Quiz 7

(solutions)

1. What is the worst-case runtime complexity (in big-Oh notation) of insertion into a binary heap with \( N \) elements?

\( O(\log N) \)

2. What is the worst-time runtime complexity of building (by insertion) a binary heap with \( N \) elements?

\( O(N \log N) \)

3. What is the height (in big-Oh notation) of a binary heap with \( N \) elements?

\( O(\log N) \)

4. What is the worst-time runtime complexity of sorting an array of \( N \) elements using heapsort?

\( O(N \log N) \)

5. What is the worst-time runtime complexity of finding the largest element in a min-heap with \( N \) elements?

\( O(N) \)

6. Consider the following max-heap. Show how to store the max-heap in the array below

```
  91
 /   \
62   83
 /  \
50  22
 /  \
37 11
|
44
```

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td>91</td>
<td>62</td>
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<td>11</td>
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</tr>
</tbody>
</table>
7. Given a sequence of numbers: **19, 6, 8, 11, 4, 5**

   a) Draw a binary min-heap (in a tree form) by inserting the above numbers reading them from left to right

```
          4
         / \
        6   5
       / \ / /
      19 11 8
```

   b) Show a tree that can be the result after the call to deleteMin() on the above heap

```
          5
         / \
        6   8
       / \ / /
      19 11 19
```

   c) Show a tree after another call to deleteMin()

```
          6
         / \
        11 8
       /   
      19
```