KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Information and Computer Science Department

2011/2012 Second Semester (Term 112)

ICS102: Introduction to Computing (2-3-3)

# MIDTERM EXAM

Tuesday, March 20th 2012, 06:30 PM – 08:30 PM

120 MINUTES

Student Information

| Name: | KEY | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ID: | | | | | | | | | |

Circle your section

| | | |
|---|---|---|
| Al-Khoraidly | SM 8:00 – 8:50 am | SM 10:00 – 10:50 am |
| Al-Turki | SM 9:00 – 9:50 am | SM 11:00 – 11:50 am |

| Question No. | Maximum Score | Score |
|---|---|---|
| 01 | 20 | |
| 02 | 10 | |
| 03 | 10 | |
| 04 | 15 | |
| 05 | 15 | |
| 06 | 15 | |
| 07 | 15 | |
| TOTAL | 100 | |

**Question 1 (20 points):**

Choose the correct answer in the following questions:

1. The text in `/* */` is:
   a. Completely ignored by the compiler
   b. To indicate String data
   c. Used in print statement
   d. None of the above

2. When the code:
```
String str = "you \"like\" programming";
str = str.substring(str.length()/2) + str.indexOf("\"");
```
   runs, `str` will have the value:
   a. `"programming4`
   b. `"programming3`
   c. `programming4`
   d. `"programming9`

3. Which of the following is NOT a Java primitive data type?
   a. boolean
   b. byte
   c. float
   d. String

4. Which of the following pairs of statements are equivalent?
   a. `a -= 3 + 2;  a = a - 5;`
   b. `int b = (int) 9.8;  int b = (int)Math.round(9 / 10.0);`
   c. `"book".indexOf("o");  "book".lastIndexOf("O");`
   d. None of the above

5. When the code:
```
String strA = new String("Roasted ");
String strB = new String("Acorns ");
strA = strB;
System.out.print(strA);
System.out.println(strB);
```
   runs, the output is going to be:
   a. `Roasted Acorns`
   b. `Acorns Roasted`
   c. `Roasted Roasted`
   d. `Acorns Acorns`

6. Given the following code:
```
do{
     break;
     System.out.println("Inside do-while loop");
} while(true);
```

Which of these statements is true?

a. It will not compile
b. `Inside do-while loop` will print once
c. Nothing is printed
d. `Inside do-while loop` will print an infinite number of times

7. Given the following code:

```
char c = 'z';
switch(c){
     default:
     case 'a': System.out.print("a");
     case 'b': System.out.print("b");
}
```

Which of the following is true?

a. This code has an error because only integers can be used in `switch`
b. When the code runs, `a` is printed
c. This code has an error because `default` must come last
d. When the code runs, `ab` is printed

8. Which statement is true about the following code?

```
int x = 15, y = 22, z = 18;
if(x < y)
if(x < z)
System.out.println("Salam");
else
System.out.println("Shabab");
```

a. When this code runs, `Salam` is printed
b. The code will not compile because there are no braces in the `if` statements
c. When this code runs, `Shabab` is printed
d. Nothing is printed out

9. The following output:

```
value is 11.54
```

is produced by:

a. `System.out.println("value is " + 1154 / 100);`
b. `System.out.println("value is " + (11 * 100 + .54));`
c. `System.out.println("value is " + 11 + 0.54);`
d. `System.out.println("value is " + (3 + 20) / 2.0 + 4);`

10. Given the following code

```
int i = 1;
do for(i = -5; i > 10; i++)
     System.out.println("ICS102");
while(i > 1);
```

which of the following is true?

a. The code will not compile because it is not correct
b. `ICS102` will be printed five times when the code runs
c. the code is fine but nothing is printed
d. `ICS102` will be printed infinitely many times

**Question 2 (10 points):**

Consider the following Java code snippets. What will be the output for the different values of `x` typed by the user?

**I)**

```
Scanner sc = new Scanner(System.in);
int x = sc.nextInt();
switch(x)
{
   case 4: x = x+3;
   case 3:
   case 1: x = x+1;
   case 6: break;
   case 7: x = x+2;
           break;
   case 8: x = x+2;
   default : x = x+1;
}
System.out.print(x);
```

| User Input | Program Output |
|---|---|
| 6 | 6 |
| 4 | 8 |
| 2 | 3 |
| 7 | 9 |
| 3 | 4 |
| 8 | 11 |

**II)**

```
Scanner sc = new Scanner(System.in);
int x = sc.nextInt();
if(x > 5 )
{
  if(x < 10)
  {
    if(x >= 8)
      System.out.println("DD");
    else
      System.out.println("EE");
  }
  else
  {
    if ( x >= 0)
      System.out.println("BB");
    else
      System.out.println("AA");
  }
}
else
  System.out.println("CC");
```

| User Input | Program Output |
|---|---|
| 3 | CC |
| 7 | EE |
| 9 | DD |
| 8 | DD |

