**Programming Assignment 4**

1. Given an array of integers nums containing n + 1 integers where each integer is in the range [1, n] inclusive. There is only one duplicate number in nums, return this duplicate number. (PS: This is a very frequently-asked interview question by software companies).

// complete the following function

int find\_duplicate(std::vector<int>& nums) {

}

int main() {

std::vector<int> nums = {1, 3, 4, 2, 2};

std::cout << find\_duplicate(nums) << ‘\n’;

}

Your program should pass the following four testcases (change nums accordingly):

**Input:** nums = {1, 3, 4, 2, 2}

**Output:** 2

**Input:** nums = {1, 1}

**Output:** 1

**Input:** nums = {1, 2, 5, 6, 8, 9, 3, 4, 7, 2}

**Output:** 2

**Input:** nums = {3, 1, 3, 4, 2}

**Output:** 3

2. Given an array of characters, check if it forms a palindrome. A palindrome is a word, number, phrase, or other sequence of characters which reads the same backward as forward, such as madam, racecar. Complete your function with two versions: (1) iterative using for loop (or while) and (2) recursive function call.

// complete the following function

bool is\_palindrome\_v1(std::vector<char>& array) {

}

bool is\_palindrome\_v2(std::vector<char>& array) {

}

int main() {

std::vector<char> array = {‘a’, ‘b’, ‘c’, ‘b’, ‘a’};

std::cout << is\_palindrome\_v1(array) << ‘\n’;

std::cout << is\_palindrome\_v2(array) << ‘\n’;

}

**Input:** array = {‘a’, ‘b’, ‘c’, ‘b’, ‘a’}

**Output:** true

**Input:** array = {‘a’, ‘b’, ‘c’}

**Output:** false