A04

Due Date: Wednesday, February 15
File(s) to be submitted: DrawFigures.java
Sample output

Draw Figures (Method)

Summary

For this assignment you are going to write a program that draws some simple figures. The program must be named **DrawFigures**.

This assignment will help you practice the following concepts:

- *void* methods without parameters
- *void* methods with parameters

Steps

1. Your program starts by identifying itself and you (its author).
2. Then it presents a menu of options to the user.

```
Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option:
```

3. After the user selects an option, your program carries out the desired task **by calling a suitable method**.
4. The options are as follows:
   a) **Rectangle**: The program prompts for the symbol, the height, and width of the rectangle and draws it.
   b) **Right triangle**: The program prompts for the symbol and the base and draws a right triangle with the specified base length.
   c) **Upside-down right triangle**: The program prompts for the symbol and the base and draws an upside-down right triangle with the specified base length. It draws a triangle like the method above, but with the widest part at the top. That is, instead of

drawing a line with 1 star, then 2 stars, then 3, ..., and finally a line with `base` stars, you draw a line with `base` stars, then `base - 1` stars, ..., then 2 stars, then 1 star. (Think about how you can change one of the loops to count *down* instead of *up*.)

d) **Isosceles triangle**: The program prompts for the symbol and the height and draws yet another triangle. For example, with the symbol being star, this triangle starts with one star at the top, and increases by two stars each line until the specified number of lines (i.e., height) have been printed. The stars are "centred" one above the other -- like this:

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

Hint: each line of this shape has two more stars than the line above it, but is indented one space less. The last line is not indented at all.

e) **Indented rectangle**: The program prompts for the symbol, the height, width and indent of the rectangle and draws a rectangle of the specified height and width, but indented the specified number of spaces.

Note: Every line needs to have that many spaces at the start of it. Think about what change you need to make to the original drawRectangle code in order to get those spaces at the start of each line.

f) **Fire tree:** The program prompts for the symbol, branches, trunk height and trunk width and draws a tree with the given number of rows of branches, and the given size of trunk. The trunk must be centred below the branches, as much as possible. The branches are an isosceles triangle, and the trunk is an indented rectangle.

5. Each task begins with a brief message saying what it is. Then it prompts the user.
6. For each figure, there should be two methods:

    a. One method has no parameters. It should be called draw*Figure*Option (where *Figure* is replaced with the actual figure name). Its job is to print the description of the figure, and prompt for and read the required information. It then calls the next method.

    b. The other method should be called draw*Figure*. Again *Figure* is replaced with the actual figure name. It takes the required information (height, possibly width, and a symbol), and draws the shape.

7. So, here are the list of methods need to be implemented:
    a) printIntroduction()
    b) drawRectangleOption()

c) drawRightTriangleOption()
d) drawInvertedTriangleOption()
e) drawIsoscelesTriangleOption()
f) drawIndentedRectangleOption()
g) drawTreeOption()
h) drawRectangle(String symbol, int height, int width)
i) drawRightTriangle(String symbol, int base)
j) drawInvertedTriangle(String symbol, int base)
k) drawIsoscelesTriangle(String symbol, int height)
l) drawIndentedRectangle(String symbol, int height, int width, int indent)
m) drawTree(String symbol, int branches, int trunkHeight, int trunkWidth)

Hints

- The symbol used is separated by spaces. Forgetting the spaces will make the figures look squashed from side-to-side. So, each time you print the symbol, add a space after it.
- For some shapes, each line has a number of spaces before the first symbol, and then a bunch of symbols (each with a space after it). Figure out how many spaces are supposed to be on the first line of the figure. (That will usually depend on its height.) How many spaces are on the *next* line? And so on… For each line, before you write the symbols, figure out how many spaces are needed at the start of that line, and use a loop to print out that many spaces.
- The tree should actually be quite easy. You just have to draw a triangle and a rectangle. *You already have methods to do that! AND you should use them!*
- I recommend that you complete the methods in the order listed above. I also recommend that you start with **stubs** of all the methods. That way you can test your main method by running the program and seeing that everything happens in the right order. For a stub, the basic idea is to make the *smallest possible method that compiles*. It generally doesn't do what it's supposed to -- but because it compiles, you can run your driver program.

