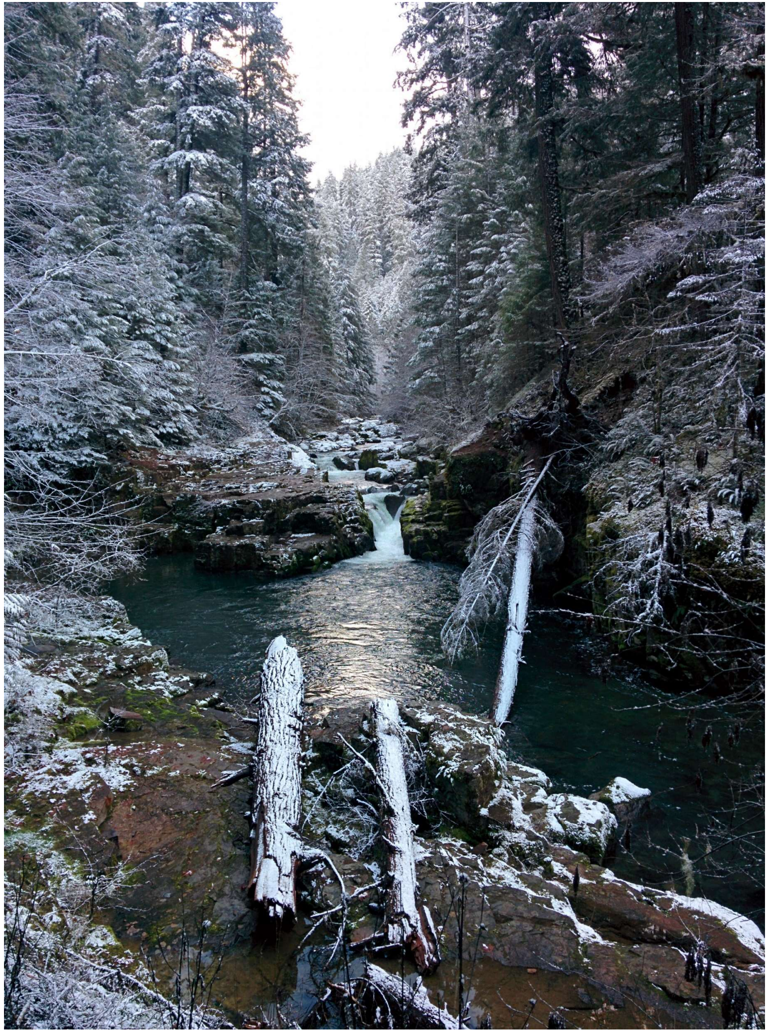
CS 161, Lecture 16: 1D Arrays – 19 February 2018

Tip: everything is more difficult in the last half of the term. If you are stuck on a problem for a significant amount of time, try walking away and go engage in something you enjoy, then come back to it. Your brain will still be working on it without you actively thinking and your new approach will likely be better than your last.



18 February 2018: Brice Creek Trail

Arrays

- An order arrangement of related items
- Colloquially called lists
  - Caution: lists are an actual data structure that behave differently from arrays
- Examples
  - Array of numbers such as in a gradebooks
  - Strings -> array of characters

Creating 1D Arrays (Statically)

int grades[5];

5	12	8	17	3
0	1	2	3	4

Access Each Element: grades[2]

Array name represents: grades → first memory address location

Initial Values: garbage

Initializing and Populating Static 1D Arrays

Declaration

```
int grades[5] = {0,0,0,0,0};
```

Individual Elements

```
grades[0] = 0;
grades[1] = 0;
grades[2] = 0;
grades[3] = 0;
grades[4] = 0;
```

Populating 1D Arrays with Loops

```
int grades[5];
for(int i = 0; i < 5; i++)
        grades[i] = 0;
Or
int i = 0;
while (i < 5){
        grades[i] = 0;
        i++;
}
```

know how many times we need to step through

Read and Print

```
int amount = 5;
int grades[amount];
for(int i = 0; i < amount; i++){
        cout << “Please input a grade: “;
        cin >> grades[i];
}
for(int i=0; i<amount; i++)
        cout << “Grade “ << i << “: ” << grades[i] << endl;
```

Static vs. Dynamic Arrays

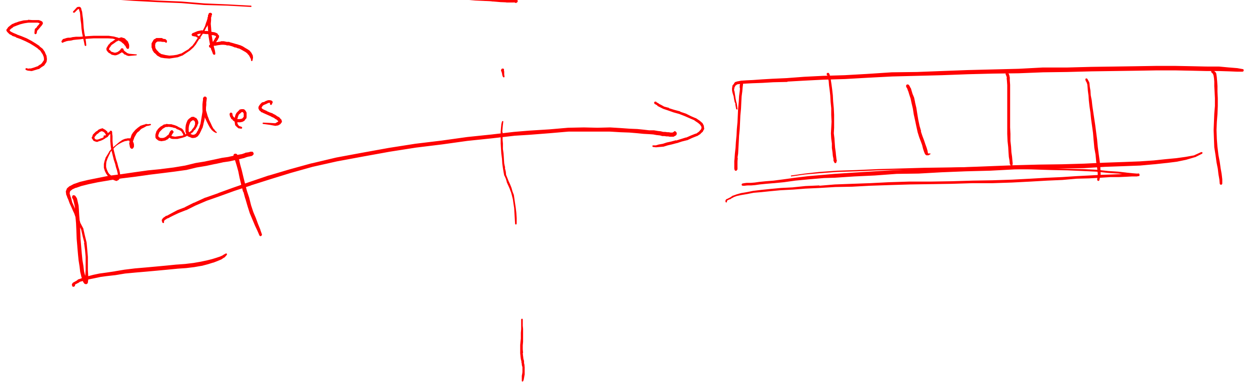
- Static: use when the size will not change

```
int grades[5];
```

