2/3/2025

Object Oriented Programming

Lab 3

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FAST NUCES

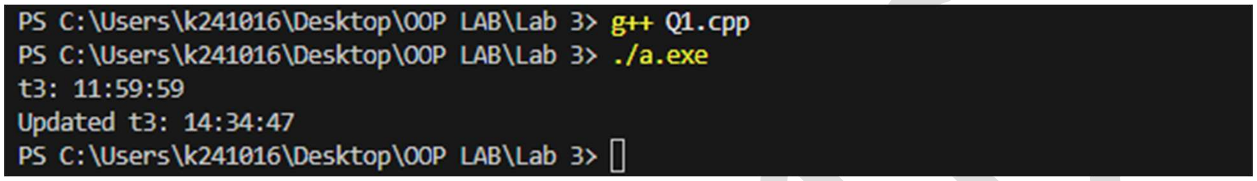
Question 1

Source Code

```
/*
Create a class called time that has separate int member data for hours, minutes,
and seconds. One constructor
should initialize this data to 0, and another should initialize it to fixed
values. Another member function should
display it, in 11:59:59 format. The final member function should add two objects
of type time passed as
arguments.
A main() program should create two initialized time objects (should they be
const?) and one that isn't initialized.
Then it should add the two initialized values together, leaving the result in the
third time variable. Finally it should
display the value of this third variable. Make appropriate member functions
const.
*/
#include <iostream>
using namespace std;

class Time{
    private:
        int hour, minute, second;
    public:
        Time(int h, int m, int s){
            hour=h;
            minute=m;
            second=s;
        }
        Time(){
            hour=0;
            minute=0;
            second=0;
        }

        int getHour() const {
            return hour;
        }

        int getMinute() const {
            return minute;
        }
```

```cpp
        int getSecond() const {
            return second;
        }

        void setHour(int h){
            hour=h;
        }

        void setMinute(int m){
            minute=m;
        }

        void setSecond(int s){
            second=s;
        }

        void display() const{
            cout<<hour<<":"<<minute<<":"<<second<<endl;
        }

        Time add(const Time& t) const {
            Time t2;
            t2.second=t.getSecond() +second;
            if (t2.second>=60){
                t2.second-=60;
                t2.minute+=1;
            }
            t2.minute+=t.getMinute() +minute;
            if (t2.minute>=60){
                t2.minute-=60;
                t2.hour+=1;
            }
            t2.hour+=t.getHour() +hour;
            return t2;
        }
};

int main(){
    Time t1;
    Time t2(11,59,59);
    Time t3=t2.add(t1);
    cout << "t3: ";
    t3.display();
    t1.setHour(2);
    t1.setMinute(34);
    t1.setSecond(48);
    cout<<"Updated t3: ";
    t3=t2.add(t1);
    t3.display();
}
```

Output:

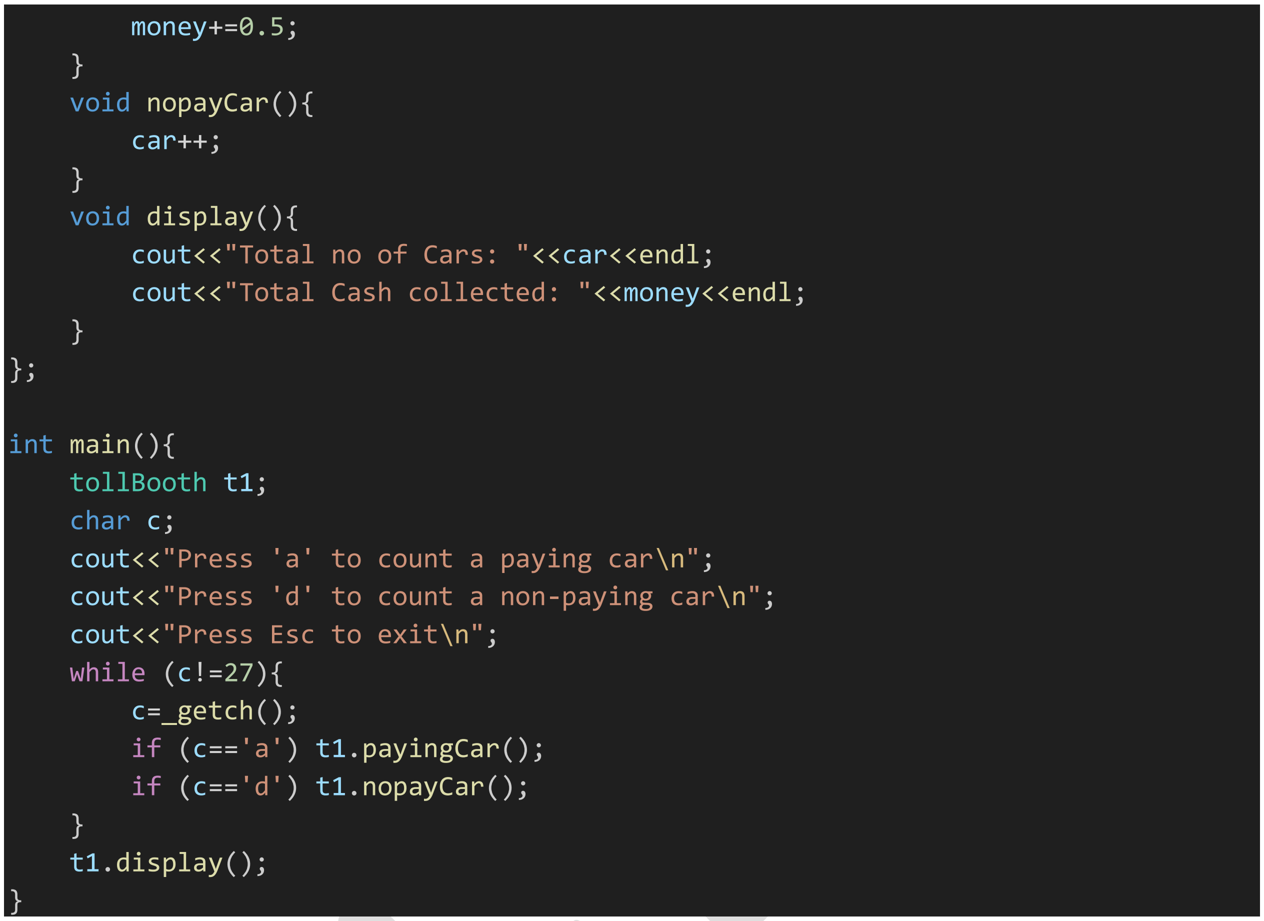


```
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> g++ Q1.cpp
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> ./a.exe
t3: 11:59:59
Updated t3: 14:34:47
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> 
```

