Slide 1

Administrivia

- Reminder: Quiz 6 next Tuesday.
- Homework 7 due dates posted (next Thursday for design, the following week for code).

Slide 2

Sorted Binary Trees (Binary Search Trees) — Recap

- Key property — everything in the left subtree is smaller than the root, and everything in the right is bigger.
- Why is this useful? If you want a data structure to hold a collection that will be searched frequently, what are the choices? this one may be better than the others.
- We sketched code for `add` and `find` last time. How about `remove`? It's trickier . . .

Slide 3

Priority Queues, Revisited

- Several data structures we could use to implement priority queue ADT:
  - Unsorted linked list.
  - Sorted linked list.
  - Sorted binary tree.

  Compare how much work to add/remove if N elements. Can we do better? Maybe!

Slide 4

Heaps

- Heap is another tree-based data structure, with two properties:
  - A node is always "bigger than" both its children.
  - Tree is "complete".
- For a priority queue, we want to retrieve the "biggest" thing (for game problem, smallest update time). Does this seem useful?
- Note also that we can store a complete binary tree in an array.
- How to insert and remove? Compare running times.

Slide 5

Homework 7

- Homework 7 asks you to do another implementation of the game priority queue and compare its performance with the first one.
- The mechanism for doing this involves using command-line arguments. So, a short discussion . . .

Slide 6

Command-Line Arguments

- Many mechanisms for starting programs provide a way of passing them information without using files or standard input — "command-line arguments". Example — when you type at the command line

```
ls -l myfile
```

`-l` and `myfile` are passed to the `ls` in this way.

- C programs can receive command-line arguments by declaring `main` as

```
int main(int argc, char *argv[])
```

or equivalent, where `argc` is the number of arguments and `argv` is an array of C-style strings. By convention the zero-th argument is something identifying the program (e.g., its name). So in the `ls` example above, there would be three arguments . . .

Slide 7

Command-Line Arguments, Continued

- Java `main` methods also receive command-line arguments via arguments passed to `main`. `main` must always be declared with an argument of type `String[]`, which is a Java array containing the arguments. A Java equivalent of `ls` would get only two arguments for the example of the previous slide.
- Eclipse unfortunately doesn't make it that easy to invoke programs with command-line arguments that vary from execution to execution, but it's possible. An alternative is to run the program from the command line:

  ```
  java MainClass arg1 arg2
  ```

  or for your game something like

  ```
  java -classpath bin:PAD2.jar MainClass arg1
  arg2
  ```

  (Replace ":" with ";" on Windows.)

Slide 8

Minute Essay

- Sketch what a sorted binary tree of integers would look like after adding the following:

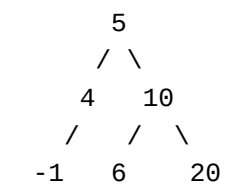
  5, 4, -1, 10, 6, 20.

- Now sketch what a heap of integers (ordered to put smallest values at the top) would look like after adding the same values.
- (And best wishes for a good holiday!)

Slide 9

Minute Essay Answer

- The BST:



- The heap: