**HW3 EE599 - Computing and Software for Systems Engineers**

**Question 1**

1. **Passing parameters by value**

|  |  |
| --- | --- |
| Pros | 1.Copying flexible and safe |
| 2. change made inside function, so original is protect |
| Cons | 1. copying can have high cost.(eg. structs and classe )  ) |
| When | 1. passing fundamental data type and enumerators |
| 2.the function does not need to change the argument. |

**2.Passing parameters using pointers**

|  |  |
| --- | --- |
| Pros | 1.No copying |
| 2. pointer can be re-assigned, and can be null |
| Cons | 1. To access the variable the pointer has to be dereferenced. |
| 2. literals and expressions do not have addresses, pointer arguments must be normal variables. |
| When | 1.  passing built-in arrays |
| 2. passing a pointer and nullptr is a valid argument logically. |

1. **Passing parameters using references**

|  |  |
| --- | --- |
| Pros | 1.No copying, pass by reference is fast |
| 2. References must be initialized, so there’s no worry about null values. |
| Cons | 1. Original might be changed  ) |
| When | 1. you need the function to modify an argument. |
| 2.passing structs or classes |

**4. Passing parameters using const references**

|  |  |
| --- | --- |
| Pros | 1.No copying |
| 2. Original cannot change |
| Cons | 1. Original might be changed  ) |
| When | 1. you need the function to modify an argument. |
| 2.passing structs or classes |

**Question 2**

**O(nlogn)**

vector<int> Solution::TwoSum(vector<int> v, int sum){

unordered\_map<int, int> map;

vector<int> result;

for (int i = 0; i < v.size(); i++){

map[v[i]] = i;

}

for (int i = 0; i < v.size(); i++){ //O(n)

int second = sum - v[i];

if (map.count(second) && map[second] != i){ //O(logn)

return {i, map[second]};

}

}

return {};

}

**Question 3**

**(1) O(n)**

SinglyLinkedList(const std::vector<int> &inputs, int i)

int size();

void push\_back(int i);

void erase(ListNode\* p);

void pop\_back(); // removes the last item

ListNode \*GetBackPointer(); // Returns pointer to last item

ListNode \*GetIthPointer(int i);

void print();

**(2)O(1)**

bool empty();// checks if empty

void push\_front(int i); // inserts at the front

void insert\_after(ListNode\* p, int i); // inserts value i after p

void pop\_front(); // removes the first item

int front(); // returns the value of first item

**Question 4**

O(n)

**Question 5**

All function is O(1)

**Question 6**

----------------------------------------------

Vector: { 1, 4, 5, 23, 100, 12, 18, 175 }

----------------------------------------------

Please choose any of the following options:

1. What is the first element?

2. What is the last element?

3. What is the current element?

4. What is the ith element from the current location?

5. Exit.;

----------------------------------------------

**you choose: 1**

**answer: 1**

----------------------------------------------

Vector: { 1, 4, 5, 23, 100, 12, 18, 175 }

----------------------------------------------

Please choose any of the following options:

1. What is the first element?

2. What is the last element?

3. What is the current element?

4. What is the ith element from the current location?

5. Exit.;

----------------------------------------------

**you choose: 2**

**answer: 175**

----------------------------------------------

Vector: { 1, 4, 5, 23, 100, 12, 18, 175 }

----------------------------------------------

Please choose any of the following options:

1. What is the first element?

2. What is the last element?

3. What is the current element?

4. What is the ith element from the current location?

5. Exit.;

----------------------------------------------

**you choose: 3**

**answer: 175**

----------------------------------------------

Vector: { 1, 4, 5, 23, 100, 12, 18, 175 }

----------------------------------------------

Please choose any of the following options:

1. What is the first element?

2. What is the last element?

3. What is the current element?

4. What is the ith element from the current location?

5. Exit.;

----------------------------------------------

**you choose: 1**

**answer: 1**

----------------------------------------------

Vector: { 1, 4, 5, 23, 100, 12, 18, 175 }

----------------------------------------------

Please choose any of the following options:

1. What is the first element?

2. What is the last element?

3. What is the current element?

4. What is the ith element from the current location?

5. Exit.;

----------------------------------------------

**you choose: 3**

**answer: 1**

----------------------------------------------

Vector: { 1, 4, 5, 23, 100, 12, 18, 175 }

----------------------------------------------

Please choose any of the following options:

1. What is the first element?

2. What is the last element?

3. What is the current element?

4. What is the ith element from the current location?

5. Exit.;

----------------------------------------------

**you choose: 4**

**Enter the value of i:**

**2**

**answer: 5**

----------------------------------------------

Vector: { 1, 4, 5, 23, 100, 12, 18, 175 }

----------------------------------------------

Please choose any of the following options:

1. What is the first element?

2. What is the last element?

3. What is the current element?

4. What is the ith element from the current location?

5. Exit.;

----------------------------------------------

**you choose: 5**

**Exit!**

**Run Time:**

1. O(1)
2. O(1)
3. O(1)
4. O(n)
5. O(1)