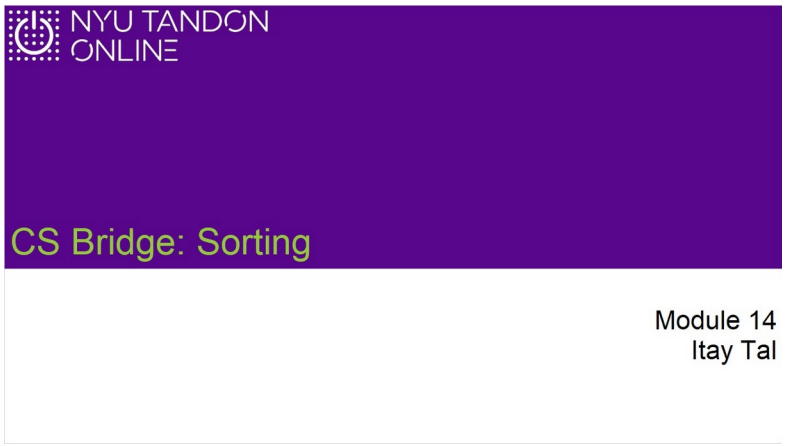
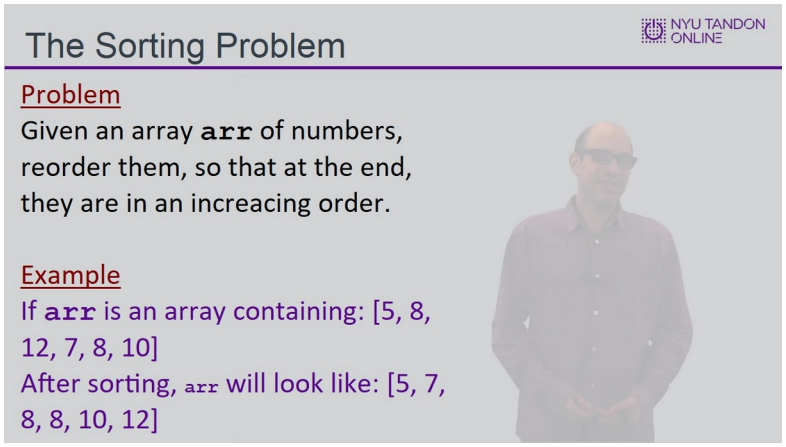
CS Bridge Module 14 Sorting

