

# Object Oriented Programming

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## Assignment #4

Umar Farooq  
09-131242-088  
BSE-2B

DEPARTMENT OF SOFTWARE ENGINEERING  
BAHRIA UNIVERSITY ISLAMABAD CAMPUS

**Question:** You are required to develop a generic billing system for an electronics store that sells different types of devices such as Laptops, Tablets, and Smartphones. Each device has the following common attributes:

- Brand Name (string)
  - Model Number (string)
  - Price (float)
1. Create an abstract base class Device with the above common attributes and a pure virtual function calculateDiscountedPrice().
  2. Create three derived classes: Laptop, Tablet, and Smartphone. Each class should override the calculateDiscountedPrice() method to apply a device-specific discount:
    - Laptop: 10%
    - Tablet: 15%
    - Smartphone: 20%
  3. Use a template class Cart<T> that can store an array of device pointers (T\*) and calculate the total discounted bill for all devices added to the cart.
  4. In your main() function:
    - Dynamically create at least 2 objects of each device type.
    - Store them using the Cart<Device> class.
    - Display the brand, model, original price, and discounted price for each device.
    - Finally, print the total bill after discounts.

**Note:** Use pointers and virtual functions effectively. Your program should demonstrate strong use of inheritance, runtime polymorphism, and templates.

Code:

```
#include <iostream>
using namespace std;
class Device {
protected:
    string brandName;
    string modelNumber;
    float price;
public:
    Device(string b, string m, float p)
    {
        brandName = b;
        modelNumber = m;
        price = p;
    }
}
```

```

    virtual float discountedPrice() const = 0;
    virtual void display() const
    {
        cout << "Brand name: " << brandName << endl;
        cout << "Model number: " << modelNumber << endl;
        cout << "Price: $" << price << endl;
    }
    virtual ~Device() {}
};

class Laptop : public Device {
public:
    Laptop(string b, string m, float p) : Device(b, m, p) {}
    float discountedPrice() const override
    {
        return price * 0.90;
    }
    void display() const override
    {
        Device::display();
        cout << "Discounted price: $" << discountedPrice() << endl;
    }
};

class Tablet : public Device {
public:
    Tablet(string b, string m, float p) : Device(b, m, p) {}
    float discountedPrice() const override
    {
        return price * 0.85;
    }
    void display() const override
    {
        Device::display();
        cout << "Discounted price: $" << discountedPrice() << endl;
    }
};

class Smartphone : public Device {
public:
    Smartphone(string b, string m, float p) : Device(b, m, p) {}
    float discountedPrice() const override
    {

```

```

        return price * 0.80;
    }
    void display() const override
    {
        Device::display();
        cout << "Discounted price: $" << discountedPrice() << endl;
    }
};

template <class T>
class Cart {
private:
    T* items[100];
    int count = 0;
public:
    void addItem(T* item)
    {
        if (count < 100)
        {
            items[count++] = item;
        }
    }
    void displayTotalBill()
    {
        float total = 0;
        cout << "---Device List---" << endl;
        for (int i = 0; i < count; i++)
        {
            items[i]->display();
            total += items[i]->discountedPrice();
            cout << "-----" << endl;
        }
        cout << "Total bill: $" << total << endl;
    }
};

int main()
{
    Device* d1 = new Laptop("HP", "Pavilion", 1249.99);
    Device* d2 = new Laptop("Apple", "Macbook air 2023", 1399.99);

    Device* d3 = new Tablet("Apple", "Mini 5", 1099.99);

```

```
Device* d4 = new Tablet("Samsung", "Tab A9+", 899.99);
```

```
Device* d5 = new Smartphone("Apple", "16 pro", 1399.99);
```

```
Device* d6 = new Smartphone("Samsung", "Galaxy S25 ultra", 1299.99);
```

```
Cart<Device> cart;
```

```
cart.addItem(d1);
```

```
cart.addItem(d2);
```

```
cart.addItem(d3);
```

```
cart.addItem(d4);
```

```
cart.addItem(d5);
```

```
cart.addItem(d6);
```

```
cart.displayTotalBill();
```

```
delete d1;
```

```
delete d2;
```

```
delete d3;
```

```
delete d4;
```

```
delete d5;
```

```
delete d6;
```

```
return 0;
```

```
}
```

Output:



Umar Farooq-088-Ass#4-2B



---Device List---

Brand name: HP

Model number: Pavilion

Price: \$1249.99

Discounted price: \$1124.99

Brand name: Apple

Model number: Macbook air 2023

Price: \$1399.99

Discounted price: \$1259.99

Brand name: Apple

Model number: Mini 5

Price: \$1099.99

Discounted price: \$934.992

Brand name: Samsung

Model number: Tab A9+

Price: \$899.99

Discounted price: \$764.992

Brand name: Apple

Model number: 16 pro

Price: \$1399.99

Discounted price: \$1119.99

Brand name: Samsung

Model number: Galaxy S25 ultra

Price: \$1299.99

Discounted price: \$1039.99

Total bill: \$6244.95

E:\source\Project35\x64\Debug\Project35.exe (proc