Question 2

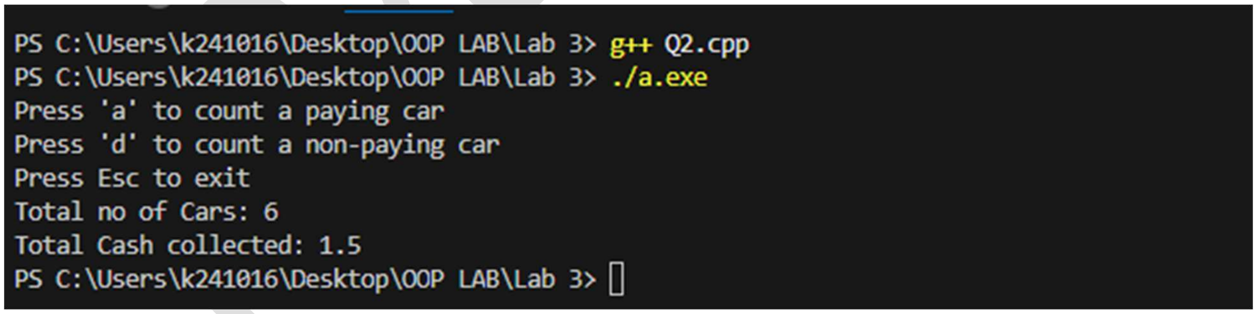
Source Code:

```
/*
Imagine a tollbooth at a bridge. Cars passing by the booth are expected to pay a
50 cent toll. Mostly they do, but
sometimes a car goes by without paying. The tollbooth keeps track of the number
of cars that have gone by, and of
the total amount of money collected.
Model this tollbooth with a class called tollBooth. The two data items are a type
unsigned int to hold the total
number of cars, and a type double to hold the total amount of money collected. A
constructor initializes both of

these to 0. A member function called payingCar() increments the car total and
adds 0.50 to the cash total. Another
function,
called nopayCar(), increments the car total but adds nothing to the cash total.
Finally, a member function called
display() displays the two totals. Make appropriate member functions const.
Include a program to test this class. This program should allow the user to push
one key to count a paying car, and
another to count a nonpaying car. Pushing the Esc key should cause the program to
print out the total cars and
total cash and then exit.
*/

#include <iostream>
#include <conio.h>
using namespace std;

class tollBooth{
    private:
    int car;
    double money;

    public:
    tollBooth(){
        car=0;
        money=0;
    }
    void payingCar(){
        car++;
```



```cpp
        money+=0.5;
    }
    void nopayCar(){
        car++;
    }
    void display(){
        cout<<"Total no of Cars: "<<car<<endl;
        cout<<"Total Cash collected: "<<money<<endl;
    }
};

int main(){
    tollBooth t1;
    char c;
    cout<<"Press 'a' to count a paying car\n";
    cout<<"Press 'd' to count a non-paying car\n";
    cout<<"Press Esc to exit\n";
    while (c!=27){
        c=_getch();
        if (c=='a') t1.payingCar();
        if (c=='d') t1.nopayCar();
    }
    t1.display();
}
```

Output:



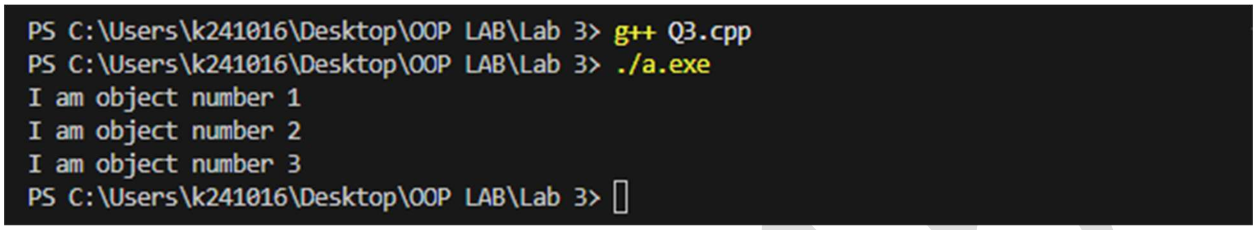
```
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> g++ Q2.cpp
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> ./a.exe
Press 'a' to count a paying car
Press 'd' to count a non-paying car
Press Esc to exit
Total no of Cars: 6
Total Cash collected: 1.5
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> 
```

Question 3

Source Code:

```
/*
Create a class that includes a data member that holds a “serial number” for each
object created from the class.
That is, the first object created will be numbered 1, the second 2, and so on. To
do this, you’ll need another data
member that records a count of how many objects have been created so far. (This
member should apply to the
class as a whole; not to individual objects. What keyword specifies this?) Then,
as each object is created, its
constructor can examine this count member variable to determine the appropriate
serial number for the new
object.
Add a member function that permits an object to report its own serial number.
Then write a main() program that
creates three objects and queries each one about its serial number. They should
respond I am object number 2, and
so on.
*/

#include <iostream>
using namespace std;

class serialNumberClass{
    private:
    int serialNumber;
    static int count;
    public:
    serialNumberClass(){
        count++;
        serialNumber=count;
    }
    void report_serialNumber(){
        cout<<"I am object number "<<serialNumber<<endl;
    }
};

int serialNumberClass::count=0;

int main(){
    serialNumberClass o1, o2, o3;
    o1.report_serialNumber();
    o2.report_serialNumber();
    o3.report_serialNumber();
}
```

Output:



```
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> g++ Q3.cpp
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> ./a.exe
I am object number 1
I am object number 2
I am object number 3
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> 
```

