Feedback — Priority Queues

```
To specify an array or sequence of values in an answer, separate the values in
the sequence by whitespace. For example, if the question asks for the first
ten powers of two (starting at 1), then the following answer is acceptable:

    1 2 4 8 16 32 64 128 256 512

If you wish to discuss a particular question and answer in the forums, please
post the entire question and answer, including the seed (which can be used by
the course staff to uniquely identify the question) and the explanation (which
contains the correct answer).
```

Question 1

```
(seed = 499026)
Give the sequence of the keys in the array that results after
inserting the sequence of 3 keys

    46 44 16
```

into the following maximum-oriented binary heap of size 10:

```
95 77 82 67 70 71 72 25 26 32
```

Your answer should be a sequence of 13 integers, separated by whitespace.

You entered:

95 77 82 67 70 71 72 25 26 32 46 44 16

Your Answer		Score	Explanation
95 77 82 67 70 71 72 25 26 32 46 44 16	✔	1.00	
Total		1.00 / 1.00	

Question Explanation

The correct answer is: 95 77 82 67 70 71 72 25 26 32 46 44 16

Here is the sequence of keys in the array after each insertion:

```
    95 77 82 67 70 71 72 25 26 32
46: 95 77 82 67 70 71 72 25 26 32 46
44: 95 77 82 67 70 71 72 25 26 32 46 44
16: 95 77 82 67 70 71 72 25 26 32 46 44 16
```

Question 2

(seed = 923683)
Give the sequence of keys in the array that results after performing 3
successive delete-the-max operations on the following maximum-oriented binary heap
of size 10:

    92 90 74 41 51 17 34 37 20 35

Your answer should be a sequence of 7 integers, separated by whitespace.

You entered:

51 41 34 37 35 17 20

Your Answer		Score	Explanation
51 41 34 37 35 17 20	✔	1.00	
Total		1.00 / 1.00	

Question Explanation

The correct answer is: 51 41 34 37 35 17 20

Here is the sequence of keys in the array after each deletion:

            92 90 74 41 51 17 34 37 20 35

```
[ 92 deleted ]  90 51 74 41 35 17 34 37 20
[ 90 deleted ]  74 51 34 41 35 17 20 37
[ 74 deleted ]  51 41 34 37 35 17 20
```

Question 3

Your Answer	Score	Explanation
☑ The number of leaf nodes (nodes with 0 children) in a binary heap containing N keys is ~ 1/2 N.	✔ 0.20	Every time you add 2 nodes, it increases the number of leaves by 1.
☑ In the best case, deleting the maximum key from a binary heap containing N >= 100 distinct keys can take as few as 4 compares.	✔ 0.20	Consider a complete heap on 127 nodes. Suppose the root contains the key 127, the left subtree contains 126 and 1-62; the right subtree contains 63-125. Then, when the maximum key is deleted, some key larger than 62 is exchanged with the root. Two compares are performed: one to determine that 126 is the larger child and one to determine that this child is larger than the current root. This triggers an exchange and two more compares to verify that heap order has been restored.
☐ In the best case, The number of compares to heapsort an array of N distinct keys is linear.	✔ 0.20	The best case running time of heapsort is ~ N lg N when the N keys are distinct. Proving this fact is not easy.

☐ Given two binary heaps, each of size N, any algorithm for constructing a single binary heap containing all 2N keys requires a linearithmic number of compares (or worse).	✔	0.20	We can construct a heap in linear time - ignore the order of the keys in the two heaps and use the bottom-up heap construction algorithm.
☑ The minimum height of a complete binary tree with N nodes is ~ lg N.	✔	0.20	The height is exactly floor(lg N).
Total		1.00 / 1.00	