SODV 1101

Programming Fundamentals

Assignment 3

Island

Assignment 3: Written Questions

1. Define Scope. / 3

2. What will the function call q2(3, 4) print? Try to do this without running the code in a computer, explaining what is happening on each line of code. / 6

```
void q2(int a, int b)
{
    int c = 1;
    for (int d = b; d > 0; --d)
    {
        c *= a;
        cout << d << ": " << c << endl;
    }
}
```

3. Describe briefly in words what the following function does (Note: do not repeat each line of code in words, your answer should only be a sentence or two). / 6

```
int q3(int a[], int b)
{
    int c = a[0];
    for (int d = 1; d < b; ++d)
    {
        if (a[d] > c)
            c = a[d];
    }
    return c;
}
```

4. The goal of the following function is to check if an array of integers is in descending order. The code below contains 3 syntax errors and 2 logic errors. Mark the errors in the code below with a circled number corresponding to the spaces provided, and **either** briefly explain why it is an error **or** give a fix for it. / 15

```
bool isDescending(int[] arr; int size) {
    i = 1;
    for (; i < size; ++i);
    {
        if (arr[i - 1] < arr[i]) {
            return false;
        }
        else {
            return true;
        }
    }
}
```

1) Syntax Error: _____

_____

2) Syntax Error: _____

_____

3) Syntax Error: _____

_____

4) Logic Error: _____

_____

5) Logic Error: _____

_____

Assignment 3: Island

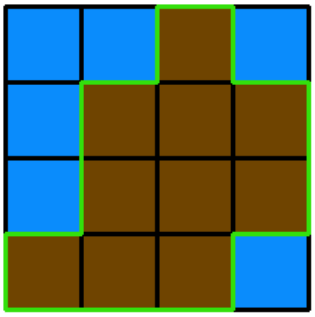
Overview

Write a program to find the area and perimeter of an island, and to sink the island in water.

Directions

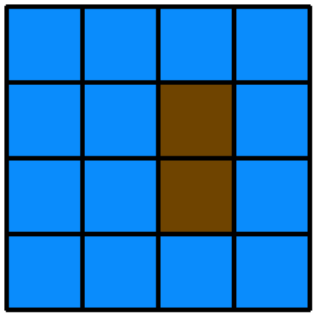
Your program will be given an array of integers representing a map of an island. The map is 2-dimensional, but will be stored in a 1-dimensional array. In the map, a 0 represents water, and a 1 represents land. You may assume the input will only include 1 island, and the island will not contain any lakes. For example, you may be given the following map as a test case:

Input Array	0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 0
2D Representation:	0010 0111 0111 1110



Using the starter code provided, implement the following 3 functions:

- **IslandArea:** This function should return the area of the island. The area is the number of blocks of land. For example, in the test case above the island has an area of 10.
- **IslandPerimeter:** This function should return the perimeter of the island. The perimeter is the number of coastal edges on the island. For example, in the test case above, the coastal edges are highlighted in green, and the perimeter of the island is 16.
- **IslandShrink:** This function should shrink the island by replacing all coastal land blocks with water. For example, after running the shrink function on the test case above the map would be: 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0. The picture below shows what the island looks like after it was shrunk.



Evaluation

This assignment has 3 main components, assigned marks as follows:

Task	Marks
Written Questions	30
Code Quality	20
Code Functionality	50
Total	100

Marks for written questions are indicated beside each question.

Code quality is worth 20 marks, but will be assigned a grade of 20, 15, 10, 5, or 0.

	20 - Excellent	*15 - Good*	*10 - Fair*	*5 - Poor*
Code quality	Code is well organized, clear, and easy to read. Style is consistent throughout and comments are used where needed.	Code is mostly clear. A few inconsistencies in style, or locations where comments would help with readability.	Code is disorganized or could use some refactoring. Style is inconsistent with little to no documentation.	Code is very difficult to read.

Functionality will be tested with standard automated tests. Students are also encouraged to run their own tests on their code.

Bonus

Make your functions work even if there are 2 or more separate islands on the map. In the case where a map contains more than 1 island, only perform the operation on the first island in the map when searching along each row.