Question 4

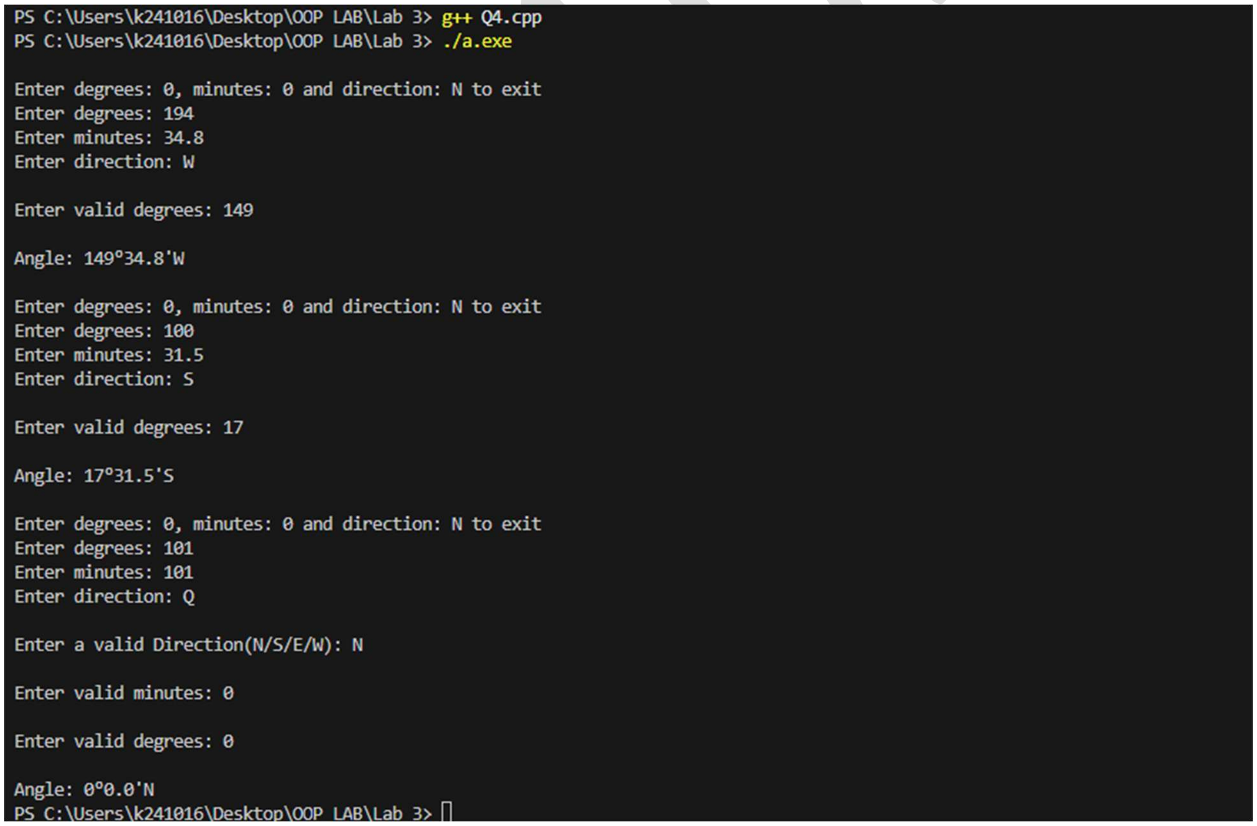
Source Code:

```
/*
In ocean navigation, locations are measured in degrees and minutes of latitude
and longitude. Thus if you’re lying
off the mouth of Papeete Harbor in Tahiti, your location is 149 degrees 34.8
minutes west longitude, and 17
degrees 31.5 minutes south latitude. This is written as 149°34.8’ W, 17°31.5’ S.
There are 60 minutes in a degree.
(An older system also divided a minute into 60 seconds, but the modern approach
is to use decimal minutes
instead.) Longitude is measured from 0 to 180 degrees, east or west from
Greenwich, England, to the international
dateline in the Pacific. Latitude is measured from 0 to 90 degrees, north or
south from the equator to the poles.
Create a class angle that includes three member variables: an int for degrees, a
float for minutes, and a char for the
direction letter (N, S, E, or W). This class can hold either a latitude variable
or a longitude variable. Write one
member function to obtain an angle value (in degrees and minutes) and a direction
from the user, and a second to
display the angle value in 179°59.9’ E format. Also write a three-argument
constructor.
Write a main() program that displays an angle initialized with the constructor,
and then, within a loop, allows the
user to input any angle value, and then displays the value. You can use the hex
character constant ‘\xF8’, which
usually prints a degree (°) symbol.

Note:
• fixed: This manipulator is used to display floating-point numbers in fixed-
point notation (i.e., a set number
of digits after the decimal point).
• setprecision(n): This manipulator sets the number of digits to be displayed
after the decimal point. For
example, setprecision(1) ensures that only one digit will be displayed after the
decimal point, as seen in
your angle minutes.
*/

#include <iostream>
#include<iomanip>
```

```cpp
using namespace std;

class Angle{
    private:
    int degrees;
    float minutes;
    char direction;

    public:
    Angle(int d, float m, char dir){
        update(d, m, dir);
    }

    void update(int d, float m, char dir){
        while (!(dir=='N'||dir=='S'||dir=='E'||dir=='W')){
            cout<<"\nEnter a valid Direction(N/S/E/W): ";
            cin>>dir;
        }
        direction=dir;
        while (m>60||m<0){
            cout<<"\nEnter valid minutes: ";
            cin>>m;
        }
        minutes=m;
        while (((dir=='N'||dir=='S')&&(d>90))||(d<0)||(d>180)){
            cout<<"\nEnter valid degrees: ";
            cin>>d;
        }
        degrees=d;
    }
    void display(){
        cout<<"\nAngle: 
"<<degrees<<'\xF8'<<fixed<<setprecision(1)<<minutes<<"'"<<direction<<endl;
    }
    int getDegree(){
        return degrees;
    }
    float getMinute(){
        return minutes;
    }
    char getDirection(){
        return direction;
    }
};
```

```cpp
int main(){
    Angle a1(0, 0, 'S');
    int d; float m; char dir;
    while (!(a1.getDegree()==0&&a1.getMinute()==0&&a1.getDirection()=='N')){
        cout<<"\nEnter degrees: 0, minutes: 0 and direction: N to exit\n";
        cout<<"Enter degrees: ";
        cin>>d;
        cout<<"Enter minutes: ";
        cin>>m;
        cout<<"Enter direction: ";
        fflush(stdout);
        cin>>dir;
        a1.update(d, m, dir);
        a1.display();
    }
}
```

