Hannah Cebulla & Hannah Madsen

1.

SORT	ELAPSED TIME
Selection Sort	0.026
Insertion Sort	0.041
Shell Sort	0.045

2.

3.

Running time = a * O(N)

Selection Sort:

$0.026 = a * O(N^2)$

$0.026 = a * 5000^2$

$0.026/5000^2 = a$

$1.04 \times 10^{-9} = a$

Insertion Sort:

$0.041 = a * O(N^2)$

$0.041 = a * 5000^2$

$0.041/5000^2 = a$

$1.64 \times 10^{-9} = a$

Shell Sort:

$0.045 = a * O(n\log(n))$

$0.045 = a * 5000*\log(5000)$

$0.045/(5000*\log(5000)) = a$

$2.4 \times 10^{-6} = a$

Performance of each sorting algorithm:

Selection:

$RT = 1.04 \times 10^{-9} * 10{,}000^2$

RT = **0.104**

Insertion:

$RT = 1.64 \times 10^{-9} * 10{,}000^2$

RT = **0.164**

Shell:

$RT = 2.4 \times 10^{-6} * 10{,}000\log(10{,}000)$

RT = **240**

4. **4 Sort:**

E Q (indices 0 & 4) - no swap
A U (indices 1 & 5) - no swap
S E (indices 2 & 6) - SWAP
Y S (indices 3 & 7) - SWAP
Q T (indices 4 & 8) - no swap
U I (indices 5 & 9) - SWAP
S O (indices 6 & 10) - SWAP
Y N (indices 7 & 11) - SWAP

RESULT AFTER 4 SORT: E A E S Q I O N T U S Y

The shell sort then runs a 1 sort, which is the same as an insertion sort.

E A - SWAP
E E - no swap
E S - no swap
S Q - SWAP
S I - SWAP
S O - SWAP
S N - SWAP
S T - no swap
T U - no swap
U S - SWAP
U Y - no swap
(start from beginning)
No swaps are made until comparison of Q I - SWAP
Q O - SWAP
Q N - SWAP
No other swaps are made until it starts at beginning again and O N are compared (SWAP)

FINAL RESULT: A E E I N O Q S S T U Y

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