Lab 2: Java Fundamentals II.
20 pts

Distribute on September 11, 2023
Due before September 17, 2023 (Sunday) at 12:00 Midnight

Learning Outcomes ((CLO) vs (SO) Mapping)

- Recognize the software and hardware components of a computer system (1)vs(6)
- Utilize Java syntax in fundamental programming algorithms (3)vs(1)
- Recognize and apply the various input and output devices in programming (4)vs(2)

Requirements
The focus of this lab is to
- gain experience with variables, assignment statements, and arithmetic operators;
- learn the fundamental Java output device: sending messages to the console;
- practice error-correcting routines.

Furthermore, this lab is also to gain experience
- creating a String object of String class,
  - variables holding the address of a String object with the value which is a string of a star pattern,
  - the String class's length method, and
- applying JOptionPane class' message dialog and input dialog.

Preliminaries

1. Create a NetBeans or Eclipse Java project. Make sure you know the folder (workspace) name where you store your project. The name of the project must be **lab02_<your FirstNameLastName >**. For example, my project would be named, lab02_PeterNg.

2. Add a Java class named **StarPattern** to your project.

3. Add the following comment block to the beginning of your Java class (necessary for getting a grade):

```
/*
 * <your name>
 * CS 16000-01 – 02/03, Fall Semester 2023
 * (Note: write either 02 or 03, depending on which is your section.)
 * Lab 02
 *
 */
```

4. Add another comment block shortly describing what task your class is responsible for (see the description of the assignments below).

Assignments

Solve the programming challenge #4 Star Pattern at the end of Chapter 2 “Programming Challenges” on page 106 of the textbook with added requirements as explained below.

1. Rather than the pattern of the book, you must create the modified star pattern as shown in Figure 1:

```
    *
   * *
  * * *
 * * * *
* * * * *
 * * * *
  * * *
   * *
    *
```

Figure 1

2. For the solution, use the StarPattern class you added to the project. That is,

```
public class StarPattern {

    public static void main(String[] args) {
        // TODO Auto-generated method stub

    }
}
```

3. In the body of the main method, declare a single String class type variable named **`pattern`**.
The **pattern** will hold the address of a String object with a string literal as its value, which is needed to be created in problem 4.

4. The string value is a description of the star pattern given in 1. Write this description using the *, the **space** character, and **\n** (newline character) as many times as needed as a string value.

5. As shown in Figure 2,

a) Use the String class’ length method to print the length of the obtained **pattern** in 4. The length of this **pattern** is the total number of characters used in constructing this **pattern**.

b) Then print the star pattern from the string value which is constructed in 4. Use a single print statement that prints a **`pattern`** to the console; that is, you are not allowed to use System.out.println repeatedly to print the given star pattern line by line. The result of this print statement will display a star pattern as shown in 1.

Use JOptionPane class’ showMessageDialog method to complete the same tasks as 5 above. Display the length of the **pattern** and the star pattern, as shown in Figure 3.

When you use JOptionPane class, you are required to have the following import for JOptionPane class to be placed before the comment block of 3. in the ***Preliminaries*** section.

```
import javax.swing.JOptionPane;   //required for JOptionPane class.
```

Before the end of the main method, you are required to have

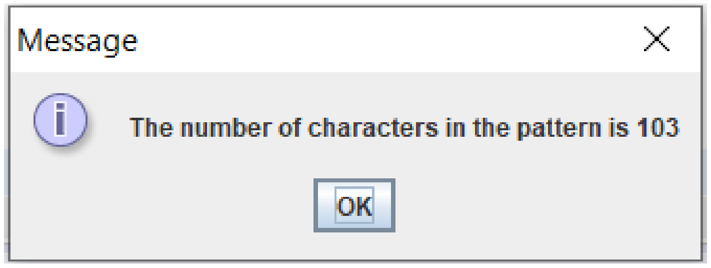
```
System.exit(0);   //required for JOptionPane class.
```

6. Run your program to see if the pattern appears correctly. Remove errors and make corrections as necessary in 4. That means you must have the correct number of occurrences for the *'s with spaces and \n's in a string literal. Repeat this until you have the star pattern displayed correctly to both the console and then the message dialog boxes.

