# Hands-on Experiment # 12: Worksheet

Section\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

No more than 3 students per one submission of this worksheet.

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## Part A: Getting Familiar with Problem (Do not code here)

In this lab, we aim to write a program to draw many geometric shapes (Square, RightTriangle, Triangle) using standards keyboard characters. In order to draw a figure, there are 2 input parameters: character and the number of rows. Assume *rows* is 5,

* For Square, the number of characters in each row and column must be 5.
* For RightTriangle and Triangle, the number of characters is increased by 1 every row (up to 5).

|  |  |  |
| --- | --- | --- |
| \*\*\*\*\* \*\*\*\*\* \*\*\*\*\* \*\*\*\*\* \*\*\*\*\* | % %%  %%%  %%%% %%%%% | #  # #  # # #  # # # #  # # # # # |
| Square | RightTriangle | Triangle |

Assume the size is 6 rows using a character ‘\*’, **draw** the following shapes and **compute** their perimeters and areas.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Square | RightTriangle | Triangle |
| Draw | \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\* | \*  \*\*  \*\*\*  \*\*\*\*  \*\*\*\*\*  \*\*\*\*\*\* | \*  \* \*  \* \* \*  \* \* \* \*  \* \* \* \* \*  \* \* \* \* \* \* |
| Perimeter | 24 | 20.49 | 19.4 |
| Area | 36 | 18 | 18 |

**Draw** the above RightTriangle when it is vertical flip and draw the above Triangle when it is horizontal flip.

|  |  |  |
| --- | --- | --- |
|  | RightTriangle (Vertical Flip) | Triangle (Horizontal Flip) |
| Draw | \*  \*\*  \*\*\*  \*\*\*\*  \*\*\*\*\*  \*\*\*\*\*\* | \* \* \* \* \* \*  \* \* \* \* \*  \* \* \* \*  \* \* \*  \* \*  \* |

Assume we can draw each shape at a position (x, y), where x is an indent (the number of spaces) and y is the starting row. Please draw a rectangle at the position (5, 2) when *rows*=6 and *character*=’\*’. From this example, there are 5 indents (x) and the starting row is 2 (y).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Square | RightTriangle | Triangle |
| Draw | \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\*  \*\*\*\*\*\* | \*  \*\*  \*\*\*  \*\*\*\*  \*\*\*\*\*  \*\*\*\*\*\* | \*  \* \*  \* \* \*  \* \* \* \*  \* \* \* \* \*  \* \* \* \* \* \* |

## Part B: Design Your Class (Do not code here)

The below figure shows a part of the program: Shape and Square. Shape is a superclass of any shapes and there are 2 *protected* variables (rows and character) – represented by the “#” symbol.



Class “Shape”

* There are two properties (variables): *rows* and *character*
* There are 2 constructors.
* There are getter & setter methods for all properties (variables).
* toString() shows all variables’ value; e.g., “rows=5 and character=\*”

Class “Square”

* There are 2 constructors.
* draw(): to draw a square without indent and starting row.
* draw(int x, int y): to draw a square with *x* indents and starting row at *y*.
* getArea() and getPerimeter() to compute area and perimeter of the object.
* toString() shows object’s information; e.g., “Square: rows=5 and character=\*”.

If the variables (*rows* and *character*) in Shape are *private*, can the following code inside Square still be able to compile? If not, why?

|  |
| --- |
| // Inside the Square class  **public** **void** test1(){  **int** side = rows;  } |

No, since the variables are private, those variables can only be accessed in the Shape class.

Write UML diagram of all shapes including: Shape, Square, Triangle, RightTriangle

* In Triangle, there is a variable called “isHorizontalFlip”. If it is true, the figure is horizontal flipped.
  + In order to get and set this variable, there are 2 extra methods: boolean isHorizontalFlip() and void setHorizontalFlip(boolean isHorizontalFlip).
* In RightTriangle, there is a variable called “isVerticalFlip”. If it is true, the figure is vertical flipped.
  + In order to get and set this variable, there are 2 extra methods: boolean isVerticalFlip() and void setVerticalFlip(boolean is VerticalFlip).

## Part C: Coding

Implement all classes based on your design in Part B. What is the result of TestDraw.java (code below)?

|  |
| --- |
| **public** **class** TestDraw {  **public** **static** **void** main(String[] args) {  Triangle head = **new** Triangle(7, '\*');  Square tail = **new** Square(5, '\*');  head.draw();  tail.draw(5, 0);  }  } |

Modify TestDraw.java to draw the following figure.

|  |
| --- |
| #  # #  # # #  # # # #  # # # # #  # # # # # #  # # # # # # #  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  %%%%%%%%%%%%%%%  & &  && &&  &&& &&&  &&&& &&&&  &&&&& &&&&&  &&&&&& &&&&&&  &&&&&&& &&&&&&& |

Include the screenshots below.

List all your source code here.

Submit this worksheet (by only one member of the group) via <http://www.myCourseVille.com> (Assignments > Hands-on Experiment # 12) before noon of the day after your lecture.