1. Sorting Problem Definition

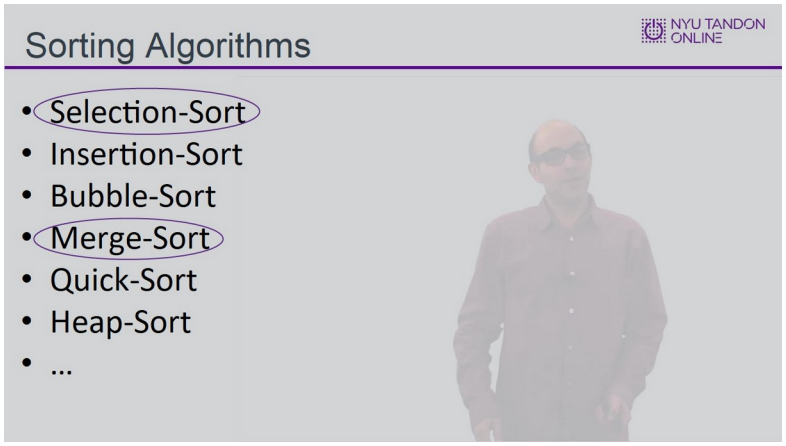
1.1 CS Bridge: Sorting



1.2 The Sorting Problem

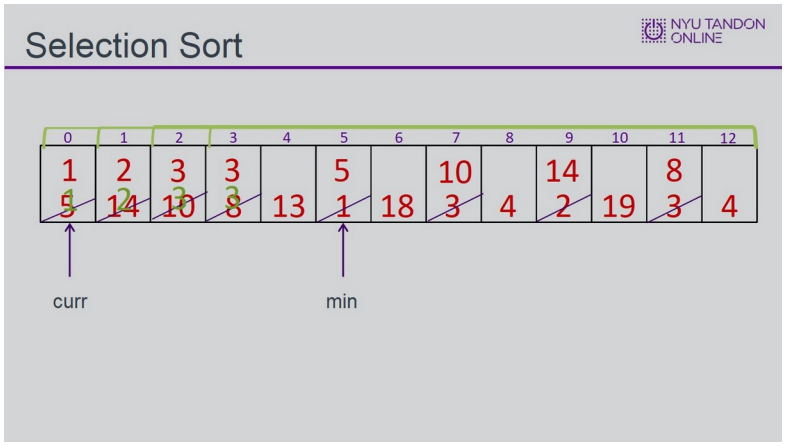


1.3 Sorting Algorithms

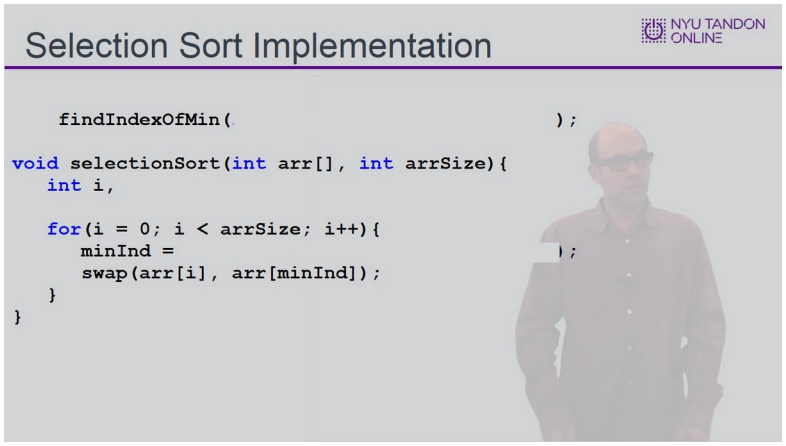


2. Selection Sort

