Feedback — Elementary Sorts

You submitted this quiz on **Sun 13 Sep 2015 6:40 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 acceptabl
e:

    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 = 468780)
Give the array that results after the first 4 exchanges when selection sort
ing the
following array:

    53 35 98 11 46 60 42 39 47 24

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

You entered:

11 24 35 39 46 60 42 53 47 98

Your Answer	Score	Explanation
11 24 35 39 46 60 42 53 47 98	✔ 1.00	
Total	1.00 / 1.00	

Question Explanation

```
The correct answer is: 11 24 35 39 46 60 42 53 47 98

Here is the array after each exchange:

   53 35 98 11 46 60 42 39 47 24
1: 11 35 98 53 46 60 42 39 47 24
2: 11 24 98 53 46 60 42 39 47 35
3: 11 24 35 53 46 60 42 39 47 98
4: 11 24 35 39 46 60 42 53 47 98
```

Question 2

```
(seed = 644712)
```
The column on the left contains an input array of 16 strings to be sorted;
the column
on the right contains the strings in sorted order; each of the other 6 colu
mns contains
the array at some intermediate step during either insertion sort, selection
sort, or shellsort
(with different columns potentially corresponding to different algorithms).

herb	herb	bole	bole	bole	bone	bole	bole
pear	flax	bone	bone	bone	dusk	flax	bone
bone	bone	dusk	cyan	cyan	herb	bone	cyan
pink	pink	herb	dusk	dusk	leaf	cyan	dusk
plum	plum	leaf	flax	flax	pear	herb	flax
leaf	leaf	mist	herb	herb	pink	leaf	herb
dusk	dusk	pear	leaf	leaf	plum	dusk	leaf
puce	puce	pink	mint	mint	puce	mint	mint
bole	bole	plum	pink	mist	bole	palm	mist
mist	mist	puce	mist	palm	mist	mist	palm

```
    ruby   ruby   ruby   ruby   pear   ruby   pear   pear
    mint   mint   mint   puce   puce   mint   pink   pink
    palm   palm   palm   palm   pink   palm   plum   plum
    sand   sand   sand   sand   sand   sand   sand   puce
    flax   pear   flax   plum   plum   flax   ruby   ruby
    cyan   cyan   cyan   pear   ruby   cyan   puce   sand
    ----   ----   ----   ----   ----   ----   ----   ----
     0      ?      ?      ?      ?      ?      ?      4
```

Match up each column with the corresponding sorting algorithm from the give
n list:

    0. Original input
    1. Insertion sort
    2. Selection sort
    3. Shellsort (3x + 1 increments)
    4. Sorted

You should use each choice at least once. Your answer should be a sequence
of 8 integers
between 0 and 4 (starting with 0 and ending with 4), separated by whitespac
e.

Hint: think about algorithm invariants. Do not trace code.

You entered:

```
0 3 1 2 2 1 3 4
```

Your Answer		Score	Explanation
0	✔	0.12	
3	✔	0.12	
1	✔	0.12	
2	✔	0.12	
2	✔	0.12	
1	✔	0.12	
3	✔	0.12	

| 4 | ✔ | 0.12 |

| Total | | 1.00 / 1.00 |

Question Explanation

```
The correct answer is: 0 3 1 2 2 1 3 4

 0: Original input
 3: Shellsort after 13-sorting
 1: Insertion sort after 11 iterations
 2: Selection sort after 8 iterations
 2: Selection sort after 11 iterations
 1: Insertion sort after 8 iterations
 3: Shellsort after 4-sorting
 4: Sorted
```

Question 3

```
(seed = 820030)
Which of the following statements about elementary sorting algorithms are t
rue? Check all that apply. Unless otherwise specified, assume that the sort
ing implementations are the ones from the lectures.
```

Your Answer	Score	Explanation
☐ The number of compares to insertion sort an array of N distinct keys is equal to the number of inv	✔ 0.20	The number of compares = number of inversions + (N-1).

ersions
in the a
rray.

☑   ✔   0.20   The number of inversions is (N/2)*(N/2) = 1/4 N^2. Thus, the
The numb   number of compares is ~ 1/4 N^2.
er of co
mpares t
o insert
ion sort
an array
of N/2 1
s follow
ed by
N/2 0s
(e.g., 1
1 1 1 1
0 0 0 0
0) is ~
1/4 N^2.

☑   ✖   0.00   The number of inversions is 0 + 2 + 4 + 6 + ... + (N-2) ~ 1/4 N^2.
The numb   Thus, the number of compares is ~ 1/4 N^2.
er of co
mpares t
o insert
ion sort
an array
of N/2 k
eys in s
trictly
increasi
ng order
followed
by the s
ame N/2
keys in
strictly
decreasi
ng order
(e.g., 0
1 2 3 4
4 3 2 1
0) is
~1/8
N^2.

☐ The expe cted num ber of c ompares to inser tion sor t an arr ay conta ining N/2 0s a nd N/2 1 s in uni formly r andom or der is ~ 1/2 N^2.	✔ 0.20	Consider element i > 0. How many of the items a[0], a[1], ..., a[i-1] is a[i] inverted with? If a[i] = 1 (which happens with probability 1/2), then the number is 0. If a[i] = 0 (which happens with probability 1/2), then we expect half of the i previous elements to be 1s, so the expected number is i/2. So, the expected number of inversions is 1/2(0/2 + 1/2 + 2/2 + 3/2 + ... + (N-1)/2) ~ N^2/8. Thus, the expected number of compares is ~ 1/8 N^2.
☑ Let a[] be an ar ray cont aining N distinct keys wit h N ≥ 4. Then, ex changing two item s can de crease t he numbe r of inv ersions by stric tly more than N.	✔ 0.20	Consider the array { N, 2, 3, 4, ..., 1 }, which has 2N-3 inversions. Exchanging N and 1 results in the array { 1, 2, 3, ..., N }, which has zero inversions.

Total	0.80 / 1.00

Question Explanation