(10 marks) You are given files for a double hashing hash table, including JUnit “TestHash.java”.

Your task is to complete code in class **HashIterator**, which represents an iterator that marks a position in a hash table (it uses integer that represents the position). You have to implement the following methods:

* hasNext()
* hasPrevious()
* next()
* previous()

**Hint:** implement hasNext() and next() together.

* Assume that:
  + Actual data in hash table must all be positive numbers.
  + So 0 (which is a default value in integer array) and DELETED (which is -9999 in the given program) can never be actual data in the table.
  + Iterator does not go beyond the leftmost and the rightmost actual data in the array.
* When an iterator is created:
  + It marks the leftmost actual data in the array. For example, if we create an iterator for the hash table that contains array:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 16 | 0 | 0 | 5 | 0 | 0 | 27 | 20 | 0 |

The iterator will mark the array slot that contains 16.

* Method hasNext()
  + It checks that there is a next position to be marked. It does not go beyond the rightmost data in the array.
  + If there is a next position, return true.
  + Otherwise, return false.

For example, in the table above:

* + - If the iterator is marking 16, hasNext() will return true because the next data exists (it is 5).
    - If the iterator is marking 20, hasNext() will return false because there is no more actual data to the right.
* Method hasPrevious()
  + It checks that there is a previous position to be marked. It does not go beyond the leftmost data in the array.
  + If there is a previous position, return true.
  + Otherwise, return false.

For example, in the table above:

* + - If the iterator is marking 27, hasPrevious() will return true because the previous data exists (it is 5).
    - If the iterator is marking 16, hasPrevious() will return false because there is no more actual data to the left.
* Method next()
  + It checks that there is a next position to be marked. It does not go beyond the rightmost data in the array.
  + If there is a next position, mark that position and return data at that position.
  + Otherwise, throw an exception.

For example, in the table

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 16 | 0 | 0 | 5 | 0 | 0 | 27 | 20 | 0 |

* + - If the iterator is marking 16, next() mark the next data (which is 5) and will return 5.
    - If the iterator is marking 20, next() will throw exception because there is no more actual data to the right to be marked.
* Method previous()
  + It checks that there is a previous position to be marked. It does not go beyond the leftmost data in the array.
  + If there is a previous position, store value of the current position first.
  + Then mark the previous position
  + Return the stored value.
  + Otherwise, throw an exception.

For example, in the table

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 16 | 0 | 0 | 5 | 0 | 0 | 27 | 20 | 0 |

* + - If the iterator is marking 27, previous() mark the data 5 and will return 27.
    - If the iterator is marking 16, previous() will throw exception because there is no more actual data to the left to be marked.

How to submit:

* Submit only “HashIterator.java” in MyCourseville.