Introduction

This program is called "Shape2D." It will teach you about abstract classes and abstract functions. Abstract classes are, well, *abstract*. They cannot be created (*instantiated* is the fancy word). Since the class is abstract it depends on its child classes to be non-abstract or *concrete*. If a parent class has any abstract methods it is up to the concrete child class to implement all of the abstract methods, that is, to provide concrete implementations.

Discussion

This assignment involves 2-dimensional geometric figures where the formulae for perimeter and area were learned in grade school. Just in case you don't remember anything from grade school, the table below gives the formulae.

Shape	Property(s)	Perimeter	Area
Circle	radius	$\pi * 2 * radius$	$\pi * radius^2$
Square	side	4 * side	$side^2$
RightTriangle	base, height	base+height+hypoteneuse	(base * height)/2
Rectangle	length, width	2*(length+width)	length * width

The project Shape2D.zip is incomplete as it stands. It only has `Circle` and `Square` implemented. Your job is to implement `RightTriangle` and `Rectangle`. Each new class should have **two** constructors: a default constructor and one where the property values are passed as parameters.

The default constructor for `RightTriangle` is shown below:

```
RightTriangle() {
      base = 1.0;
      height = 1.0;
}
```

The default constructor for `Rectangle` is shown below:

```
Rectangle() {
      length = 2.0;
      width = 1.0;
}
```

You can program the explicit constructors yourself but you must check that the arguments passed are valid (see `Circle(double r)` or `Square(double s)`. You must also implement a `toString()` method in `RightTriangle` and `Rectangle`.

Note: Raise the `IllegalArgumentException` if any parameter to the constructor is invalid, that is, less than or equal to zero.

Once you've added `RightTriangle` and `Rectangle` classes you must alter 'main' to create one of each object. When you run the program, your output should be something like below:

```
Circle radius: 1.0
Perimeter: 6.283185
Area     : 3.141593

Square side: 1.0
Perimeter: 4.0
Area     : 1.0

Right Triangle base: 1.0 height: 1.0
Perimeter: 3.414214
Area     : 0.5

Rectangle length: 2.0 width: 1.0
Perimeter: 6.0
Area     : 2.0
```

Assignment

When submitting your assignment to Canvas attach the files `Rectangle.java` and `RightTriangle.java`. Also cut/paste the console output into a text file named `output.txt` and attach that also. Finally, write a comment indicating what you learned doing this assignment.