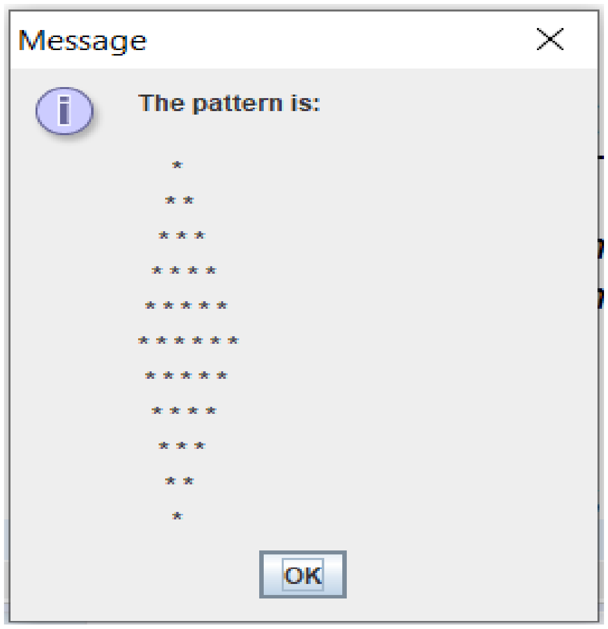
```
The number of characters in the pattern is 103

     *
    * *
   * * *
  * * * *
 * * * * *
* * * * * *
 * * * * *
  * * * *
   * * *
    * *
     *
```

Figure 2


Message

The number of characters in the pattern is 103



```
The pattern is:

     *
    * *
   * * *
  * * * *
 * * * * *
* * * * * *
 * * * * *
  * * * *
   * * *
    * *
     *
```

Figure 3.

Continue the code as follows:

7. Declare an **`int`** type variable named **`asterisks`**

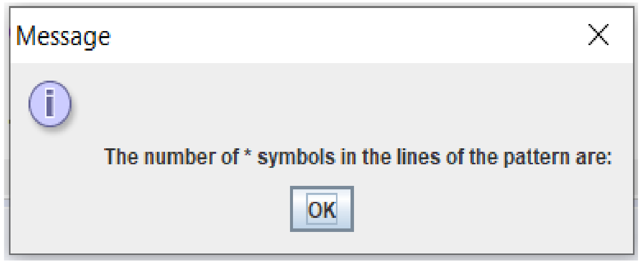
8. Write a formula that adds the number of asterisks in the individual lines of the pattern and assign the **`asterisks`** variable the formula. [Hint: Total number of asterisks depends upon the number of columns of stars! This is a simple formula.]

9. Separated by two blank lines from the above pattern printing, print the following added information to the console arranged exactly as shown in Figure 4:

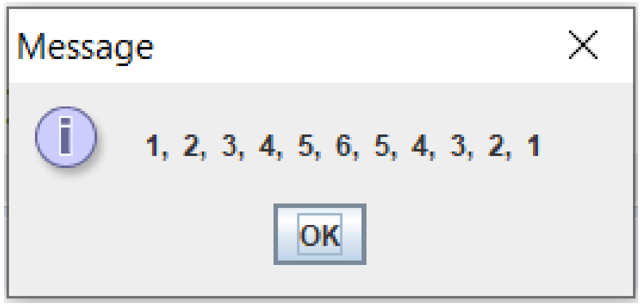
```
The number of * symbols in the lines of the pattern are
1,  2,  3,  4,  5,  6,  5,  4,  3,  2,  1
The total number of * symbols in the pattern is: <place the
value of the variable asterisks here>
```

Figure 4

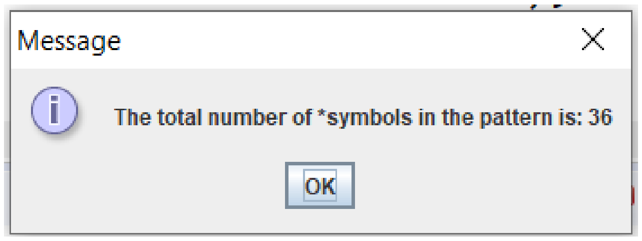
Likewise, use JOptionPane class to display the result in Figure 4 to form the following message dialog boxes in Figure 5.