Output:



```
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> g++ Q4.cpp
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> ./a.exe

Enter degrees: 0, minutes: 0 and direction: N to exit
Enter degrees: 194
Enter minutes: 34.8
Enter direction: W

Enter valid degrees: 149

Angle: 149°34.8'W

Enter degrees: 0, minutes: 0 and direction: N to exit
Enter degrees: 100
Enter minutes: 31.5
Enter direction: S

Enter valid degrees: 17

Angle: 17°31.5'S

Enter degrees: 0, minutes: 0 and direction: N to exit
Enter degrees: 101
Enter minutes: 101
Enter direction: Q

Enter a valid Direction(N/S/E/W): N

Enter valid minutes: 0

Enter valid degrees: 0

Angle: 0°0.0'N
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> 
```

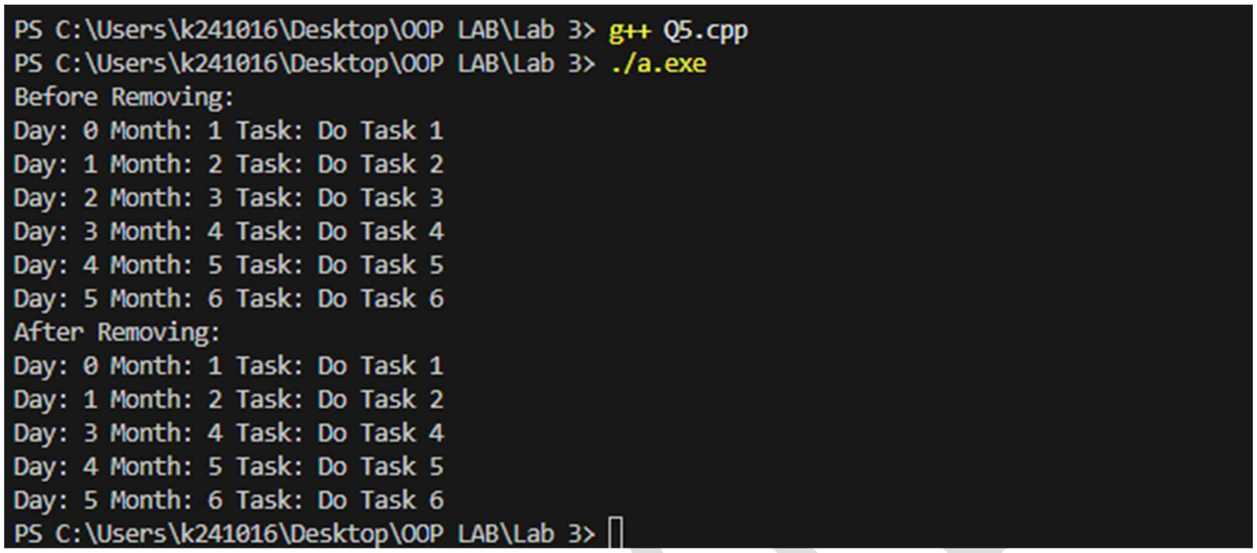
Question 5

Source Code:

```
/*
Create a class called calendar. The calendar should have 12 arrays for each month
of the year, and a variable that
stores information about the current year. The user is allowed to store their
tasks to do against each day. Assume
only one entry is needed per day.
Create the following methods for your class:
- Add a task. Thisfunction accepts three parameters: task details, date and
month. It should add
- a task on the day specified.
- Remove a task. Accepts the date and month as a parameter to remove the task
from.
- Show tasks. This method should go through all of your months and print all the
tasks allocated.
Your task is to create one calendar object, then hardcode 5-6 tasks for your
calendar. Then demonstrate how
you’ll remove a task, and display the updated task list.
*/

#include <iostream>
using namespace std;

class calender{
    private:
    string **cal=new string* [12];
    void check(int &m, int &d){
        while (m<=0 || m>12){
            cout<<"Enter a valid month number(1-12): ";
            cin>>m;
        }
        int max_days;
        if (m == 2)
            max_days = 28;
        else if (m == 4 || m == 6 || m == 9 || m == 11)
            max_days = 30;
        else
            max_days = 31;
        while (d <= 0 || d > max_days) {
            cout << "Enter a valid day number: ";
            cin >> d;
```

```cpp
        }
    }
    public:
    calender(){
        for (int i=0; i<12; i++){
            cal[i]=new string[31];
            for (int j=0; j<31; j++){
                cal[i][j]=" ";
            }
        }
    }
    void addTask(string t, int d, int m){
        check(m, d);
        cal[m-1][d-1]=t;
    }
    void removeTask(int d, int m){
        check(m, d);
        cal[m-1][d-1]=" ";
    }
    void showTasks(){
        for (int i=0; i<12; i++){
            for (int j=0; j<31; j++){
                if (cal[i][j]!=" "){
                    cout<<"Day: "<<j<<" Month: "<<i+1<<" Task: 
"<<cal[i][j]<<endl;
                }
            }
        }
    }
};

int main(){
    calender c;
    c.addTask("Do Task 1", 1, 1);
    c.addTask("Do Task 2", 2, 2);
    c.addTask("Do Task 3", 3, 3);
    c.addTask("Do Task 4", 4, 4);
    c.addTask("Do Task 5", 5, 5);
    c.addTask("Do Task 6", 6, 6);
    cout<<"Before Removing:\n";
    c.showTasks();
    c.removeTask(3,3);
    cout<<"After Removing:\n";
    c.showTasks();
}
```

Output:



```
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> g++ Q5.cpp
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> ./a.exe
Before Removing:
Day: 0 Month: 1 Task: Do Task 1
Day: 1 Month: 2 Task: Do Task 2
Day: 2 Month: 3 Task: Do Task 3
Day: 3 Month: 4 Task: Do Task 4
Day: 4 Month: 5 Task: Do Task 5
Day: 5 Month: 6 Task: Do Task 6
After Removing:
Day: 0 Month: 1 Task: Do Task 1
Day: 1 Month: 2 Task: Do Task 2
Day: 3 Month: 4 Task: Do Task 4
Day: 4 Month: 5 Task: Do Task 5
Day: 5 Month: 6 Task: Do Task 6
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3>
```

