CS118 – Programming Fundamentals

Lecture # 22
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Array as a parameter to Functions

- Arrays are passed by reference only
- The symbol **&** is not used when declaring an array as a formal parameter
- The size of the array is usually omitted
- If provided, it is ignored by the compiler

E.g.

```
void foo(double firstList[], int secondList[])
{
    .
    .
    .
}
```

Arrays as Parameters to Functions

```
void initialize(int list[], int listSize)
{
    int count;
    for (count = 0 ; count < listSize ; count++)
        list[count] = 0;
}
```

- The first parameter of the function initialize is an **int** array of any size
- When the function initialize is called, the size of the actual array is passed as the second parameter of the function initialize

Passing an Entire Array

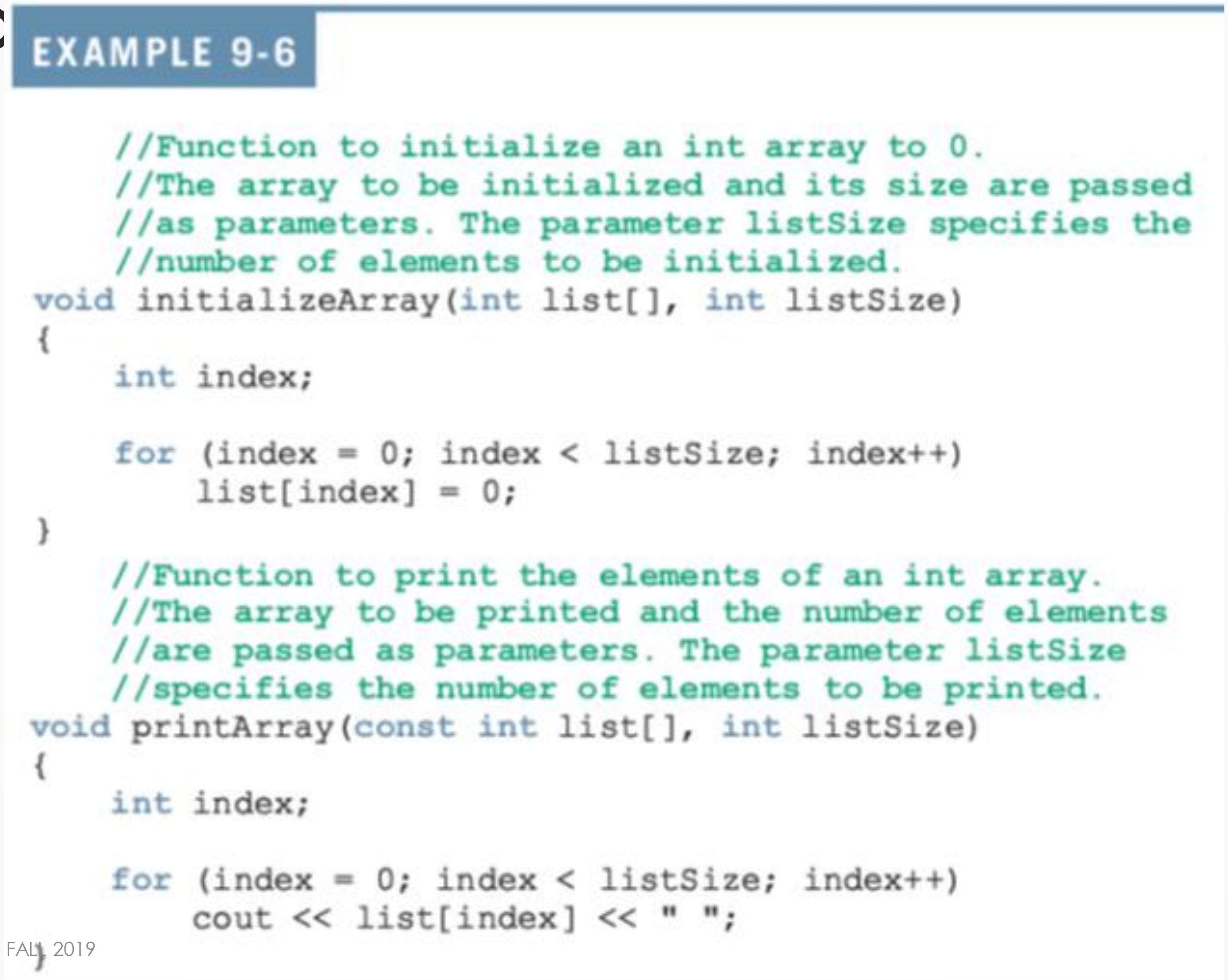
- Use the array name, without any brackets, as the argument
- Can also pass the array size so the function knows how many elements to process

```
void printGrades(int[], int);      // prototype
```

```
void printGrades(int A[], int size) // header
```

```
printGrades(tests, 5);              // call
```

Constant Arrays as Formal Pa



EXAMPLE 9-6

```
    //Function to initialize an int array to 0.
    //The array to be initialized and its size are passed
    //as parameters. The parameter listSize specifies the
    //number of elements to be initialized.
void initializeArray(int list[], int listSize)
{
    int index;

    for (index = 0; index < listSize; index++)
        list[index] = 0;
}
    //Function to print the elements of an int array.
    //The array to be printed and the number of elements
    //are passed as parameters. The parameter listSize
    //specifies the number of elements to be printed.
void printArray(const int list[], int listSize)
{
    int index;

    for (index = 0; index < listSize; index++)
        cout << list[index] << " ";
}
```

Base Address of an Array and Array in Computer Memory

- The base address of an array is the address, or memory location of the first array component
- If **list** is a one-dimensional array, its base address is the address of **list[0]**
- When we pass an array as a parameter, the base address of the actual array is passed to the formal parameter

Base Address of an Array and Array in Computer Memory (cont'd.)

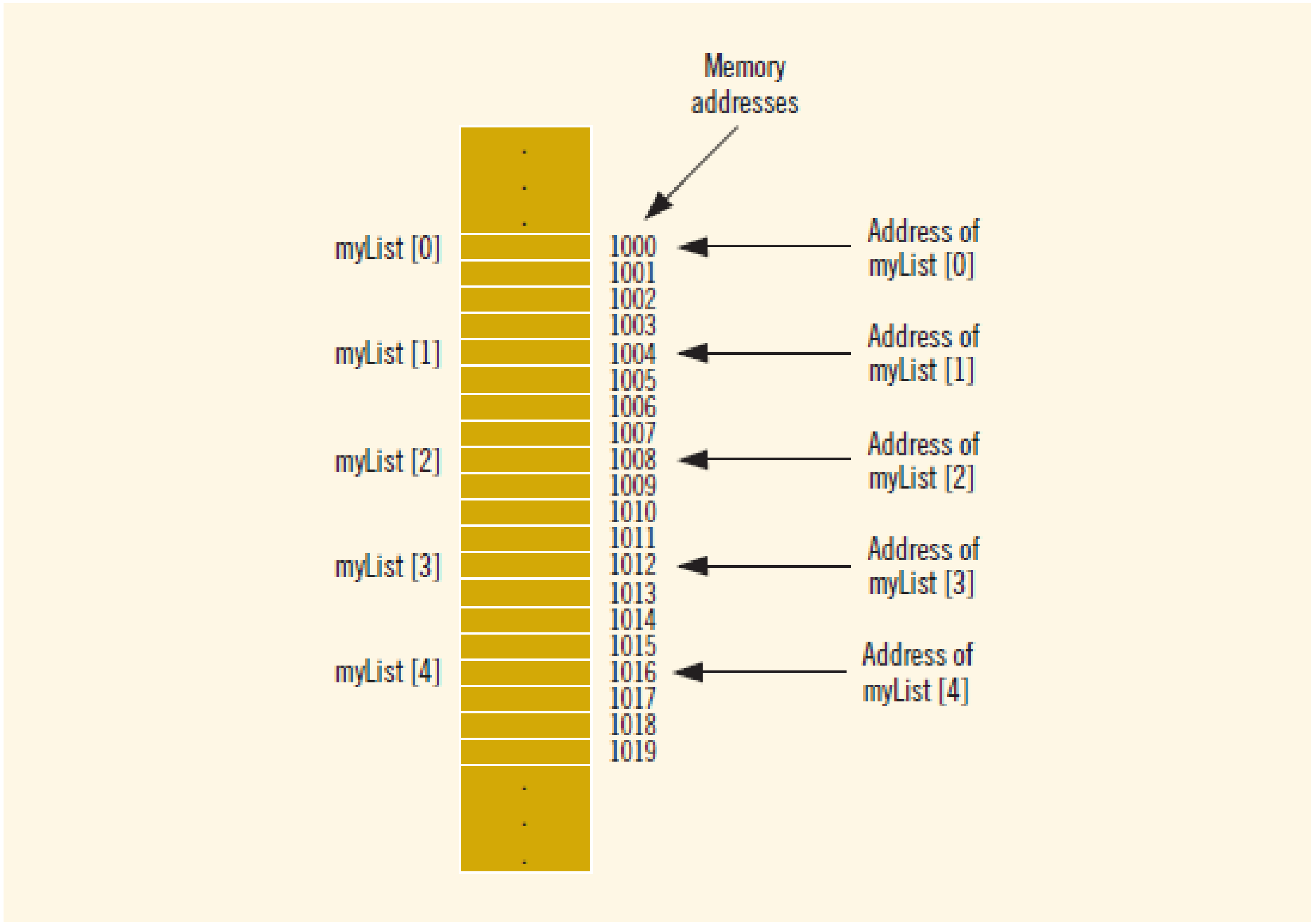


FIGURE 9-7 Array `myList` and the addresses of its components

Base Address of an Array and Array in Computer Memory (cont'd.)

- Consider the following statement:
  - cout << myList << endl; //Line 2
- This statement will not output the values of the components of **myList**
- In fact, the statement outputs the **value of myList**, which is the base address of the array
- This is why the statement will not generate a syntax error

Base Address of an Array and Array in Computer Memory (cont'd.)

- Suppose that you also have the following statement:

```
    int yourList[5];
```

- Then, in the statement:

```
    if (myList <= yourList)
```

- It does not determine whether the elements of **myList** are less than or equal to the corresponding elements of **yourList**

Base Address of an Array and Array in Computer Memory (cont'd.)

- when you declare an array, the only things about the array that the computer remembers are:
  - Name of the array
  - Its base address
  - The data type of each component
  - and (possibly) the number of components

Example

- Suppose you want to access the value of **myList[3]**
- Now, the base address of **myList** is 1000
  - Each component of **myList** is of type **int**, so it uses four bytes to store a value, and the index is 3
- To access the value of myList[3], the computer calculates the address

  1000 + 4 * 3 = 1000 + 12 = 1012
- That is, this is the starting address of myList[3]
  - So, starting at 1012, the computer accesses the next four bytes

Example

```
void arrayAsParameter(int list[], int size)
{
    ...
    list[2] = 28; //Line 4
    ...
}
```

- Suppose that you have the following call to this function:
- arrayAsParameter(myList, 5);
- list[2] = 28; This statement stores 28 into list[2]. To access list[2], the computer calculates the address as follows: 1000 + 4 * 2 = 1008

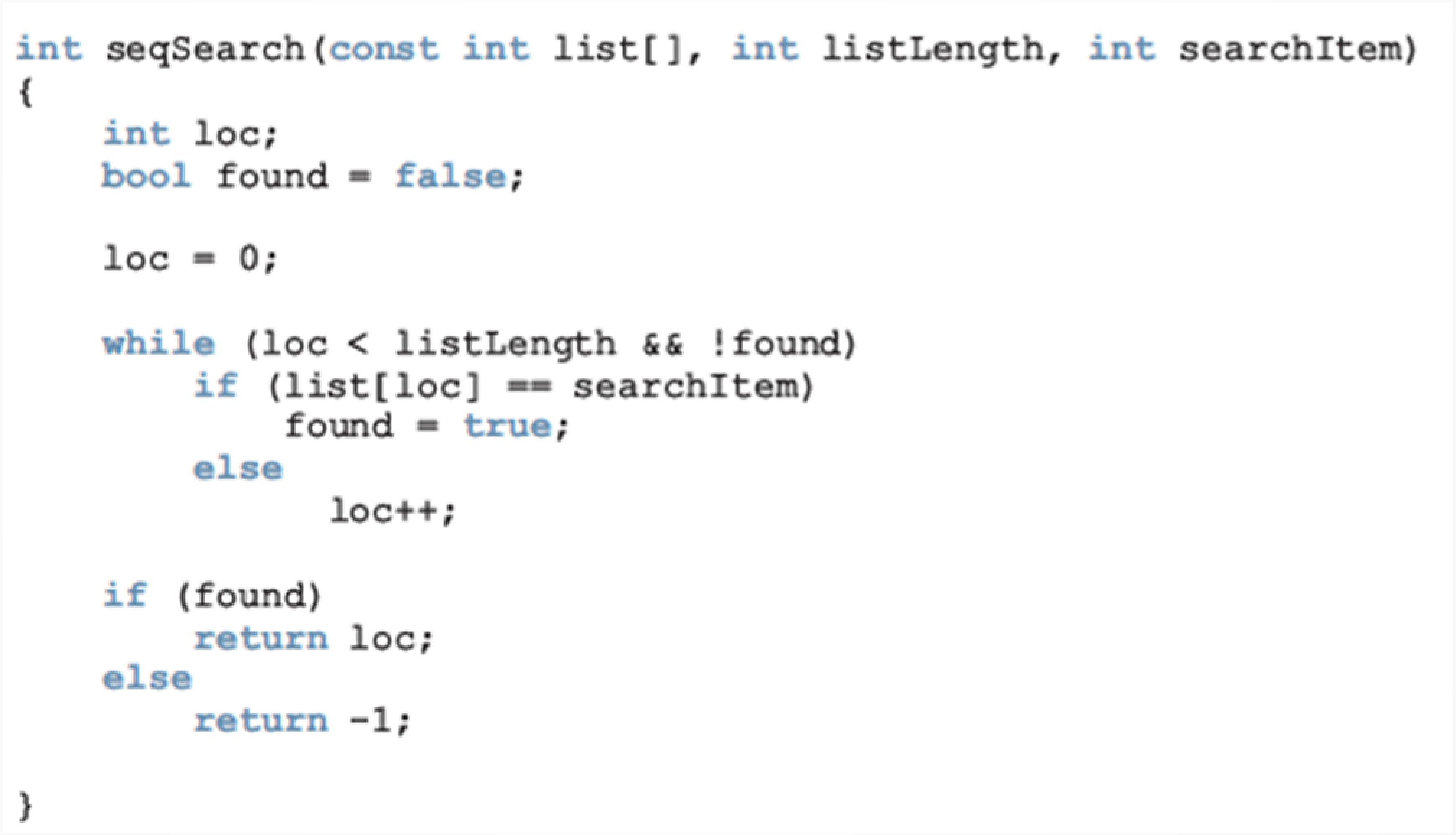
Functions Cannot Return a Value of the Type Array

- C++ does not allow functions to return a value of the type array

Searching an Array for a Specific Item

- Sequential search or linear search
  - Searching a list for a given item
  - Starting from the first array element
  - Compare **searchItem** with the elements in the array
  - Continue the search until either you find the item, or no more data is left in the **list** to compare with **searchItem**

Searching an Array for a Specific Item (cont'd.)



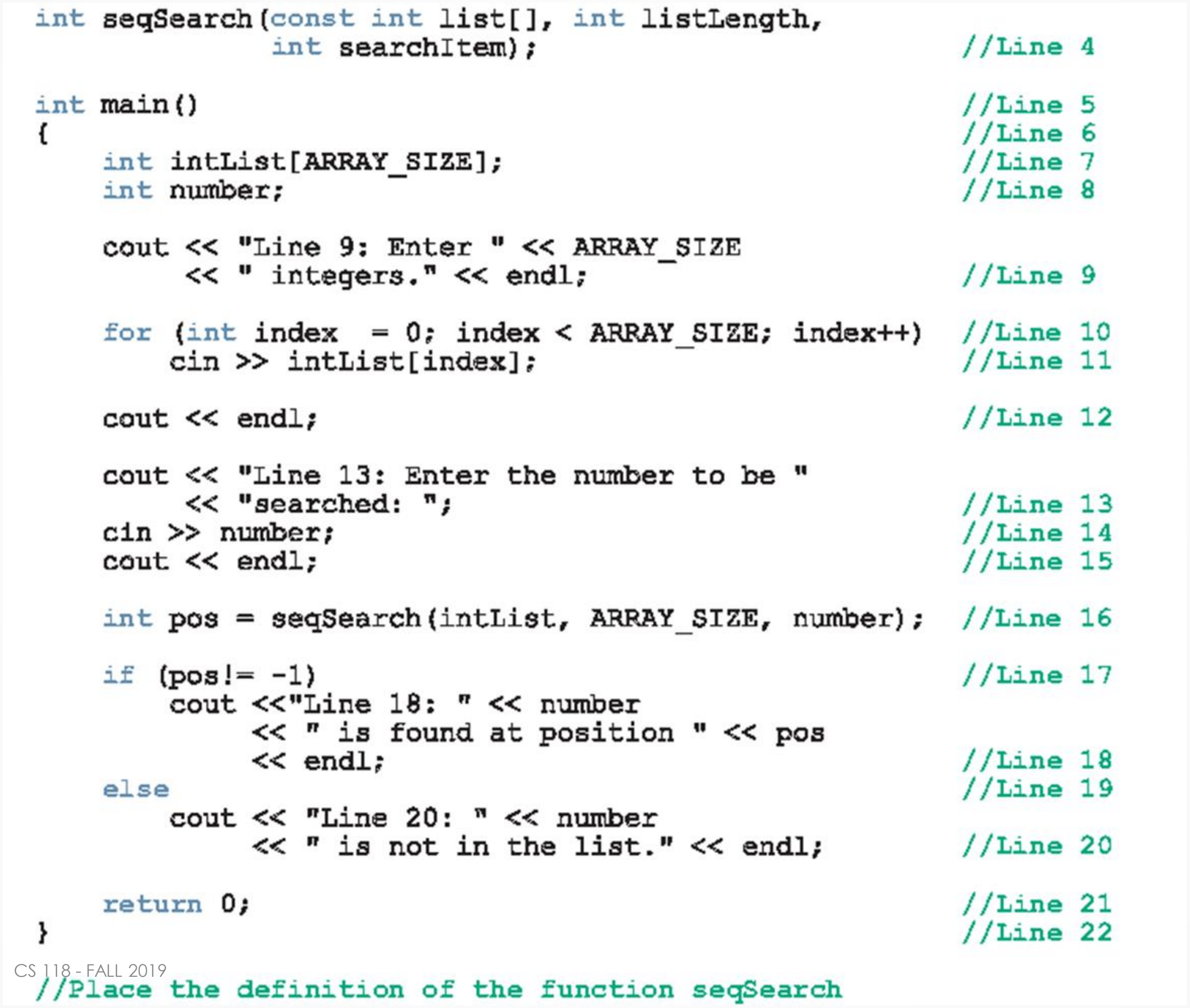
```
int seqSearch(const int list[], int listLength, int searchItem)
{
    int loc;
    bool found = false;

    loc = 0;

    while (loc < listLength && !found)
        if (list[loc] == searchItem)
            found = true;
        else
              loc++;

    if (found)
        return loc;
    else
        return -1;

}
```



```
int seqSearch(const int list[], int listLength,
              int searchItem);                        //Line 4

int main()                                            //Line 5
{                                                     //Line 6
    int intList[ARRAY_SIZE];                          //Line 7
    int number;                                       //Line 8

    cout << "Line 9: Enter " << ARRAY_SIZE
         << " integers." << endl;                     //Line 9

    for (int index  = 0; index < ARRAY_SIZE; index++) //Line 10
        cin >> intList[index];                        //Line 11

    cout << endl;                                     //Line 12

    cout << "Line 13: Enter the number to be "
         << "searched: ";                             //Line 13
    cin >> number;                                    //Line 14
    cout << endl;                                     //Line 15

    int pos = seqSearch(intList, ARRAY_SIZE, number); //Line 16

    if (pos!= -1)                                     //Line 17
        cout <<"Line 18: " << number
             << " is found at position " << pos
             << endl;                                 //Line 18
    else                                              //Line 19
        cout << "Line 20: " << number
             << " is not in the list." << endl;       //Line 20

    return 0;                                         //Line 21
}                                                     //Line 22

//Place the definition of the function seqSearch
```

Questions