Al-Ali`
	`Computer Science`
		i = 284652
		n = ""
		m = "Tareq Al-Ali"

`int i = myKeyboard.nextInt();`
`myKeyboard.nextLine();`
`String n = myKeyboard.nextLine();`
`String m = myKeyboard.nextLine();`
	`284652`
	`Tareq Al-Ali`
	`Computer Science`
		i = 284652
		n = "Tareq Al-Ali"
		m = "Computer"

***Q2.* [20 marks]** Write a program that reads an unknown number of lines from a file called source.txt and every line contain 2 values. The program should put the smaller number in a file named small.txt and the larger number in a file named big.txt. For example if the content of the file is:

Source.txt

```
15   7
23   39
44   16
58   60
74   74
…..
…..
```

File content should be:

small.txt

```
7
23
16
58
74
```

big.txt

```
15
39
44
60
74
```

```
public class PlayingWithFiles {
   public static void main(String[] args) {

Scanner sourcefile;
      PrintWriter bigfile, smallfile;
      try{
         sourcefile = new Scanner(new FileInputStream("Source.txt"));
         bigfile = new PrintWriter(new FileOutputStream("big.txt"));
         smallfile = new PrintWriter(new FileOutputStream("small.txt"));
      }
      catch(FileNotFoundException e){
         System.out.println("Files could not be opened");
         System.exit(0);
      }
      int x = sourcefile.nextInt();
      int y = sourcefile.nextInt();
      if(x > y){ bigfile.println(x); smallfile.println(y); }
      else {  bigfile.println(y); smallfile.println(x); }
      x = sourcefile.nextInt();
      y = sourcefile.nextInt();
      if(x > y){  bigfile.println(x); smallfile.println(y); }
      else {  bigfile.println(y); smallfile.println(x); }
      x = sourcefile.nextInt();
      y = sourcefile.nextInt();
      if(x > y){  bigfile.println(x); smallfile.println(y); }
      else {  bigfile.println(y); smallfile.println(x); }
      x = sourcefile.nextInt();
      y = sourcefile.nextInt();
      if(x > y){  bigfile.println(x); smallfile.println(y); }
      else {  bigfile.println(y); smallfile.println(x); }
      x = sourcefile.nextInt();
      y = sourcefile.nextInt();
      if(x > y){  bigfile.println(x); smallfile.println(y); }
      else {  bigfile.println(y); smallfile.println(x); }
      sourcefile.close();
      bigfile.close();
      smallfile.close();


   }
}
```

Annotations:

- 4 marks Exception handling
- 6 marks opening files
- 5 marks reading & writing
- 4 marks using if statements
- 1 mark closing files

Q3. **[4 * 5 = 20 marks]** Convert the following algebraic expressions to JAVA statements. Define and initialize all needed variables as shown below.

a) The volume of a cylinder with radius ***r*** and height ***h***: $volume = \pi \ r^2 h$ **(where r = 2.5 and h = 2.6)**

b) Hook's law gives the acoustic velocity as $velocity = \left(\frac{E}{rho}\right)$ **(where E = 324.234 and rho =** $\sqrt[3]{\pi}$ **)**

c) Given the value of the compressibility, K, and the density rho, the speed of sound is:

$$v = \left(K \cdot rho\right)^{-\frac{1}{2}}$$ **(where K = log(E^2.5) and rho =** $\left(\cos\frac{\pi}{4}\right)^2$

d) $E = \max\left(\sqrt[3]{\frac{a}{b}}, \frac{a^2}{\log(b)}\right)$ **(where a = 2 and b = 3)**

a)	**double r = 2.5, h = 2.6** **double volume = Math.PI * r * r * h;** **// or** **double volume = Math.PI * Math.pow(r, 2) * h;**
b)	**double E = 324.234, rho = Math.cbrt(math.PI);** **// or** **double E = 324.234, rho = Math.pow(math.PI, 1.0/3);** **double velocity = E / rho;**
c)	**double K = Math.log(Math.pow(Math.E, 2.5));** **double rho = Math.pow(Math.cos(Math.PI/4), 2);** **double v = Math,pow(K * rho, -1/2.0);** **// or** **double v = 1 / Math,sqrt (K * rho);**
d)	**double a = 2, b = 3;** **double E = Math.max(Math.cbrt(a/b), (a * a)/log(b));** **//or** **double E = Math.max(Math.cbrt(a/b), (Math.pow(a, 2))/log(b));**

***Q4.* [20 marks]** Write a program that reads an integer between 0 and 1000 and returns:

1- The sum of the first and last digits.
2- The absolute difference of the first and last digits

For example, if an integer is 638, the sum of the first and last digits is: 14 and the absolute difference of the first and last digits is 6 - 8 = 2.

