CSCI 3357: Database System Implementation
Homework Assignment 7
Due Thursday November 2

The SimpleDB record manager only knows how to read files in the forward direction. Your task this week is to make it possible to also read files in reverse. In particular, you should add the following two methods to the class `TableScan`:

- the method `previous()`, which moves to the previous record in the file and returns false if there is no such record;
- the method `afterLast()`, which positions the current record to be after the last record in the file (so that a call to `previous` will position the current record at the last record in the file).

To implement `afterLast`, you will need to be able to position a record page after its last slot. To implement `previous`, you will also need to search a record page backwards. For ease of grading, I would like you to implement these capabilities by writing the following methods in `RecordPage`:

- the method `slots()`, which returns the number of slots in the page;
- the method `nextBefore(int slot)`, which returns the next used slot before the specified one, or -1 if no such slot exists.

You are, of course, free to implement other private methods in either class.

You should assume that the first block of a file is block 0, and the last block is block `s-1`, where `s` is the size of the file. Your code can find the size of file `f` by calling the method `tx.size(f)`.

Your changes to `RecordPage` should begin from the version you wrote for HW6. Be careful when writing `nextBefore` — Remember that the null-value flags are now part of the empty/inuse integer. If you need a working version of the *RecordPage.java*, email me.

I would like you to make one additional change to `TableScan`, which is to add methods to allow table scans to understand null values. The following methods will work; please add them to your file.

```
public boolean isNull(String fldname) {
     return rp.isNull(currentslot, fldname);
}

public void setNull(String fldname) {
     rp.setNull(currentslot, fldname);
}
```

You can use my class `HW7Test` to help verify that your code works. I suggest that you simplify or rewrite it during debugging, so that you can test features incrementally.

When you are done, create a zip file containing *RecordPage.java* and *TableScan.java*, and submit it Canvas.