# Feedback — Quicksort

Help Center

You submitted this quiz on **Mon 21 Sep 2015 7:54 PM EDT**. You got a score of **2.80** out of **3.00**. You can attempt again, if you'd like.

```
To specify an array or sequence of values in an answer, separate the value
s in
the sequence by whitespace. For example, if the question asks for the firs
t
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, ple
ase
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 (w
hich
contains the correct answer).
```

## Question 1

```
(seed = 103513)
Give the array that results after applying the standard 2-way partitioning
subroutine from lecture to the following array:

    32 39 45 29 54 42 69 26 57 10 47 20

Your answer should be a sequence of 12 integers, separated by whitespace.

Recall, in the standard 2-way partitioning subroutine, the leftmost entry i
s the partitioning item.
```

**You entered:**

```
26  20  10  29  32  42  69  54  57  45  47  39
```

| Your Answer | | Score | Explanation |
|---|---|---|---|
| 26 20 10 29 32 42 69 54 57 45 47 39 | ✓ | 1.00 | |
| Total | | 1.00 / 1.00 | |

**Question Explanation**

```
The correct answer is: 26 20 10 29 32 42 69 54 57 45 47 39

Here is the array before and after each exchange:

  i   j    0   1   2   3   4   5   6   7   8   9  10  11
--------------------------------------------------------
  0  12   32  39  45  29  54  42  69  26  57  10  47  20
  1  11   32  39  45  29  54  42  69  26  57  10  47  20
  1  11   32  20  45  29  54  42  69  26  57  10  47  39
  2   9   32  20  45  29  54  42  69  26  57  10  47  39
  2   9   32  20  10  29  54  42  69  26  57  45  47  39
  4   7   32  20  10  29  54  42  69  26  57  45  47  39
  4   7   32  20  10  29  26  42  69  54  57  45  47  39
  5   4   26  20  10  29  32  42  69  54  57  45  47  39
      4   26  20  10  29  32  42  69  54  57  45  47  39
```

# Question 2

```
(seed = 528346)
Give the array that results after applying Dijkstra's 3-way partitioning
subroutine from lecture to the following array:

    56 31 42 79 66 21 56 56 90 93

Your answer should be a sequence of 10 integers, separated by whitespace.
```

**You entered:**

```
31   42   21   56   56   56   66   90   93   79
```

| Your Answer | | Score | Explanation |
|---|---|---|---|
| 31 42 21 56 56 56 66 90 93 79 | ✓ | 1.00 | |
| Total | | 1.00 / 1.00 | |

**Question Explanation**

```
The correct answer is: 31 42 21 56 56 56 66 90 93 79

Here is the array after each iteration:

 lt   i  gt    0   1   2   3   4   5   6   7   8   9
----------------------------------------------------
  0   0   9   56  31  42  79  66  21  56  56  90  93
  0   1   9   56  31  42  79  66  21  56  56  90  93
  1   2   9   31  56  42  79  66  21  56  56  90  93
  2   3   9   31  42  56  79  66  21  56  56  90  93
  2   3   8   31  42  56  93  66  21  56  56  90  79
  2   3   7   31  42  56  90  66  21  56  56  93  79
  2   3   6   31  42  56  56  66  21  56  90  93  79
  2   4   6   31  42  56  56  66  21  56  90  93  79
  2   4   5   31  42  56  56  56  21  66  90  93  79
  2   5   5   31  42  56  56  56  21  66  90  93  79
  3   6   5   31  42  21  56  56  56  66  90  93  79
  3       5   31  42  21  56  56  56  66  90  93  79
```

# Question 3

```
(seed = 703444)
Which of the following statements about quicksort are true? Check all that
apply. Unless otherwise specified, assume that quicksort refers to the recu
rsive, randomized version of quicksort (with no extra optimizations) and us
es the 2-way partitioning algorithm described in lecture.
```

| Your Answer | | Score | Explanation |
|---|---|---|---|
| ☑ Suppose that quicksort is modified to use an explicit stack instead of recursion and to always recur on the subarray with fewer items before the subarray with more items. Then, the order of growth of the maximum size of the stack is log N in the worst case. | ✓ | 0.20 | The size of each subarray on the stack is at least half as small as the subarray from which it was derived. Thus, the number of elements can be no larger than ~ 2 lg N. |
| ☐ The expected number of compares to quicksort an array of N distinct keys depends only on the size of the array (and not the items in the array). | ✗ | 0.00 | The random shuffle ensures this. |
| ☐ Suppose that quicksort is modified to use an explicit stack instead of recursion and to always recur on the subarray with more items before the subarray with fewer items. Then, the order of growth of the maximum size of t | ✓ | 0.20 | It will be linear if the array is sorted (after the random shuffle). We note that if the modified algorithm always chooses the subarray with *more* elements first, then the maximum size will be logarithmic. |

| | | | |
|---|---|---|---|
| he stack is log N in the worst case. | | | |
| □ The expected number of compares to quicksort an array of N keys (not necessarily all distinct) depends only on the size of the array (and not the items in the array). | ✓ | 0.20 | If all the keys are distinct, it is ~ 2 N ln N; if the keys are all equal, it is ~ N lg N. |
| ☑ The number of compares to 3-way quicksort an array of N items with only two distinct keys is linear. | ✓ | 0.20 | The number of partitioning steps is no larger than the number of distinct keys. |
| Total | | 0.80 / 1.00 | |

**Question Explanation**