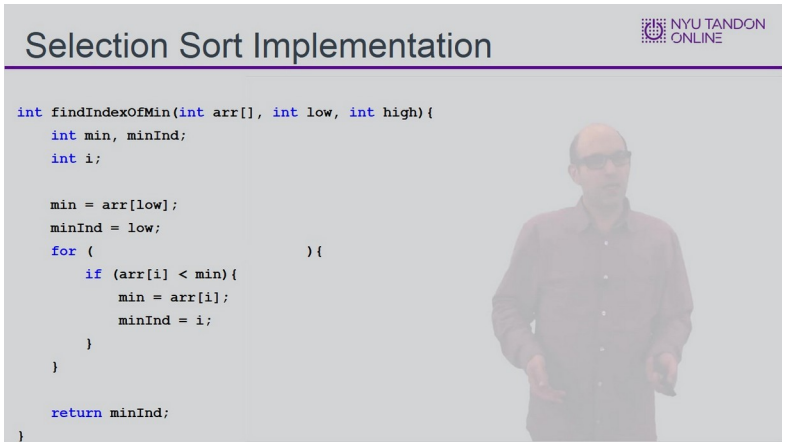
2.1 Selection Sort



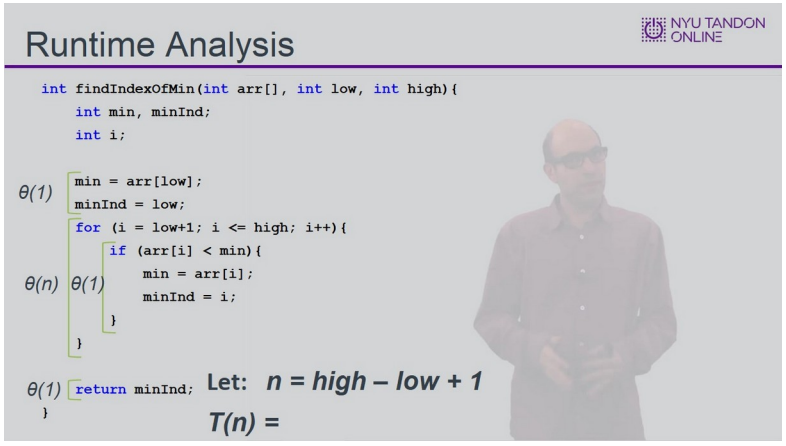
2.2 Selection Sort Implementation



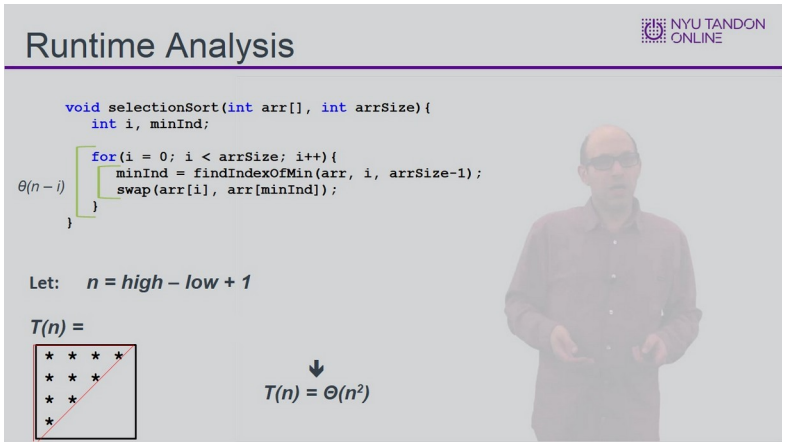
2.3 Selection Sort Implementation



2.4 Runtime Analysis

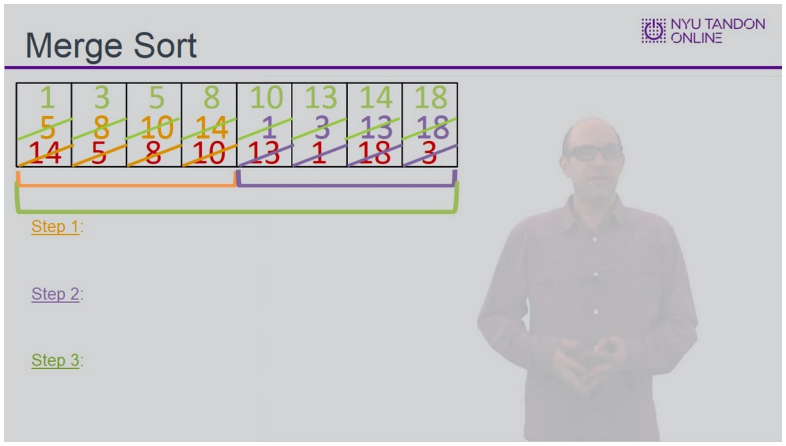