The number of * symbols in the lines of the pattern are:



1, 2, 3, 4, 5, 6, 5, 4, 3, 2, 1

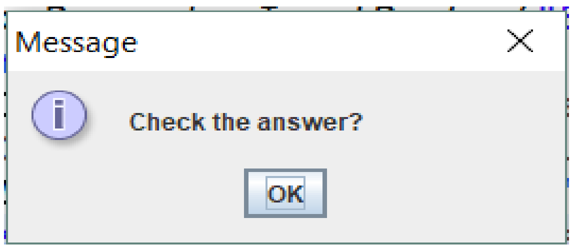


The total number of *symbols in the pattern is: 36

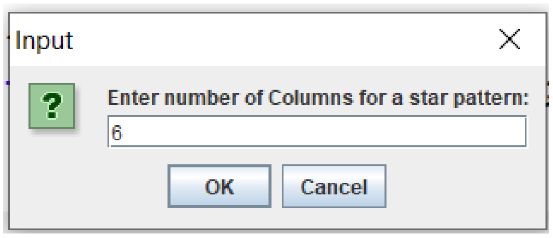
Figure 5.

10. Run your program and see if the second message prints correctly.

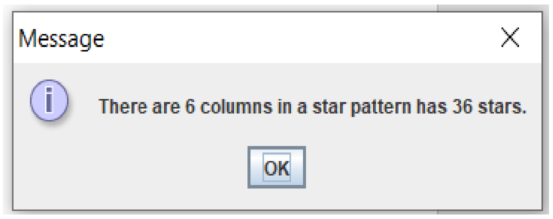
11. In the main() method, use JOptionPane class's showInputDialog method to enter the number of columns for any star pattern (as shown in the top two dialog boxes). Then write a method call statement, which passes the value of the number of columns to the called method for computing the number of asterisks and displaying "There are 6 columns in a star pattern that has 36 stars" (as shown in the third dialog boxes). Use the showMessageDialog to output the following information as shown in Figure 6.



Check the answer?

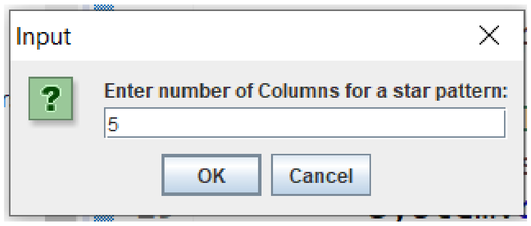


Enter number of Columns for a star pattern:
6

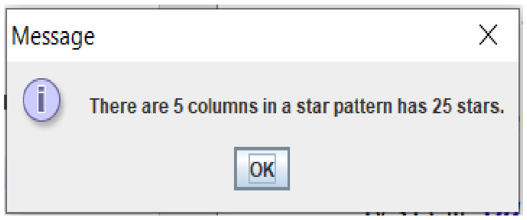


There are 6 columns in a star pattern has 36 stars.

If you enter 5 to the showInputDialog, the called method computes and displays “There are 6 columns in a star pattern that has 25 stars”



Enter number of Columns for a star pattern:
5



There are 5 columns in a star pattern has 25 stars.

Figure 6

12. Ask the GTA or the instructor to verify your active presence in the lab. **Verification is necessary for getting your assignment graded.**

Submit: Zip your project folder and upload the zip file on Brightspace at the designated place.