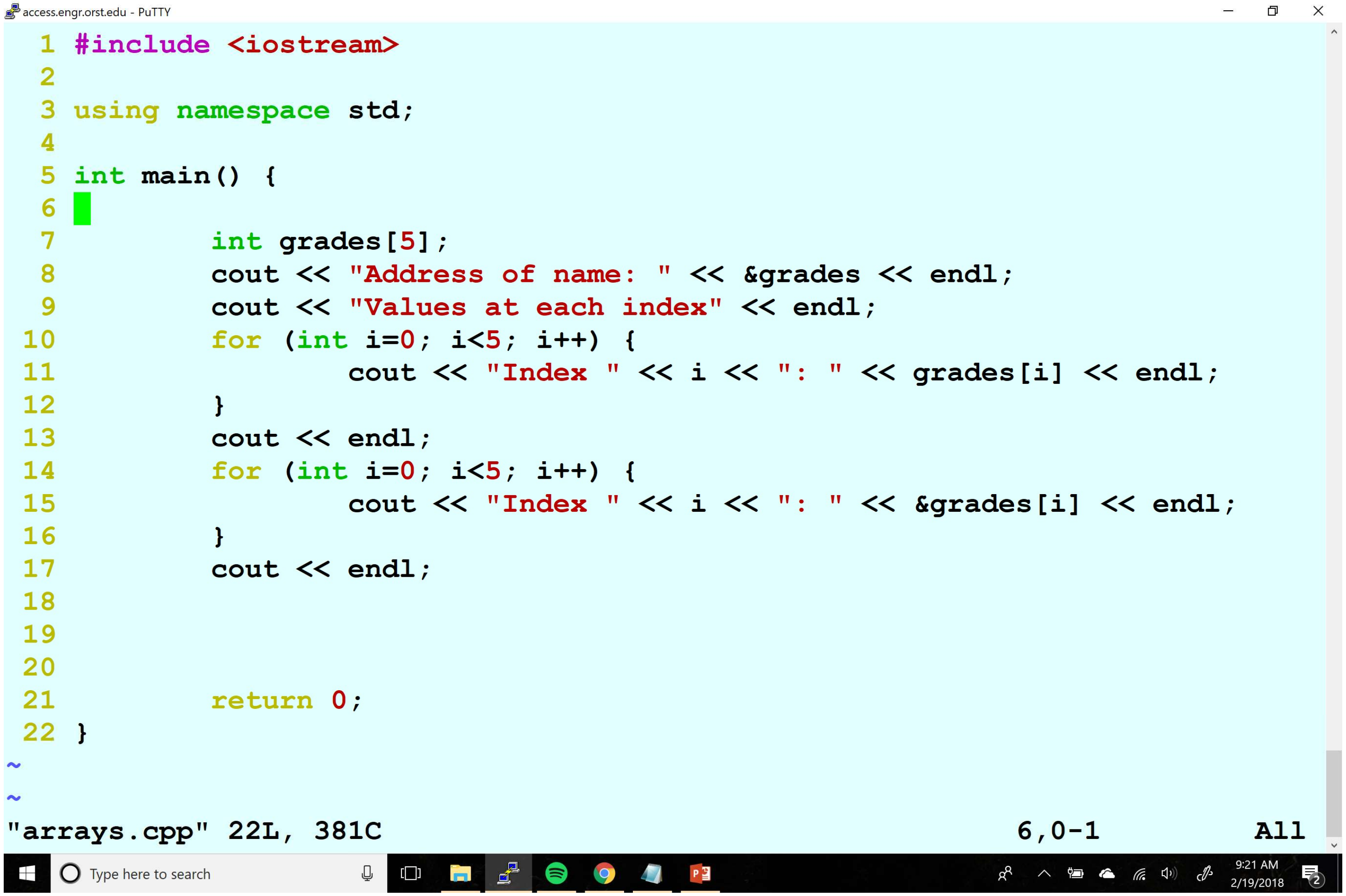
- Dynamic: use when you do not know how big the array needs to be at compile

```
int* grades = new int[5];
```

