Assignment A3 - Number Sequence

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October 7, 2022

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A sequence of real numbers can be represented like this:

$a_0, a_1, a_2, \ldots, a_{n-1}, a_n, n \geq 1$

A real number u is an upper bound for the sequence if and only if the following holds:

$u \geq a_i, \text{for } i = 0, 1, 2, \ldots, n-1, n$

A real number l is a lower bound for the sequence if and only if the following holds:

$l \leq a_i, \text{for } i = 0, 1, 2, \ldots, n-1, n$

The sequence is increasing if and only if the following holds:

$a_{i+1} > a_i, \text{for } i = 0, 1, 2, \ldots, n-2, n-1$

The sequence is decreasing if and only if the following holds:

$a_{i+1} < a_i, \text{for } i = 0, 1, 2, \ldots, n-2, n-1$

Files

The file `NumberSequence.java` contains the interface `NumberSequence`. This interface defines a sequence of real numbers.

The file `ArrayNumberSequence.java` contains the class `ArrayNumberSequence`. This class implements the interface `NumberSequence`. The real numbers are stored in an array.

The file `LinkedNumberSequence.java` contains the class `LinkedNumberSequence`. This class implements the interface `NumberSequence`. The real numbers are stored in a sequence of nodes.

The file `NumberSequenceTest.java` is a test program for the classes `ArrayNumberSequence` and `LinkedNumberSequence`. Objects of these classes are created and the methods in the interface `NumberSequence` are called in these objects.

The file `NumberSequenceTestData.txt` contains the printout which is generated on the standard output device upon executing the program `NumberSequenceTest`.

The file `NumberSequenceObject.pdf` shows what objects of the classes `ArrayNumberSequence` and `LinkedNumberSequence` looks like.

Assignment

Make complete the classes `ArrayNumberSequence, LinkedNumberSequence,` and `NumberSequenceTest` so that they meet the given requirements.

Comment

The given programs are not to be altered, only extended. Write your code in the places marked `add code here`.

During development, comment out the declaration `implements NumberSequence` in the classes `ArrayNumberSequence` and `LinkedNumberSequence`. Put the declaration back when all methods in the interface `NumberSequence` are implemented.

While developing, objects of the classes `ArrayNumberSequence` and `LinkedNumberSequence` shall be created in the test program accordingly: `ArrayNumberSequence sequence = new ArrayNumberSequence(realNumbers)` and `LinkedNumberSequence sequence = new LinkedNumberSequence(realNumbers)`. When everything is implemented you switch to the given test program.

As a preparation for this assignment, the provided example program shall be studied. It consists of the following classes: `Queue, ArrayQueue, LinkedQueue,` and `QueueTest`.