2.5 Runtime Analysis



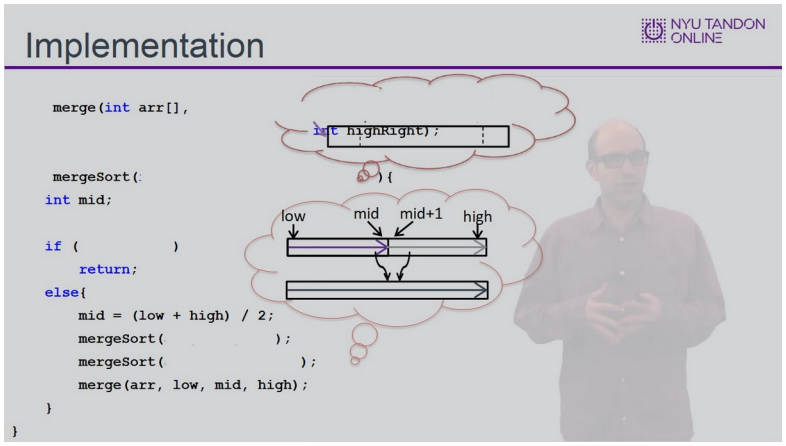
3. Merge Sort

3.1 Merge Sort

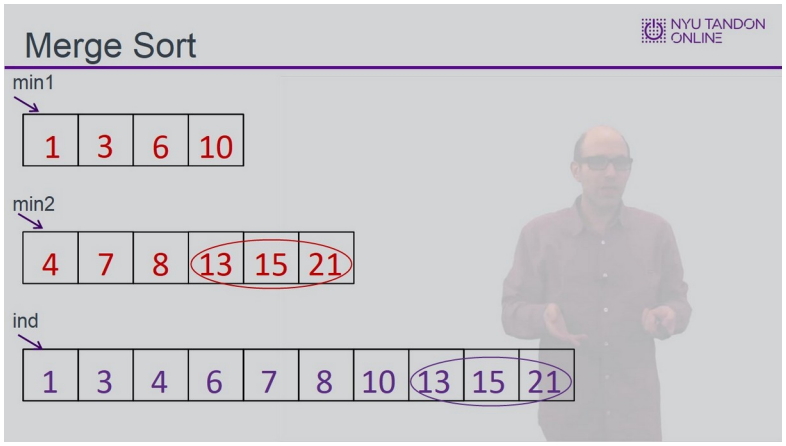


Notes:

3.2 Implementation

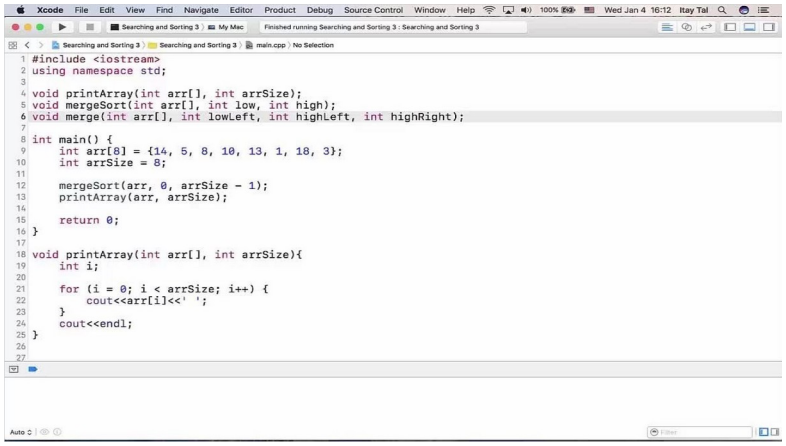


3.3 Merge Sort



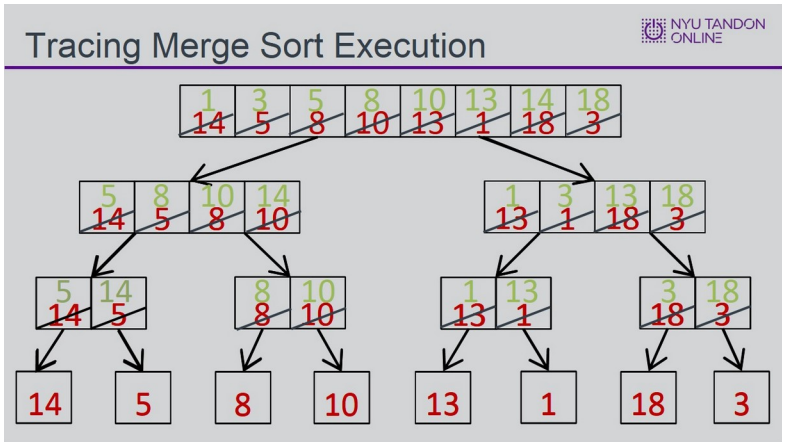
Notes:

