

Assignment 10 (Bonus)

Exercise 1 (5pt)

Write a `Book` class that contains the title and author of a book. Implement the `BookShelf` class that stores a `ArrayList` of books.

Add a method to sort the books (the sorting should first follow the title then the author), and a method to find a particular book.

Exercise 2 (7pt)

Write the `Complex` number class. The class must extend `java.lang.Number`. The conversion to the basic types (e.g., float, double, ...) should be done on the real part.

It should provide

- An empty constructor (initialise the number to 0)
- A constructor with one parameter (real number)
- A constructor with 2 parameters (real and imaginary part)

- `re()` that returns the real part
- `im()` that returns the imaginary part
- `conjugate()` that returns the complex conjugate

- addition, subtraction, and multiplication, with complex numbers or doubles (see https://en.wikipedia.org/wiki/Complex_number#Elementary_operations)

Exercise 3 (5pt)

Implement the `GeometricObject` class (or reuse the one from previous assignment), it should provide

- The `x, y` position

- An empty constructor that initialises it at 0,0
- A constructor that takes the 2 fields

- A method `getArea()` that returns the area
- A method `getPerimeter()` that returns the perimeter

Implement also 3 subclasses (add all necessary fields and methods)

- `Circle`
- `Rectangle`
- `Triangle`

Implement setters for the radius width/height and base/height for the 3 geometric figures and throw the appropriate exception if the values are invalid (e.g., negative).

Exercise 4 (6pt)

Implement the Triangle class. The constructor should take 3 arguments, corresponding to the length of the sides. In a triangle, the sum of any two sides is greater than the other side.

Create the IllegalTriangleException class and make the constructor of the Triangle class throw such exception if the object violates the rule.

Example:

`new Triangle(10, 1, 1)`, violates the rule since $1 + 1 < 10$

Exercise 5 (10pt)

Write a java program that counts that give you the weather forecast for an input zip code. You must use this RSS feed to get the information <http://www.rssweather.com/zipcode/<zip>/rss.php> where <zip> is the zip code. You can use Chrome or Firefox to open the url, right-click to view to page source to have an idea on how the feed looks like. Here is a screenshot to help.