Grading Outline

- 80% -- Program performs as required.
- 20% -- Submitted material meets the standard requirements.

  Make sure your program code is neat and orderly, and follows the conventions described in the rules for submissions and the style rules, available on Brightspace page for the course.
  Btw, Don’t forget to add Javadocs for the class (program) as well as all methods.

Sample output

First sample (rectangle):

```
Drawing Figures
---------------
by Somayeh Kafaie (A00000000)
This program draws some figures.

Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option: 1↵

Drawing a Rectangle ...

What are height and width of the rectangle? 5 10↵
What character should be used? %↵

% % % % % % % % % %
% % % % % % % % % %
% % % % % % % % % %
% % % % % % % % % %
% % % % % % % % % %
```

Second sample (right triangle):

```
Drawing Figures
----------------
by Somayeh Kafaie (A00000000)
This program draws some figures.

Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option: 2↵

Drawing a Right Triangle ...

What size is the base of the triangle? 10↵
What character should be used? *↵

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

Third sample (upside-down right triangle):

```
Drawing Figures
---------------
by Somayeh Kafaie (A00000000)
This program draws some figures.

Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option: 3↵

Drawing an Upside-down Right Triangle ...

What size is the base of the triangle? 7↵
What character should be used? #↵

# # # # # # #
# # # # # #
# # # # #
# # # #
# # #
# #
#
```

Fourth sample (isosceles triangle):

```
Drawing Figures
---------------
by Somayeh Kafaie (A00000000)
This program draws some figures.

Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option: 4↵

Drawing an Isosceles Triangle ...

What height is the triangle? 8↵
What character should be used? @↵

               @
             @ @ @
           @ @ @ @ @
         @ @ @ @ @ @ @
       @ @ @ @ @ @ @ @ @
     @ @ @ @ @ @ @ @ @ @ @
   @ @ @ @ @ @ @ @ @ @ @ @ @
 @ @ @ @ @ @ @ @ @ @ @ @ @ @ @
```

Fifth sample (indented rectangle):

```
Drawing Figures
---------------
by Somayeh Kafaie (A00000000)
This program draws some figures.

Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option: 5↵

Drawing an Indented Rectangle ...

What are height and width of the rectangle? 10 6↵
What is the size of indentation? 4↵
What character should be used? $↵

    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
    $ $ $ $ $ $
```

Sixth sample (tree):

```
Drawing Figures
---------------
by Somayeh Kafaie (A00000000)
This program draws some figures.

Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option: 6↵

Drawing a Tree ...

What is the size of branches and height and width of trunk? 5 3 3↵
What character should be used? *↵

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

Seventh sample (another tree):

```
Drawing Figures
----------------
by Somayeh Kafaie (A00000000)
This program draws some figures.

Main Menu:
1 Draw a rectangle
2 Draw a right triangle
3 Draw an upside-down right triangle
4 Draw an isosceles triangle
5 Draw an indented rectangle
6 Draw a fire tree

Please select an option: 6↵

Drawing a Tree ...

What is the size of branches and height and width of trunk? 10 6 8↵
What character should be used? &↵

                    &
                  & & &
                & & & & &
              & & & & & & &
            & & & & & & & & &
          & & & & & & & & & & &
        & & & & & & & & & & & & &
      & & & & & & & & & & & & & & &
    & & & & & & & & & & & & & & & & &
  & & & & & & & & & & & & & & & & & & &
& & & & & & & & & & & & & & & & & & & & &
              & & & & & & & &
              & & & & & & & &
              & & & & & & & &
              & & & & & & & &
              & & & & & & & &
              & & & & & & & &
```