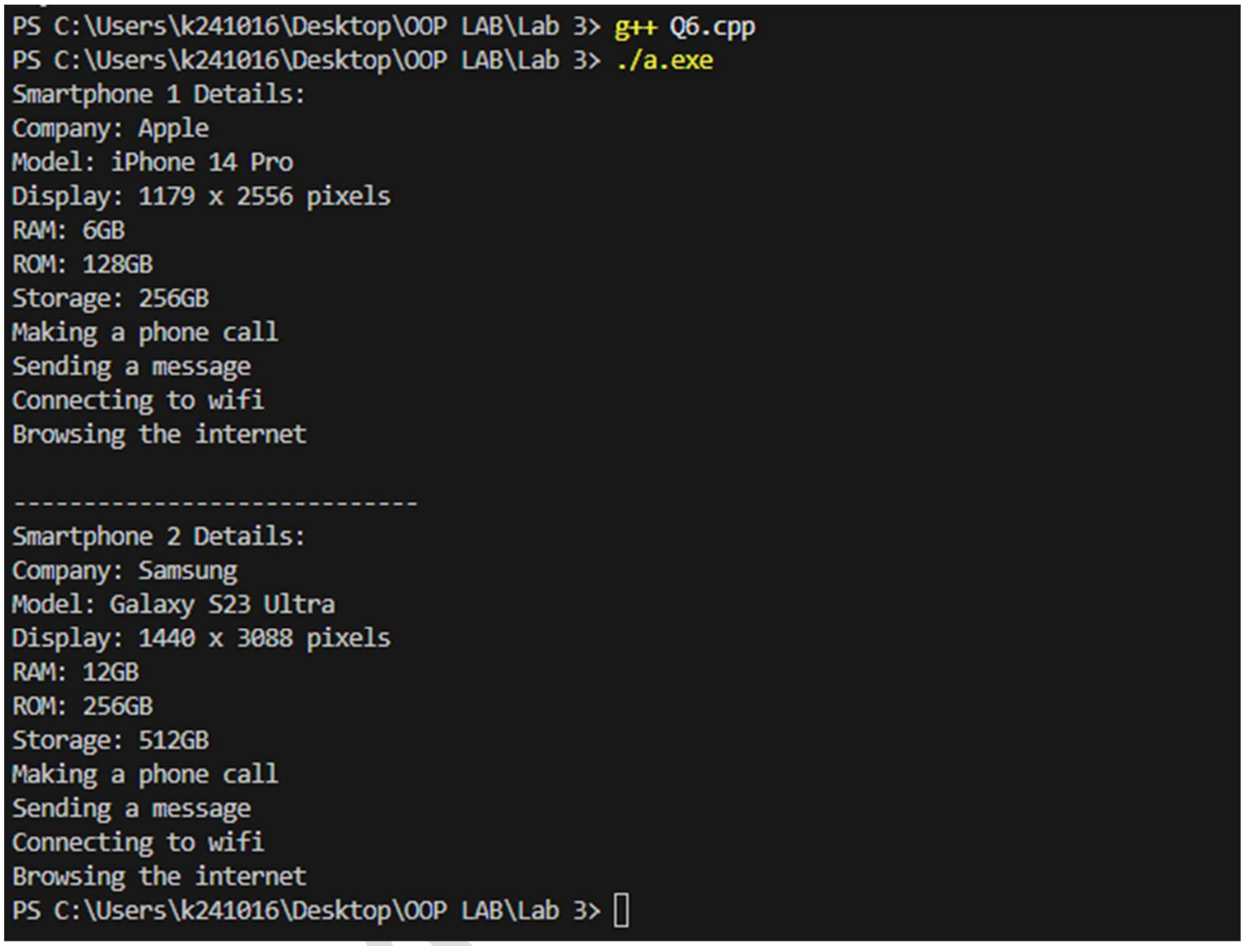
Question 6

Source Code:

```
/*
Create a class called Smartphone with the following attributes:
- Company
- Model
- Display Resolution
- RAM
- ROM
- Storage

Create getter and setter methods for your attributes. A smartphone has some
specific actions that it can perform.
For example:
1. Make a phone call
2. Send a message
3. Connect to the wifi
4. Browse the internet

Create different smartphone objects. Set their attributes using the setter
functions and display their attributes after
using the getter functions to fetch the attributes.
*/

#include <iostream>
using namespace std;

class Smartphone{
    private:
    string company, model, display;
    int ram, rom, storage;

    public:
    void setcompany(string c){
        company=c;
    }
    void setmodel(string m){
        model=m;
    }
    void setdisplay(string d){
        display=d;
    }
```

```cpp
    void setram(int r){
        ram=r;
    }
    void setrom(int r){
        rom=r;
    }
    void setstorage(int s){
        storage=s;
    }
    string getcompany(){
        return company;
    }
    string getmodel(){
        return model;
    }
    string getdisplay(){
        return display;
    }
    int getram(){
        return ram;
    }
    int getrom(){
        return rom;
    }
    int getstorage(){
        return storage;
    }
    void call(){
        cout<<"Making a phone call\n";
    }
    void message(){
        cout<<"Sending a message\n";
    }
    void wifi(){
        cout<<"Connecting to wifi\n";
    }
    void browse(){
        cout<<"Browsing the internet\n";
    }
};

int main() {
    Smartphone phone1, phone2;

    phone1.setcompany("Apple");
    phone1.setmodel("iPhone 14 Pro");
    phone1.setdisplay("1179 x 2556 pixels");
    phone1.setram(6);
    phone1.setrom(128);
    phone1.setstorage(256);

    phone2.setcompany("Samsung");
    phone2.setmodel("Galaxy S23 Ultra");
    phone2.setdisplay("1440 x 3088 pixels");
    phone2.setram(12);
    phone2.setrom(256);
    phone2.setstorage(512);

    cout << "Smartphone 1 Details:\n";
    cout << "Company: " << phone1.getcompany() << endl;
    cout << "Model: " << phone1.getmodel() << endl;
    cout << "Display: " << phone1.getdisplay() << endl;
    cout << "RAM: " << phone1.getram() << "GB\n";
    cout << "ROM: " << phone1.getrom() << "GB\n";
    cout << "Storage: " << phone1.getstorage() << "GB\n";

    phone1.call();
    phone1.message();
    phone1.wifi();
    phone1.browse();

    cout << "\n-----------------------------\n";

    cout << "Smartphone 2 Details:\n";
    cout << "Company: " << phone2.getcompany() << endl;
    cout << "Model: " << phone2.getmodel() << endl;
    cout << "Display: " << phone2.getdisplay() << endl;
    cout << "RAM: " << phone2.getram() << "GB\n";
    cout << "ROM: " << phone2.getrom() << "GB\n";
    cout << "Storage: " << phone2.getstorage() << "GB\n";

    phone2.call();
    phone2.message();
    phone2.wifi();
    phone2.browse();
}
```

