Seminar 6 – Revision

1. [ICT131, Jan 2010]
   Examine the following program and answer the questions that follow.

```
1.  public class Q2
2.  {
3.   public static void main(String[] args)
4.  {
5.          int i = 5;
6.          while (i >= 1)
7.          {
8.                  for (int j = 1; j <= 2*i; j+=2)
9.                  {
10.                         String s;
11.                         if ((i+j) % 2 == 1)
12.                                 s = "*";
13.                         else
14.                                 s = "$";
15.                         System.out.print(s);
16.         }
17.                 i--;
18.                 System.out.println();
19.         }
20. }
21. }
```

   (a) How many times will the statement in line 15 be executed?

   (b) Consider the boolean expression (i+j) % 2 == 1 in line 11. What are the values of i and j for the condition to be true?

   (c) What happens if line 18 is changed to System.out.println(i); ?

   (d) What happens if line 18 is changed to System.out.println(j); ?

   (e) What is the output produced by the original program?

2. a. An arithmetic progression (AP) is a series where the difference between the numbers is a constant. E.g. 4 7 10 13 16 19 is an AP with 6 terms and common difference of 3. Assume the following variables has been assign with values:

```
int start;          //the starting number of the AP
int difference;     //the common difference
int nbrOfTerms;     //the number of terms
```

i) Use a while loop to display the AP with the format as shown in the example above.

ii) Rewrite using a for loop.

b. Trace the output of the following program:

```
public static void main(String[] args){
  int[ ] x = {1, 2, 3, 4, 5};
  int[ ] y = {1, 2, 3, 4, 5, 6};
  for ( int i=0; i<x.length; i++){
        y[ x[i] ] += y[i];
  }
  for ( int i=0; i<y.length; i++)
        System.out.println( i + " " + y[i]);
}
```

3. Write a program that records the score of a table tennis competition. A table tennis tournament is played over 7 games between 2 players. The winner of a game is the first to reach 11 points. The winner of a competition is the first to win 4 games.

The program must include the following:

a. In the main method, declare 2 integer arrays of size 7 to record the score of the games of each player. It has an integer variable to keep track of the number of games played.

b. In the main method, include a menu as follows:

1. Input Score
2. Display winner
3. Print Score
4. Quit

Enter choice:

Each choice of the menu must call one of the methods as described in the next 3 parts.

c. A method called `inputScore`. The method has 2 array parameters to record the score. Use the Scanner class to read in the scores. This method returns the number of games entered. A sample input is as follows:

```
Game 1:
Enter player 1 score: 11
Enter player 2 score: 5
Game 2:
Enter player 1 score: 7
Enter player 2 score: 11
```

Game 3:
Enter player 1 score: 11
Enter player 2 score: 8
Game 4:
Enter player 1 score: 11
Enter player 2 score: 9
Game 5:
Enter player 1 score: 11
Enter player 2 score: 2
Game 6:
Enter player 1 score: -1

-1 is used as a sentinel to end input of the scores if the number of games is less than 7. If the full 7 games score are entered, input will automatically end, without prompting for the 8th game. A return value indicating the number of games played is returned.

d. A method called `getWinner`. The method has 2 array parameters and an integer parameter which indicates the number of games played. The method returns 1 if the first array parameter is the winner or 2 otherwise.

e. A method called `printScore` that has 2 array parameters and an integer parameter that indicates the number of games played. It displays the scores of the 2 players as follows:

Player 1 11 7 11 11 11
Player 2 5 11 8 8 2
Winner player 1

4. [ICT131 Jul 2010]

a. Write a simple Java class Cone. The class should have the following:

- The instance variables, radius and height, representing the radius of the base circle and height of the right circular cone.
- A parameterised constructor that sets the attributes to the values passed in.
- The usual get and set methods for the instance variables.
- A findVolume() method to calculate and return the volume of the cone. Formula for volume of cone is:

$$\frac{1}{3}\pi r^2 h$$

where r is the radius of the base circle and h is the height.

- A toString() method to return a string consisting of the values of the attributes with description.

b. Write a simple Tester class to test your implementation of Cone class as follows:

- Create a Cone object of any dimension.
- Find the volume of the cone.
- Display the dimension of the cone and the volume.

5. [ICT131 July 2011]

You are to develop a simple application system to manage student marks. The system should be able to maintain a list of up to 20 students. Each student has a unique name and a mark.

(a) Write Java statements that declare and create two arrays, where one is used to store the names of the students and the other one to store the students' marks.

(b) Write a Java method with the following method signature:

```
public static void displayHighestMark(String[] names,
                    int[] marks, int count)
```

This method displays the name of the student with the highest mark. You only need to print the first student who gets the highest mark if two or more students have the same score.

Parameters:
names: the array that stores the names of the students
marks: the array that stores the marks of the students
count: the actual number of students in the system at the moment

(c) Write a Java method with the following method signature:

```
public static int searchStudent(String[] names, int count, String target)
```

This method searches for the student whose name is the same as target and returns the index in the names array if it is found, or -1 if it is not found.

Parameters:
names: the array that stores the names of the students
count: the actual number of students in the system at the moment
target: the target that is to be found

(d) Write a Java method with the following method signature:

public static void updateMark(String[] names, int[] marks, int count)

This method prompts and reads the name of the student whose mark is to be updated and the new mark from the user. It updates the student's mark if it is found and displays the message "Mark updated", or the message "Student not found" if it is not found. You are required to call the method searchStudent() defined in part (c) above.

Parameters:
names: the array that stores the names of the students
marks: the array that stores the marks of the students
count: the actual number of students in the system at the moment