

2024 AP DAILY: PRACTICE SESSIONS

AP Computer Science A Session 6 – FRQ (Question 3: Array/ArrayList)

This question involves the analysis of weather data. The following `WeatherData` class has an instance variable, `temperatures`, which contains the daily high temperatures recorded on consecutive days at a particular location. The class also contains methods used to analyze that data. You will write two methods of the `WeatherData` class.

```
public class WeatherData
{
    /** Guaranteed not to be null and to contain only non-null entries */
    private ArrayList<Double> temperatures;

    /**
     * Cleans the data by removing from temperatures all values that are less than
     * lower and all values that are greater than upper, as described in part (a)
     */
    public void cleanData (double lower, double upper)
    { /* to be implemented in part (a) */ }

    /**
     * Returns the length of the longest heat wave found in temperatures, as described in
     * part (b)
     * Precondition: There is at least one heat wave in temperatures based on threshold.
     */
    public int longestHeatWave (double threshold)
    { /* to be implemented in part (b) */ }

    // There may be instance variables, constructors, and methods that are not shown.
}
```

- a. Write the `cleanData` method, which modifies the `temperatures` instance variable by removing all values that are less than the `lower` parameter and all values that are greater than the `upper` parameter. The order of the remaining values in `temperatures` must be maintained.

For example, consider a `WeatherData` object for which `temperatures` contains the following.

| | | | | | | | | | |
|------|-------|------|------|------|------|-------|------|-------|-------|
| 99.1 | 142.0 | 85.0 | 85.1 | 84.6 | 94.3 | 124.9 | 98.0 | 101.0 | 102.5 |
|------|-------|------|------|------|------|-------|------|-------|-------|

The three shaded values shown would be removed by the method call `cleanData (85.0, 120.0)`.

| | | | | | | | | | |
|------|-------|------|------|------|------|-------|------|-------|-------|
| 99.1 | 142.0 | 85.0 | 85.1 | 84.6 | 94.3 | 124.9 | 98.0 | 101.0 | 102.5 |
|------|-------|------|------|------|------|-------|------|-------|-------|

The following shows the contents of `temperatures` after the three shaded values are removed as a result of the method call `cleanData (85.0, 120.0)`.

| | | | | | | |
|------|------|------|------|------|-------|-------|
| 99.1 | 85.0 | 85.1 | 94.3 | 98.0 | 101.0 | 102.5 |
|------|------|------|------|------|-------|-------|

Complete method `cleanData`.

```
/**
 * Cleans the data by removing from temperatures all values that are less than
 * lower and all values that are greater than upper, as described in part (a)
 */
public void cleanData (double lower, double upper)
```

- b. Write the `longestHeatWave` method, which returns the length of the longest heat wave found in the `temperatures` instance variable. A heat wave is a sequence of two or more consecutive days with a daily high temperature greater than the parameter `threshold`. The `temperatures` instance variable is guaranteed to contain at least one heat wave based on the `threshold` parameter.

For example, consider the following contents of `temperatures`.

| | | | | | | | | | | | |
|-------|------|-------|-------|------|-------|------|------|-------|-------|-------|------|
| 100.5 | 98.5 | 102.0 | 103.9 | 87.5 | 105.2 | 90.3 | 94.8 | 109.1 | 102.1 | 107.4 | 93.2 |
|-------|------|-------|-------|------|-------|------|------|-------|-------|-------|------|

In the following sample contents of `temperatures`, all heat waves based on the `threshold` temperature of `100.5` are shaded. The method call `longestHeatWave (100.5)` would return 3, which is the length of the longest heat wave.

| | | | | | | | | | | | |
|-------|------|-------|-------|------|-------|------|------|-------|-------|-------|------|
| 100.5 | 98.5 | 102.0 | 103.9 | 87.5 | 105.2 | 90.3 | 94.8 | 109.1 | 102.1 | 107.4 | 93.2 |
|-------|------|-------|-------|------|-------|------|------|-------|-------|-------|------|

In the following sample contents of `temperatures`, all heat waves based on the `threshold` temperature of `95.2` are shaded. The method call `longestHeatWave (95.2)` would return 4, which is the length of the longest heat wave.

| | | | | | | | | | | | |
|-------|------|-------|-------|------|-------|------|------|-------|-------|-------|------|
| 100.5 | 98.5 | 102.0 | 103.9 | 87.5 | 105.2 | 90.3 | 94.8 | 109.1 | 102.1 | 107.4 | 93.2 |
|-------|------|-------|-------|------|-------|------|------|-------|-------|-------|------|

Complete method `longestHeatWave`.

```
/**
 * Returns the length of the longest heat wave found in temperatures, as
 * described in part (b)
 * Precondition: There is at least one heat wave in temperatures based on
 * threshold.
 */
public int longestHeatWave (double threshold)
```