Hint: you should iteratively locate the <item> string then search for title and description.

```
<rss version="2.0" xmlns:content="http://purl.org/rss/1.0/modules/content/">
  <channel>
    <title>New York, NY weather via rssWeather.com</title>
    <link>http://www.rssweather.com/zipcode/10001/wx.php</link>
    <description>
      <![CDATA[Current weather, forecasts and alerts delivered using RSS.
        <h2>Using the Feeds</h2>
        <ul>
          <li>Request Frequency - The feeds are updated once per hour. More frequent requests may result in your access being limited.</li>
          <li>Web Site Usage - If you are using the feed on your web site, you are required to maintain a link to rssWeather.com.</li>
        </ul>]]>
    </description>
    <ttl>60</ttl>
    <generator>rssWeather.com (http://www.rssweather.com/)</generator>
    <language>en</language>
  </channel>
  <item>
    <title>New York, NY Weather :: 64F Fair</title>
    <link>http://www.rssweather.com/zipcode/10001/wx.php</link>
    <category>Current Conditions</category>
    <pubDate>Sun, 03 May 2020 10:51:00 -0400</pubDate>
    <description>64F Fair</description>
    <content:encoded>
      <![CDATA[<div>
        <a href="http://www.rssweather.com/zipcode/10001/wx.php" title="New York, NY Weather Forecast">
          getIconName();" border="0"/>
        </a>
        <span class="sky">Fair</span>
        <span class="temp">64F</span>
      </div>
      <dl style="display: inline;">
        <dt style="display: inline; font-weight: bold;">Humidity:</dt>
        <dd id="humidity" style="display: inline;">65</dd>
        <dt style="display: inline; font-weight: bold;">Wind Speed:</dt>
        <dd id="windspeed" style="display: inline;">8 MPH</dd>
        <dt style="display: inline; font-weight: bold;">Wind Direction:</dt>
        <dd id="winddir" style="display: inline;">West ( 250deg)</dd>
        <dt style="display: inline; font-weight: bold;">Barometer:</dt>
        <dd id="pressure" style="display: inline;">29.82 in.</dd>
        <dt style="display: inline; font-weight: bold;">Dewpoint:</dt>
        <dd id="dewpoint" style="display: inline;">52.06F</dd>
        <dt style="display: inline; font-weight: bold;">Heat Index:</dt>
        <dd id="heatindex" style="display: inline;">89F</dd>
        <dt style="display: inline; font-weight: bold;">Visibility:</dt>
        <dd id="visibility" style="display: inline;">10mi</dd>
      </dl>
    </content:encoded>
    <guid isPermaLink="false">Current-Last Updated on May 3 2020, 10:51 am EDT</guid>
  </item>
  <item>
    <title>Today</title>
    <category>Weather Forecast</category>
    <link>http://www.rssweather.com/zipcode/10001/wx.php</link>
    <description>Mostly sunny, with a high near 75. West wind around 11 mph. </description>
    <pubDate>Sun, 03 May 2020 09:12:50 -0400</pubDate>
    <guid isPermaLink="false">Forecast-3 May 10:51 am EDT-Today</guid>
  </item>
  <item>
    <title>Tonight</title>
    <category>Weather Forecast</category>
    <link>http://www.rssweather.com/zipcode/10001/wx.php</link>
    <description>A 30 percent chance of showers, mainly between 9pm and 2am. Mostly cloudy, with a low around 56. Southwest wind 6 to 8 mph becoming northwest after midnight. </description>
    <pubDate>Sun, 03 May 2020 09:12:50 -0400</pubDate>
    <guid isPermaLink="false">Forecast-3 May 10:51 am EDT-Tonight</guid>
  </item>
  <item>
    <title>Monday</title>
    <category>Weather Forecast</category>
    <link>http://www.rssweather.com/zipcode/10001/wx.php</link>
    <description>Mostly sunny, with a high near 63. Breezy, with a northwest wind 10 to 20 mph. </description>
    <pubDate>Sun, 03 May 2020 09:12:50 -0400</pubDate>
    <guid isPermaLink="false">Forecast-3 May 10:51 am EDT-Monday</guid>
  </item>
  <item>
    <title>Monday Night</title>
    <category>Weather Forecast</category>
    <link>http://www.rssweather.com/zipcode/10001/wx.php</link>
    <description>Mostly clear, with a low around 43. Northwest wind 8 to 16 mph. </description>
    <pubDate>Sun, 03 May 2020 09:12:50 -0400</pubDate>
    <guid isPermaLink="false">Forecast-3 May 10:51 am EDT-Monday Night</guid>
  </item>
</rss>
```

Example of call:

```
> java WeatherForecast 10001
```

Output

Today

Mostly sunny, with a high near 75. West wind around 11 mph.

Tonight

A 30 percent chance of showers, mainly between 9pm and 2am. Mostly cloudy, with a low around 56. Southwest wind 6 to 8 mph becoming northwest after midnight.

Monday

Mostly sunny, with a high near 63. Breezy, with a northwest wind 10 to 20 mph.

Monday Night

Mostly clear, with a low around 43. Northwest wind 8 to 16 mph.

Tuesday

Sunny, with a high near 61. Northwest wind 6 to 9 mph.

Tuesday Night

Mostly cloudy, with a low around 46.

Wednesday

Mostly cloudy, with a high near 59.

Wednesday Night

Mostly cloudy, with a low around 46.

Thursday

A 30 percent chance of showers. Mostly sunny, with a high near 60.

Thursday Night

Partly cloudy, with a low around 45.

Friday

Mostly sunny, with a high near 60.

Friday Night

A 30 percent chance of showers. Mostly cloudy, with a low around 43.

Saturday

Partly sunny, with a high near 56.

Instructions

The solution of the exercises must be provided as a **java** (for the code, do not submit class files), **png** (for eventual screenshot), and **pdf** (for eventual text) files. The **files must be zipped** together before upload.

Assignments not respecting these instructions will be ignored.