**Question 3 (10 points):**

Find the output of the following Java code snippets:

**I)**

```
int i, sum = 0; double avg;
for(i = 1; i <= 9; i++) {
   if(i % 2 == 0) sum = sum + i;
   else sum = sum + 1;
}
avg = sum / 10;
System.out.println("Sum = " + sum);
System.out.println("Average = " + avg);
```

**OUTPUT**

```
Sum = 25
Average = 2.0
```

**II)**

```
for(int i = 1; i < 4; i++) {
   for(int j = 1; j < i; j++)
       System.out.print(j);
   System.out.println();
}
```

**OUTPUT**

```
1
12
```

**III)**

```
String s = "Of-course,-\"Java\"-is-Fun";
System.out.println(s.length()-4+s.substring(12));
System.out.println(s.substring(1,3) + 1 + 3);
System.out.println(s.substring(4,8).toUpperCase());
System.out.println(
   s.substring(s.indexOf("a"), s.indexOf("is")));
```

**OUTPUT**

```
20Java"-is-Fun
f-13
OURS
ava"-
```

**Question 4: (15 points)**

Write a Java program that calculates the sum:

$$sum = 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \cdots \pm \frac{1}{n}$$

The program should first read the value of n, and then calculate and print out the sum.

```
import java.util.Scanner;

class Summation {
    public static void main(String[] args) {
          Scanner kb = new Scanner(System.in);
          System.out.print("Enter a value for n: ");
          int n = kb.nextInt();
          double sum = 0;
          for(int i = 1; i <= n; i++)
              sum += Math.pow(-1, i+1) * 1.0 / i;
          System.out.println("The summation is " + sum);
    }
}
```

**Question 5: (15 points)**

Write a Java program that computes the cost of shipping of a package based on the following table:

| Weight (kg) | Amount (Riyals) |
|---|---|
| $x \leq 20$ | 1000 |
| $20 < x \leq 40$ | 1000 + (100 per kilogram for each additional kilogram exceeding 20) |
| $x > 40$ | 100 per kilogram |

The program should first ask the user to enter the weight of the package, and then output the shipping cost.

```
import java.util.Scanner;

class ShippingCost {
  public static void main(String[] args) {
    Scanner kb = new Scanner(System.in);
    System.out.print("Enter the weight of the package: ");
    double weight = kb.nextDouble();
    if (weight > 40)
      System.out.println("The amount is " + (weight * 100));
    else if (weight > 20)
      System.out.println(
                      "The amount is " + (1000 + (weight - 20) * 100));
    else if (weight > 0)
      System.out.println("The amount is 1000");
    else
      System.out.println("Invalid weight");
  }
}
```

**Question 6: (15 points)**

Write a Java program that computes and prints out the solutions of a given quadratic equation:

$$ax^2 + bx + c = 0$$

The program first reads the values of the coefficients a, b and c (a cannot be zero). It then computes the "discriminant" D:

$$D = b^2 - 4ac$$

If D is negative, then there are no real solutions to the equation. If D is zero, then there is only one solution, which is $-\frac{b}{2a}$ . If D is positive, then the two possible solutions are:

$\frac{-b+\sqrt{D}}{2a}$ and $\frac{-b-\sqrt{D}}{2a}$

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```
import java.util.Scanner;

class Quadratic {
  public static void main(String[] args) {
    Scanner kb = new Scanner(System.in);
    System.out.print("Enter values for the coefficients a, b and c: ");
    double a = kb.nextDouble();
    double b = kb.nextDouble();
    double c = kb.nextDouble();
    if (a == 0) {
      System.out.println("The coefficient a cannot be zero!");
      System.exit(0);
    }
    double d = b * b - 4 * a * c;
    if (d < 0)
      System.out.println("There is no real solution to the equation.");
    else if (d == 0)
      System.out.println("The only solution is " + (-b / (2 * a)));
    else {
      double s1 = (-b + Math.sqrt(d)) / (2 * a);
      double s2 = (-b - Math.sqrt(d)) / (2 * a);
      System.out.println(
                  "The two solutions are: " + s1 + " and " + s2 + ".");
    }
  }
}
```

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**Question 7: (15 points)**

Write a Java program that finds and prints all integers that are composite (not prime) between 2 and 10000.

(Note: An integer is prime if and only if it is divisible by 1 and itself only. An integer that is not prime is called composite. For example, 13 is prime since it is divisible only by 1 and 13, but 28 is composite (not prime) since 28 = 2 x 2 x 7.).

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

     for(int i = 4; i <= 10000; i++)
         for(int j = 2; j < i; j++)
          if (i % j == 0) {
              System.out.print(i + " ");
              break;
          }
    }
}
```