Example execution:

Please enter an integer: **638**
The sum of the first and last digits of 638 is: **14**
The absolute difference of the first and last digits of 638 is: **2**

```
import java.util.Scanner;   // 1 Point
public class FirstandLastDigits {
   public static void main(String[] args) {

      int num;  // 1 Point
      int firstDigit, lastDigit;  // 2 Points

      Scanner myKeyboard = new Scanner(System.in);  // 1 Points

      System.out.print("Please enter an integer: ");  // 1 Point
      num = myKeyboard.nextInt();   // 1 Point

      if(num < 0 | num >= 1000) {
         System.out.println("Error! Number out of range!");
         System.exit(0);
      }                                                          // 3 Points

      firstDigit = num / 100;  // 3 Points
      lastDigit = num % 10;  // 3 Points

      System.out.println("The sum of the first and last digits of " + num + " is: " + (firstDigit + lastDigit));  // 2 Points
      System.out.println("The absolute difference of the first and last digits of " + num + " is: " + Math.abs(firstDigit-
lastDigit));  // 2 Points









   }
}
```

Q5. **[15 marks]** Write a program that reads the following information from the user:
Student's first name (for example **Khaled**)
Student's last name (for example **Al-Abdullah**)
Number of credit hours in this semester (for example **15**)
Student's GPA (for example **3.6**)

Then, the program should print the first and last names capitalized. Also, the program outputs a statement according to the following rule:

Rule	Statement
9 < Number of credit hours < 12 and GPA < 2.0	You are under probation. You must work hard!
9 < Number of credit hours < 12 and GPA > 2.5	You are under load. Register more courses!
12 ≤ Number of credit hours < 15 and GPA > 2.5	Your load is fine and your academic performance is acceptable!
15 ≤ Number of credit hours < 18 and GPA < 2.5	Your load is high based on your poor academic performance!
15 ≤ Number of credit hours < 18 and GPA > 2.5	Your load is normal based on your good academic performance!
12 ≤ Number of credit hours < 18 and GPA > 3.5	Your load is fine based on your excellent academic performance!
18 ≤ Number of credit hours < 20 and GPA > 3.5	You are a very hard working and excellent academic performer!

Example of execution and output:

Please enter your first name: **Khaled**
Please enter your last name: **Al-Abdulah**
Enter the number of credit hours in this semester: **15**
Enter your GPA: **3.6**

Student's name: KHALED AL-ABDULLAH
Your load is fine based on your excellent academic performance!

```
import java.util.Scanner; // 1 Point
public class StudentPerformance {
   public static void main(String[] args) {
        String fName, lName;  // 1 Point
        double gpa;  // 0.5 Point
        int nCredits;  // 0.5 Point
        Scanner myKeyboard = new Scanner(System.in); // 0.5 Point

        System.out.print("Please enter your first name: ");
        fName = myKeyboard.next();
        System.out.print("Please enter your last name: ");
        lName = myKeyboard.next();
        System.out.print("Enter the number of credit hours in this semester: ");
        nCredits = myKeyboard.nextInt();
        System.out.print("Enter your GPA: ");
        gpa = myKeyboard.nextDouble();

        System.out.println("Student's name: " + fName.toUpperCase() + " " + lName.toUpperCase());  // 2 Points

      if(nCredits < 9 && nCredits < 12 && gpa < 2)   // 1 Point
          System.out.println("You are under probation. You must work hard!");  // 0.5 Point
      else if(nCredits < 9 && nCredits < 12 && gpa > 2.5)  // 1 Point
          System.out.println("You are under load. Register more courses!");  // 0.5 Point
      else if(nCredits <= 12 && nCredits < 15 && gpa > 2.5)  // 1 Point
          System.out.println("Your load is fine and your academic performance is acceptable!");  // 0.5 Point
      else if(nCredits <= 15 && nCredits < 18 && gpa < 2.5) // 1 Point
          System.out.println("Your load is high based on your poor academic performance!");  // 0.5 Point
      else if(nCredits <= 15 && nCredits < 18 && gpa > 2.5) // 1 Point
          System.out.println("Your load is normal based on your good academic performance!");  // 0.5 Point
      else if(nCredits <= 12 && nCredits < 18 && gpa > 3.5) // 1 Point
          System.out.println("Your load is fine based on your excellent academic performance!");  // 0.5 Point
      else if(nCredits >= 18 && nCredits < 20 && gpa > 3.5) // 1 Point
          System.out.println("You are a very hard working and excellent academic performer!");  // 0.5 Point

   }
}
```

// 2.5 Points

// 5 Points

// 10.5 Points