Output:

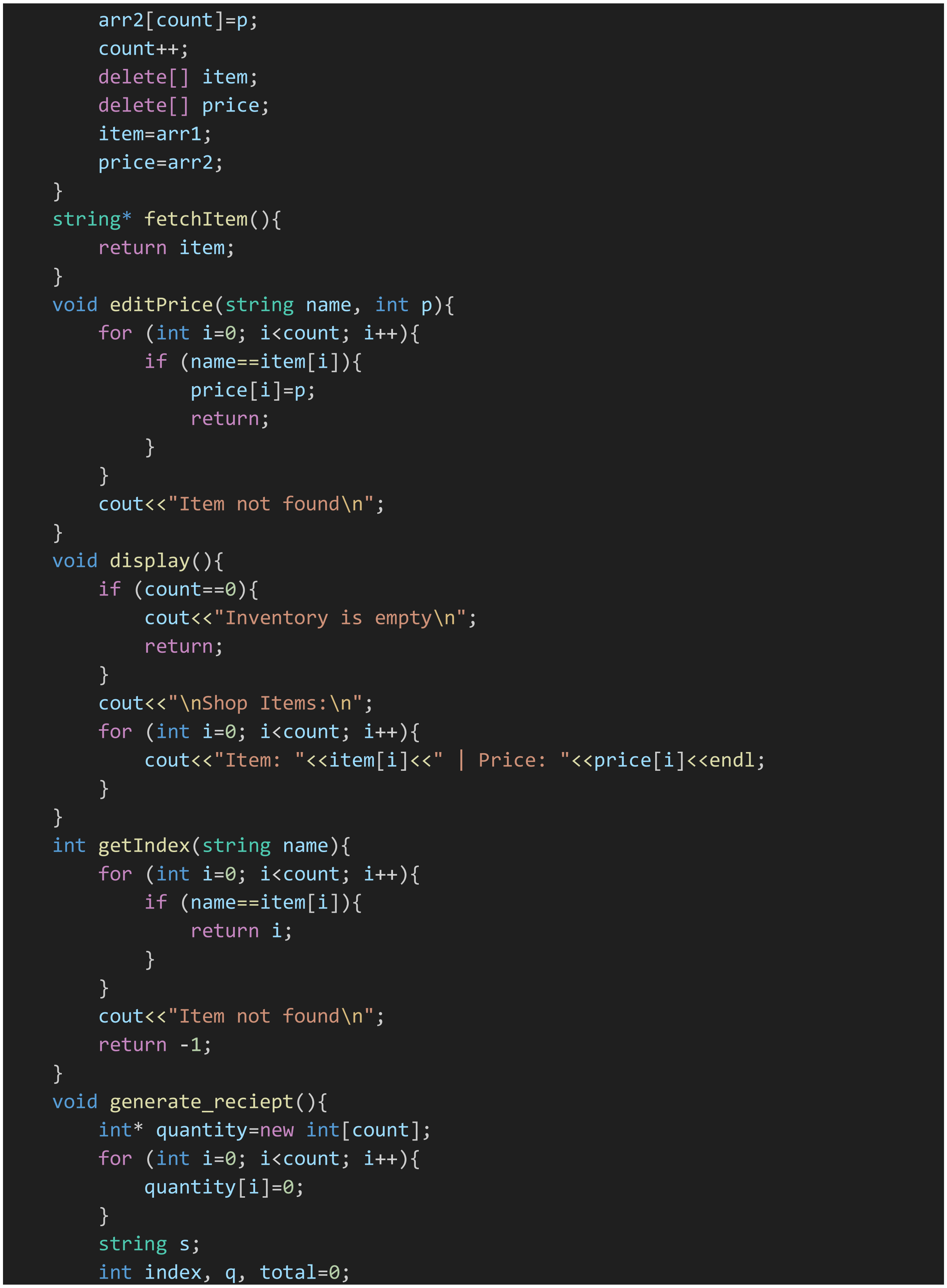


```
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> g++ Q6.cpp
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> ./a.exe
Smartphone 1 Details:
Company: Apple
Model: iPhone 14 Pro
Display: 1179 x 2556 pixels
RAM: 6GB
ROM: 128GB
Storage: 256GB
Making a phone call
Sending a message
Connecting to wifi
Browsing the internet

-----------------------------
Smartphone 2 Details:
Company: Samsung
Model: Galaxy S23 Ultra
Display: 1440 x 3088 pixels
RAM: 12GB
ROM: 256GB
Storage: 512GB
Making a phone call
Sending a message
Connecting to wifi
Browsing the internet
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3>
```

Question 7

Source Code:

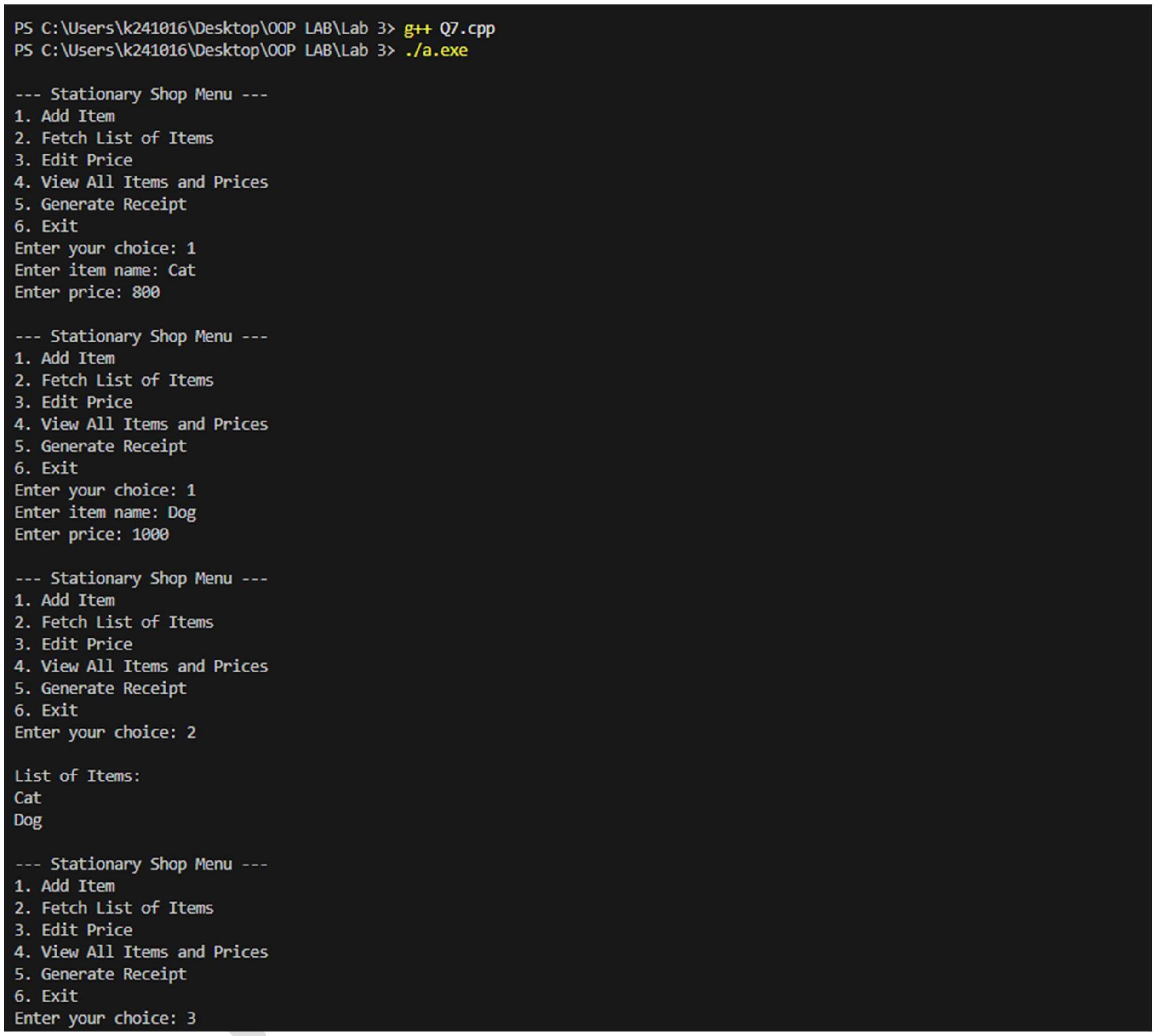
```
/*
Create a class for a stationary shop. The stationary shop maintains a list for
all the items that it sells (hint: array of
strings), and another list with the prices of the items (hint: array of prices).
Create a menu-driven program to:
1. Allow the shop owner to add the items and their prices.
2. Fetch the list of items
3. Edit the prices of the items
4. View all the items and their prices
Create a receipt that the shopkeeper can share with their customers. The receipt
can only be created after the
shopkeeper inputs the items and their amounts bought by the customer.
*/

#include <iostream>
using namespace std;

class StationaryShop{
    private:
    string *item;
    int *price;
    int count;
    public:
    StationaryShop(){
        count=0;
        item=nullptr;
        price=nullptr;
    }
    ~StationaryShop() {
        delete[] item;
        delete[] price;
    }
    void add(string it, int p){
        string *arr1=new string[count+1];
        int *arr2=new int[count+1];
        for (int i=0; i<count; i++){
            arr1[i]=item[i];
            arr2[i]=price[i];
        }
        arr1[count]=it;
```



