Objectives:

Student should learn how to:

1- Follow the loop design strategy to develop loops.

2- Control a loop with a sentinel value.

3- Write loops using for statements

4- Write nested loops

5- Combine loops and control statements to solve problems with complex logic

Exercise 1

1) How many times is the println statement executed in the following code?

```
for (int i = 0; i < 10; i++)
   for (int j = 0; j < i; j++)
      System.out.println(i * j)
```

2) Show the output of the following programs?

```java
public class Test {
  public static void main(String[] args) {
    for (int i = 1; i < 5; i++) {
      int j = 0;
      while (j < i) {
        System.out.print(j + " ");
        j++;
      }
    }
  }
}
```

(a)

```java
public class Test {
  public static void main(String[] args) {
    int i = 0;
    while (i < 5) {
      for (int j = i; j > 1; j--)
        System.out.print(j + " ");
      System.out.println("****");
      i++;
    }
  }
}
```

(b)

```java
public class Test {
  public static void main(String[] args) {
    int i = 5;
    while (i >= 1) {
      int num = 1;
      for (int j = 1; j <= i; j++) {
        System.out.print(num + "xxx");
        num *= 2;
      }

      System.out.println();
      i--;
    }
  }
}
```

(c)

```java
public class Test {
  public static void main(String[] args) {
    int i = 1;
    do {
      int num = 1;
      for (int j = 1; j <= i; j++) {
        System.out.print(num + "G");
        num += 2;
      }

      System.out.println();
      i++;
    } while (i <= 5);
  }
}
```

(d)

Solution

1)

   45 times

2)

   a)

```
0 0 1 0 1 2 0 1 2 3
```

   b)

```
****
****
2 ****
3 2 ****
4 3 2 ****
```

   c)

```
1xxx2xxx4xxx8xxx16xxx
1xxx2xxx4xxx8xxx
1xxx2xxx4xxx
1xxx2xxx
1xxx
```

   d)

```
1G
1G3G
1G3G5G
1G3G5G7G
1G3G5G7G9G
```

Exercise 2

Write a program that reads a character then displays the following pattern using the input character (assuming input character is 'A' and height is 6):

```
          A
        A A
      A A A
    A A A A
  A A A A A
A A A A A A
```

Height of pattern and character are input by user.

(Hint: assuming name of your Scanner object is input, use input.next().charAt(0);   to read a character from user.)

Solution

```java
import java.util.Scanner;
public class Triangle {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Enter character: ");
        char c = input.next().charAt(0);
        System.out.print("Enter height: ");
        int height = input.nextInt();
        for (int i = 1; i <= height; i++) {
            // Print leading space
            for (int j = height - i; j >= 1; j--)
                System.out.print("  ");

            for (int j = i; j >= 1; j--)
                System.out.print(c + " ");
            System.out.println();
        }
    }
}
```