3.4 Merge Sort Implementation

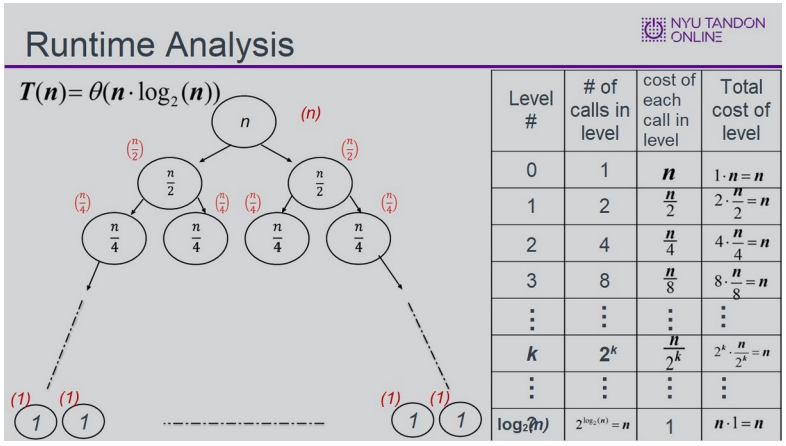


```
#include <iostream>
using namespace std;

void printArray(int arr[], int arrSize);
void mergeSort(int arr[], int low, int high);
void merge(int arr[], int lowLeft, int highLeft, int highRight);

int main() {
    int arr[8] = {14, 5, 8, 10, 13, 1, 18, 3};
    int arrSize = 8;

    mergeSort(arr, 0, arrSize - 1);
    printArray(arr, arrSize);

    return 0;
}

void printArray(int arr[], int arrSize){
    int i;

    for (i = 0; i < arrSize; i++) {
        cout<<arr[i]<<' ';
    }
    cout<<endl;
}
```

3.5 Tracing Merge Sort Execution



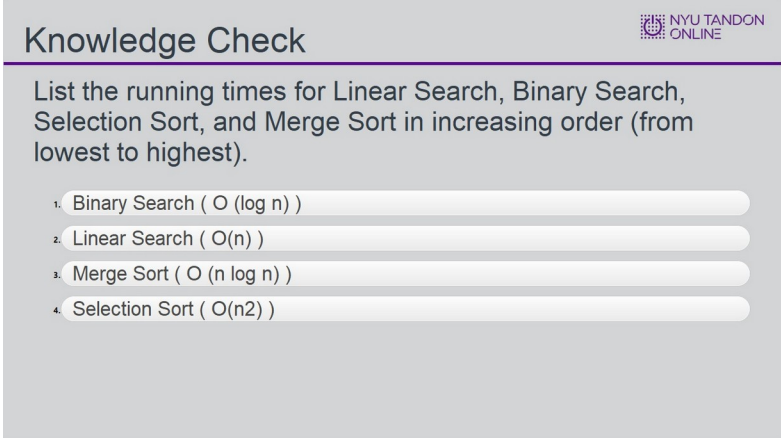
3.6 Runtime Analysis



Level #	# of calls in level	cost of each call in level	Total cost of level
0	1	n	$1 \cdot n = n$
1	2	$\frac{n}{2}$	$2 \cdot \frac{n}{2} = n$
2	4	$\frac{n}{4}$	$4 \cdot \frac{n}{4} = n$
3	8	$\frac{n}{8}$	$8 \cdot \frac{n}{8} = n$
⋮	⋮	⋮	⋮
k	2^k	$\frac{n}{2^k}$	$2^k \cdot \frac{n}{2^k} = n$
⋮	⋮	⋮	⋮
$\log_2(n)$	$2^{\log_2(n)} = n$	1	$n \cdot 1 = n$

3.7 Knowledge Check

(Sequence Drag-and-Drop, 10 points, 3 attempts permitted)



Correct Order
Binary Search (O (log n))
Linear Search (O(n))
Merge Sort (O (n log n))
Selection Sort (O(n2))

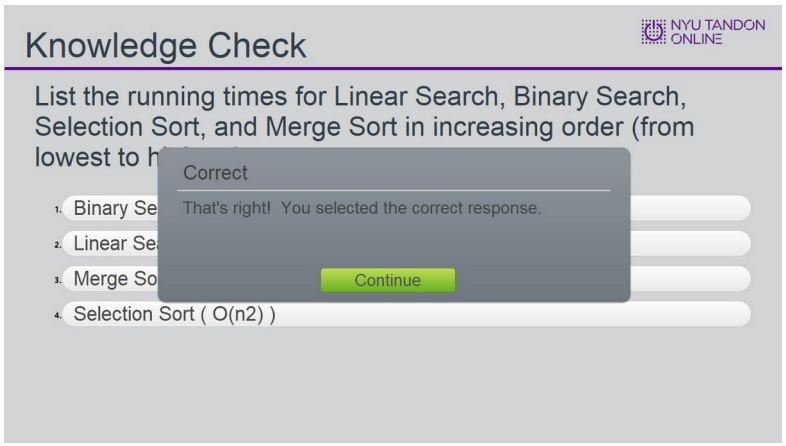
Feedback when correct:

That's right! You selected the correct response.