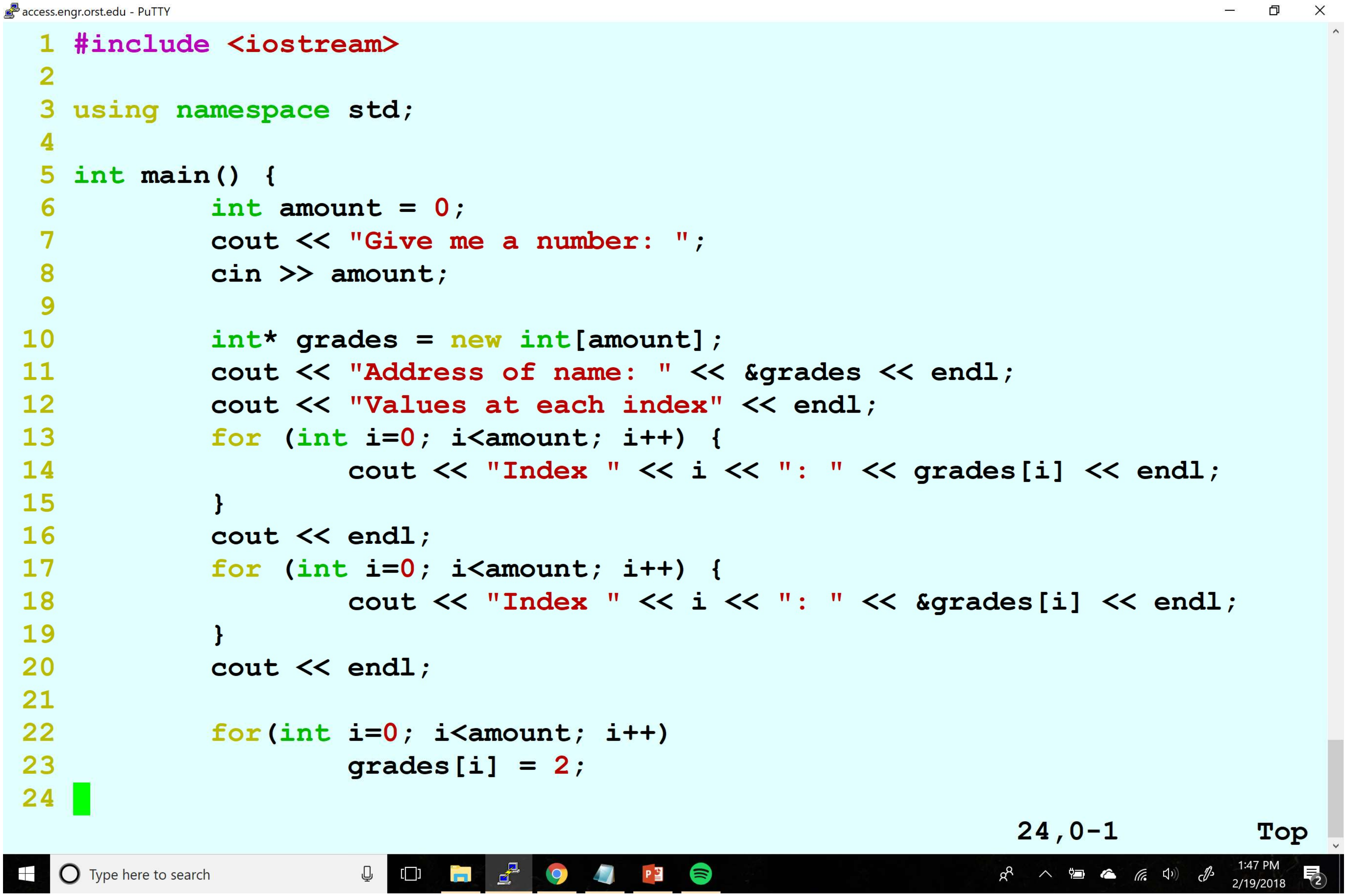
delete [] grades;