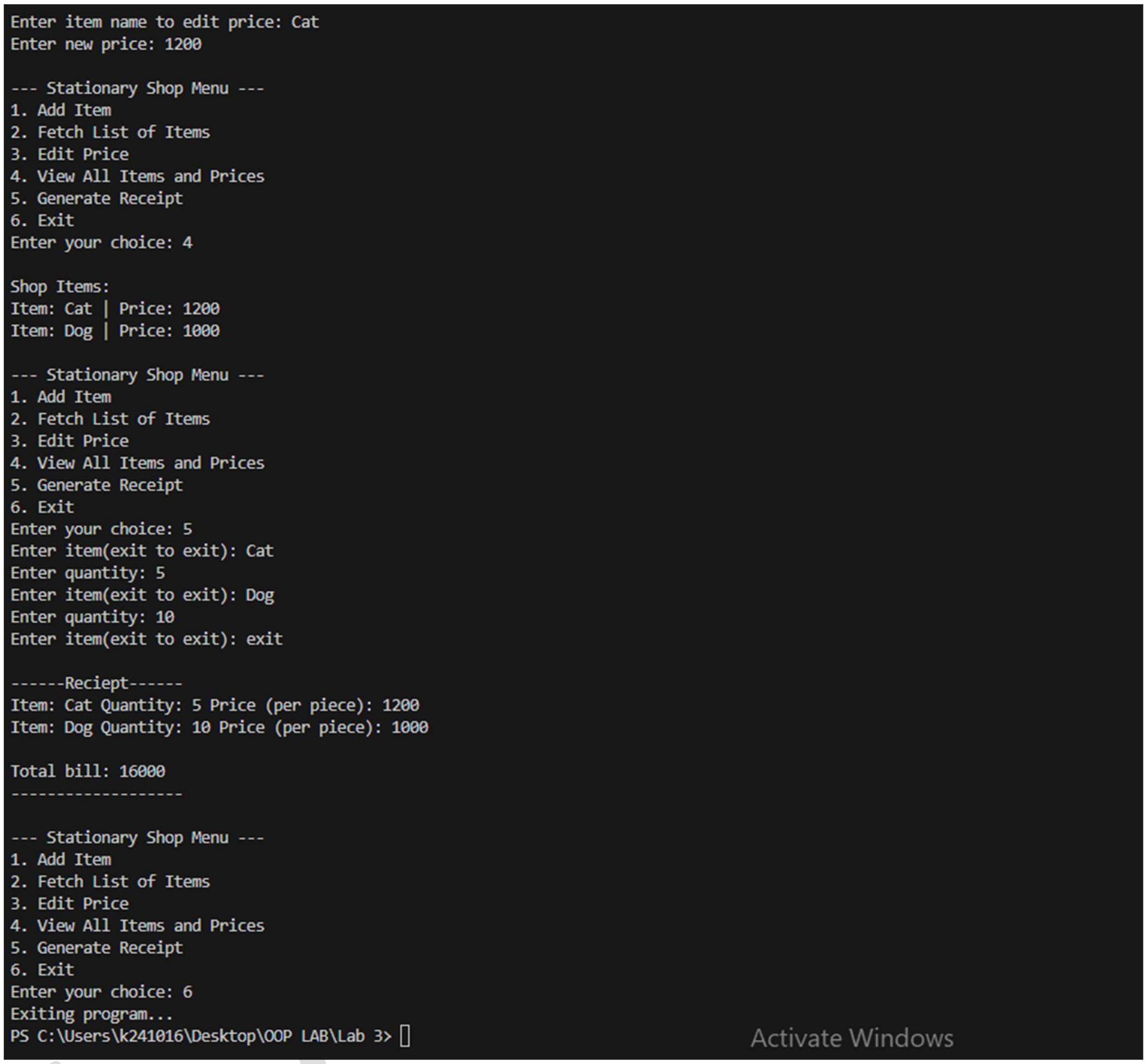
```cpp
        arr2[count]=p;
        count++;
        delete[] item;
        delete[] price;
        item=arr1;
        price=arr2;
    }
    string* fetchItem(){
        return item;
    }
    void editPrice(string name, int p){
        for (int i=0; i<count; i++){
            if (name==item[i]){
                price[i]=p;
                return;
            }
        }
        cout<<"Item not found\n";
    }
    void display(){
        if (count==0){
            cout<<"Inventory is empty\n";
            return;
        }
        cout<<"\nShop Items:\n";
        for (int i=0; i<count; i++){
            cout<<"Item: "<<item[i]<<" | Price: "<<price[i]<<endl;
        }
    }
    int getIndex(string name){
        for (int i=0; i<count; i++){
            if (name==item[i]){
                return i;
            }
        }
        cout<<"Item not found\n";
        return -1;
    }
    void generate_reciept(){
        int* quantity=new int[count];
        for (int i=0; i<count; i++){
            quantity[i]=0;
        }
        string s;
        int index, q, total=0;
        while (1){
            cout<<"Enter item(exit to exit): ";
            cin>>s;
            if (s=="exit") break;
            index=getIndex(s);
            if (index>=0) {
                cout<<"Enter quantity: ";
                cin>>q;
                if (q>0) quantity[index]=q;
                else cout<<"Error\n";
            }
        }
        cout<<"\n------Reciept------\n";
        for (int i=0; i<count; i++){
            if (quantity[i]!=0){
                cout<<"Item: "<<item[i]<<" Quantity: "<<quantity[i]<<" Price (per
piece): "<<price[i]<<endl;
                total+=quantity[i]*price[i];
            }
        }
        cout<<"\nTotal bill: "<<total<<endl;
        cout<<"-------------------\n";
        delete[] quantity;
    }
    int getCount(){
        return count;
    }
};

int main() {
    StationaryShop shop;
    int choice;

    do {
        cout << "\n--- Stationary Shop Menu ---\n";
        cout << "1. Add Item\n";
        cout << "2. Fetch List of Items\n";
        cout << "3. Edit Price\n";
        cout << "4. View All Items and Prices\n";
        cout << "5. Generate Receipt\n";
        cout << "6. Exit\n";
        cout << "Enter your choice: ";
        cin >> choice;

        switch (choice) {
            case 1: {
                string item;
                int price;
                cout << "Enter item name: ";
                cin >> item;
                cout << "Enter price: ";
                cin >> price;
                shop.add(item, price);
                break;
            }
            case 2: {
                string* items = shop.fetchItem();
                cout << "\nList of Items:\n";
                int count=shop.getCount();
                for (int i = 0; i < count; i++) {
                    cout << items[i] << endl;
                }
                break;
            }
            case 3: {
                string item;
                int newPrice;
                cout << "Enter item name to edit price: ";
                cin >> item;
                cout << "Enter new price: ";
                cin >> newPrice;
                shop.editPrice(item, newPrice);
                break;
            }
            case 4: {
                shop.display();
                break;
            }
            case 5: {
                shop.generate_reciept();
                break;
            }
            case 6: {
                cout << "Exiting program...\n";
                break;
            }
            default:
                cout << "Invalid choice. Please try again.\n";
        }
    } while (choice != 6);
```

```
}
```

Output:



```
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> g++ Q7.cpp
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3> ./a.exe

--- Stationary Shop Menu ---
1. Add Item
2. Fetch List of Items
3. Edit Price
4. View All Items and Prices
5. Generate Receipt
6. Exit
Enter your choice: 1
Enter item name: Cat
Enter price: 800

--- Stationary Shop Menu ---
1. Add Item
2. Fetch List of Items
3. Edit Price
4. View All Items and Prices
5. Generate Receipt
6. Exit
Enter your choice: 1
Enter item name: Dog
Enter price: 1000

--- Stationary Shop Menu ---
1. Add Item
2. Fetch List of Items
3. Edit Price
4. View All Items and Prices
5. Generate Receipt
6. Exit
Enter your choice: 2

List of Items:
Cat
Dog

--- Stationary Shop Menu ---
1. Add Item
2. Fetch List of Items
3. Edit Price
4. View All Items and Prices
5. Generate Receipt
6. Exit
Enter your choice: 3
```



```
Enter item name to edit price: Cat
Enter new price: 1200

--- Stationary Shop Menu ---
1. Add Item
2. Fetch List of Items
3. Edit Price
4. View All Items and Prices
5. Generate Receipt
6. Exit
Enter your choice: 4

Shop Items:
Item: Cat | Price: 1200
Item: Dog | Price: 1000

--- Stationary Shop Menu ---
1. Add Item
2. Fetch List of Items
3. Edit Price
4. View All Items and Prices
5. Generate Receipt
6. Exit
Enter your choice: 5
Enter item(exit to exit): Cat
Enter quantity: 5
Enter item(exit to exit): Dog
Enter quantity: 10
Enter item(exit to exit): exit

------Reciept------
Item: Cat Quantity: 5 Price (per piece): 1200
Item: Dog Quantity: 10 Price (per piece): 1000

Total bill: 16000
-------------------

--- Stationary Shop Menu ---
1. Add Item
2. Fetch List of Items
3. Edit Price
4. View All Items and Prices
5. Generate Receipt
6. Exit
Enter your choice: 6
Exiting program...
PS C:\Users\k241016\Desktop\OOP LAB\Lab 3>
```