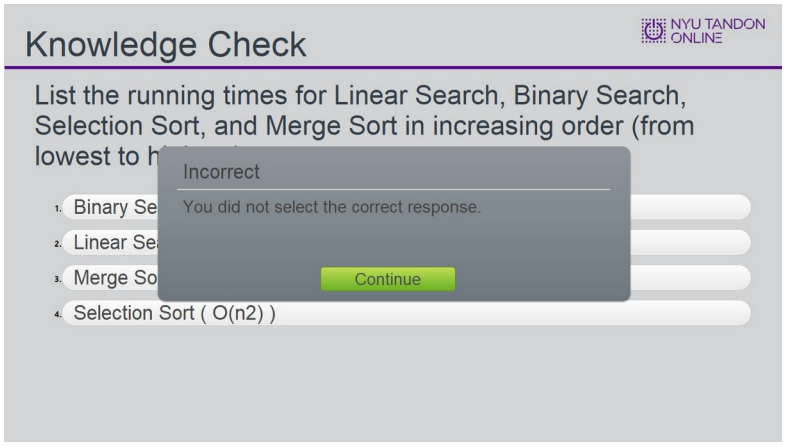
Feedback when incorrect:

You did not select the correct response.

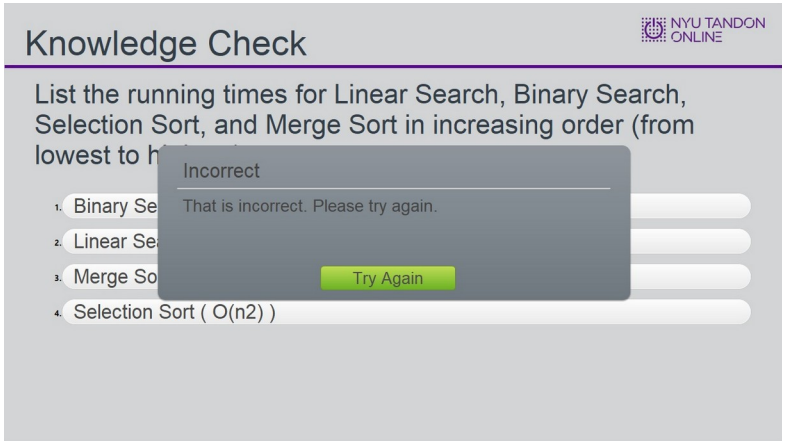
Correct (Slide Layer)



Incorrect (Slide Layer)

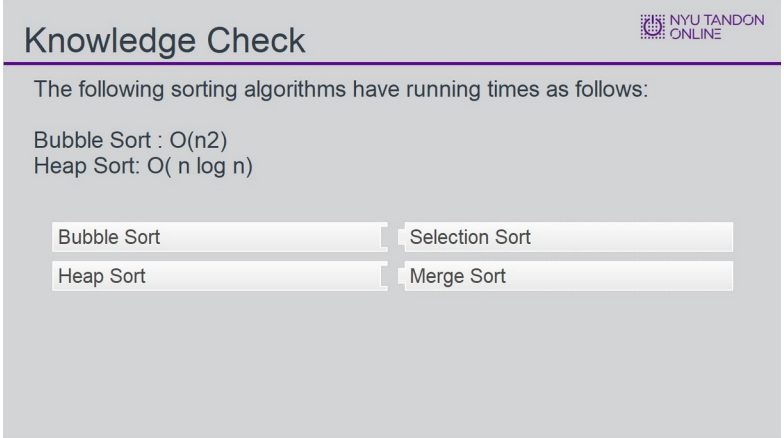


Try Again (Slide Layer)