Demo

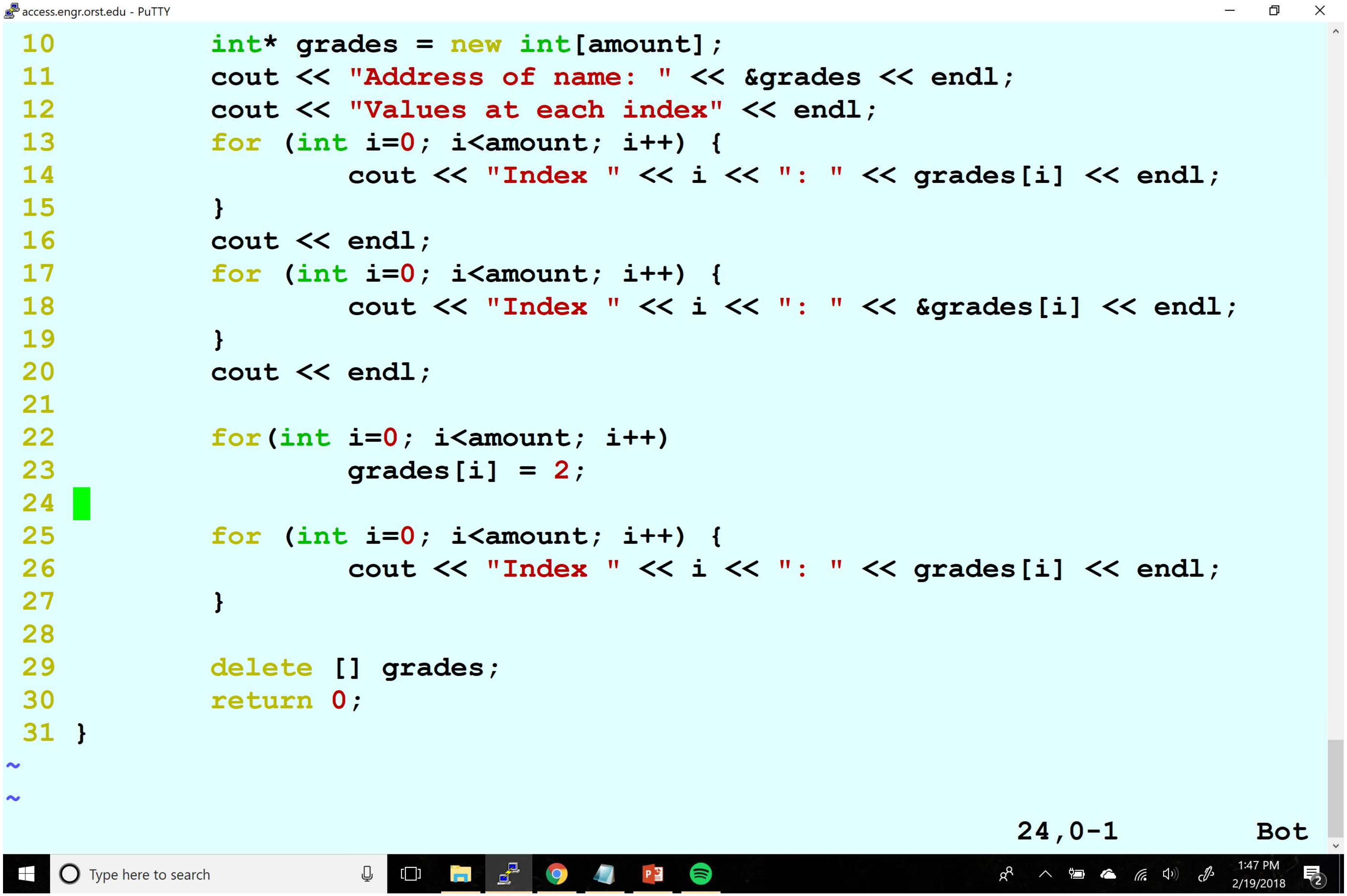


```
#include <iostream>

using namespace std;

int main() {

        int grades[5];
        cout << "Address of name: " << &grades << endl;
        cout << "Values at each index" << endl;
        for (int i=0; i<5; i++) {
                cout << "Index " << i << ": " << grades[i] << endl;
        }
        cout << endl;
        for (int i=0; i<5; i++) {
                cout << "Index " << i << ": " << &grades[i] << endl;
        }
        cout << endl;



        return 0;
}
~
~
"arrays.cpp" 22L, 381C                                    6,0-1         All
```



```cpp
#include <iostream>

using namespace std;

int main() {
        int amount = 0;
        cout << "Give me a number: ";
        cin >> amount;

        int* grades = new int[amount];
        cout << "Address of name: " << &grades << endl;
        cout << "Values at each index" << endl;
        for (int i=0; i<amount; i++) {
                cout << "Index " << i << ": " << grades[i] << endl;
        }
        cout << endl;
        for (int i=0; i<amount; i++) {
                cout << "Index " << i << ": " << &grades[i] << endl;
        }
        cout << endl;

        for(int i=0; i<amount; i++)
                grades[i] = 2;

```

```
24,0-1        Top
```



```
        int* grades = new int[amount];
        cout << "Address of name: " << &grades << endl;
        cout << "Values at each index" << endl;
        for (int i=0; i<amount; i++) {
                cout << "Index " << i << ": " << grades[i] << endl;
        }
        cout << endl;
        for (int i=0; i<amount; i++) {
                cout << "Index " << i << ": " << &grades[i] << endl;
        }
        cout << endl;

        for(int i=0; i<amount; i++)
                grades[i] = 2;

        for (int i=0; i<amount; i++) {
                cout << "Index " << i << ": " << grades[i] << endl;
        }

        delete [] grades;
        return 0;
}
~
~
```