

CS 101: Practice Questions for Test 2

SOLUTIONS

1. Write a Java application which prompts the user to enter integers from the screen until the end of file character is entered, computes the sum of the integers, and prints this sum to the screen.

Solution:

```
import java.util.Scanner;
public class SumInts{
    public static void main (String[] args){
        Scanner scan = new Scanner(System.in);
        int sum = 0;
        System.out.print("Enter some integers, push <CONTROL>D to exit: ");
        while (scan.hasNext())
            sum += scan.nextInt();
        System.out.println("\nThe sum of your integers is " + sum);
    }
}
```

2. If a triangle has side lengths a, b, c , then the formula for the area of the triangle is

$$\sqrt{s(s-a)(s-b)(s-c)},$$

where $s = \frac{1}{2}(a + b + c)$. Write a class `Triangle` which contains three **private** data members a, b, c for the side lengths. Make sure `Triangle` has the following methods:

```
public Triangle (double x, double y, double z)
    // constructor: x,y,z are side lengths
public double area ()
    // compute and return area of triangle
public double perimeter ()
    // compute and return the perimeter of triangle
```

Solution:

```

public class Triangle{
    private double a,b,c;
    public Triangle(double x, double y, double z){
        a = x;
        b = y;
        c = z;
    }
    public double area(){
        double s = 1./2 * (a+b+c);
        return Math.sqrt(s*(s-a)*(s-b)*(s-c));
    }
    public double perimeter(){
        return a+b+c;
    }
}

```

3. Bonus: The side lengths of a triangle must satisfy the following constraints: Each side must be positive, and no side may be longer than the sum of the other two side lengths. Modify your constructor `Triangle` above to print to the screen an appropriate error message if the proposed side lengths do not meet these specifications.

Solution: Replace the above constructor with

```

public Triangle(double x, double y, double z){
    a = x;
    b = y;
    c = z;
    if (a<0 || b<0 || c<0 || a+b<c || a+c<b || b+c<a)
        System.out.println("Not a valid triangle.");
}

```

4. Consider the method `question4` defined by

```

public static double question4 (double x, double y){
    return (x>y) ? x : y;
}

```

(a) What is the value of `question4(4.7,5.3)`?

Solution: 5.3

(b) Describe in words what the return value of the method `question4` represents mathematically in terms of the parameters `x,y`.

Solution: The return value is the maximum of `x,y`, since it is `x` if `x>y` and `y` otherwise.

5. What is the output of the following code fragment?

```
int z = 4;
do{
    System.out.println(z);
    z--;
}while (z>5);
```

Solution:

4

6. Write a method

```
public static String firstWord(String sentence)
```

which uses a `Scanner` to scan through the `String sentence` to return the word in the sentence which comes first alphabetically. (Recall that the method `next()` returns the next word in a `Scanner`.)

Solution:

```
public static String firstWord(String sentence){
    Scanner scan = new Scanner(sentence);
    String first = scan.next(), temp;
    while (scan.hasNext()){
        temp = scan.next();
        if ((first.toUpperCase()).compareTo(temp.toUpperCase()) > 0)
            first = temp;
    }
    return first;
}
```

7. What is the output to the screen of the following code fragment?

```
boolean done = false;
int n = 5;
while (n>0 && !done){
    --n;
    System.out.println(n);
    done = (n*n==1 || n<3);
}
```

Solution:

```
4
3
2
```

8. Write a java applet which draws four squares of side-length 50 whose upper left corners have coordinates given by random integers from 0 to 99.

Solution:

```
import javax.swing.JApplet;
import java.awt.*;
public class Squares extends JApplet{
    public void paint (Graphics page){
        final int SIDE_LENGTH = 50;
        for (int i=1; i<=4; i++){
            int x = (int)(Math.random()*100);
            int y = (int)(Math.random()*100);
            page.drawRect(x,y,SIDE_LENGTH,SIDE_LENGTH);
        }
    }
}
```

```
public class BasketballTeam{
    private int score;
    private String name;

    public BasketballTeam(String s){
        score = 0;
        name = s;
    }

    public int getScore(){
        return score;
    }

    public String getName(){
        return name;
    }

    public String toString(){
        return ("The " + name + " have " + score + " points.\n");
    }

    public int freeThrow(){
        score++;
        return score;
    }

    public int threePoint(){
        score += 3;
        return score;
    }

    public int makeShot(){
        score += 2;
        return score;
    }
}
```

9. Consider the class `BasketballTeam` above. What is the output of the following driver program?

```
public class BigGame{
    public static void main(String[] args){
        BasketballTeam team1 = new BasketballTeam("Raiders");
        BasketballTeam team2 = new BasketballTeam("Tigers");
        team1.makeShot();
        team2.freeThrow();
        team1.threePoint();
        System.out.println ("Team 1 has " + team1.freeThrow() +
                            " points.");
        team2.makeShot();
        System.out.print(team1)
        System.out.print(team2);
    }
}
```

Solution:

```
Team 1 has 6 points.
The Raiders have 6 points.
The Tigers have 3 points.
```

10. Using the `BasketballTeam` class above, write a driver class which simulates a basketball game in the following way: instantiate two teams as above, and then assume the teams alternate possession of the ball for 20 times each. During each possession, the team with the ball has the following probabilities:

- 35% chance of making a 2-point shot
- 15% chance of making a 3-point shot
- 20% chance of making a free throw
- 30% chance of turning over the ball without scoring

Use a `double` variable set to equal `Math.random()`, together with some `if-else` statements, to control the probabilities. After each possession, print the score of both teams to the screen.

Solution:

```
public class GameSimulator{
    public static void main(String[] args){
        BasketballTeam team1 = new BasketballTeam("Raiders");
        BasketballTeam team2 = new BasketballTeam("Tigers");
        for (int i=1; i<=20; i++){
            double rand = Math.random();
            if (rand<.35)
                team1.makeShot();
            else if (rand<.50)
                team1.threePoint();
            else if (rand<.70)
                team1.freeThrow();
            System.out.print(team1);
            System.out.print(team2);

            rand = Math.random();
            if (rand<.35)
                team2.makeShot();
            else if (rand<.50)
                team2.threePoint();
            else if (rand<.70)
                team2.freeThrow();
            System.out.print(team1);
            System.out.print(team2);
        }
    }
}
```