3.8 Knowledge Check

(Matching Drag-and-Drop, 10 points, 2 attempts permitted)



Correct	Choice
Bubble Sort	Selection Sort
Heap Sort	Merge Sort

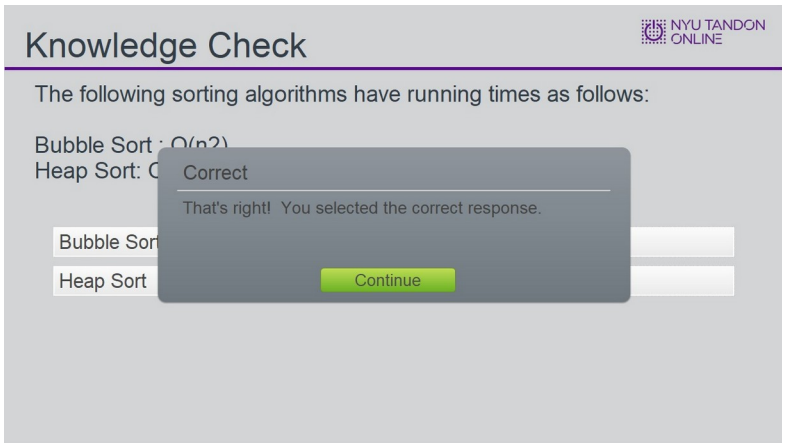
Feedback when correct:

That's right! You selected the correct response.

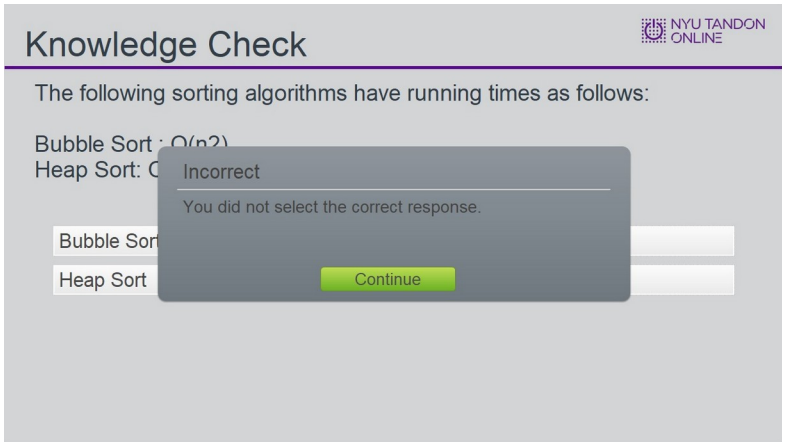
Feedback when incorrect:

You did not select the correct response.

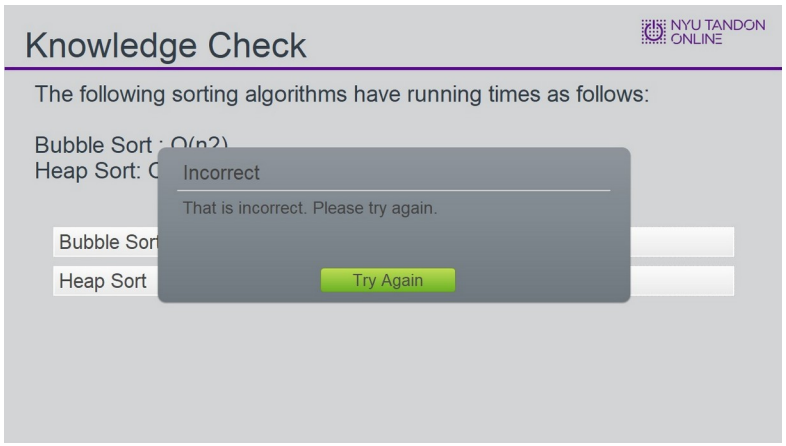
Correct (Slide Layer)



Incorrect (Slide Layer)



Try Again (Slide Layer)



3.9 End of Module