Question 1:

```cpp
#include <iostream>
using namespace std;
class Rectangle{
    private:
        int length;
        int width;
    public:
        Rectangle(int l,int w):length(l),width(w) {}
        friend class AreaCalculator;
};
class AreaCalculator{
    public:
        static int calculateArea(Rectangle& x){
            return x.length * x.width;
        }
};
int main(){
    Rectangle r(10,5);
    int area = AreaCalculator::calculateArea(r);
    cout << "Area of Rectangle: " << area << endl;
    return 0;
}
```

```
Area of Rectangle: 50

--------------------------------
Process exited after 0.1656 seconds with return value 0
Press any key to continue . . .
```

Question 2:

```cpp
#include <iostream>
using namespace std;
class BankAccount{
    private:
        int accountNumber;
        double balance;
    public:
        BankAccount(int a,double b):accountNumber(a),balance(b) {}
        friend class Transaction;
};
class Transaction{
    public:
        static void processTransaction(BankAccount& b){
            int choice;
            double temp;
            cout<<"1. Deposit\n2.Withdrawal"<<endl;
            cin>>choice;
            switch(choice){
                case 1:
                    cout<<"Enter amount to deposit"<<endl;
                    cin>>temp;
                    b.balance += temp;
                    break;
                case 2:
                    cout<<"Enter amount to deposit"<<endl;
                    cin>>temp;
                    if(temp>b.balance){
                        cout<<"Not sufficient funds"<<endl;
                        break;
                    }
                    else{
                        b.balance -= temp;
                        break;
                    }
                default:
                    cout<<"Invalid choice"<<endl;
            }
        }
};
int main(){
    BankAccount a(1002,200000);
    Transaction::processTransaction(a);
    Transaction::processTransaction(a);
    return 0;
}
```

```
1. Deposit
2.Withdrawal
1
Enter amount to deposit
2222
1. Deposit
2.Withdrawal
3
Invalid choice

--------------------------------
Process exited after 7.805 seconds with return value 0
Press any key to continue . . .
```

Question 3:

```cpp
#include <iostream>
using namespace std;

class Doctor;

class Patient {
    string name;
    int age;
    string medHis;
public:
    Patient(string n, int a, string m) : name(n), age(a), medHis(m) {}
    friend class Doctor;
};

class Doctor {
public:
    void display(Patient& p) {
        cout << "Patient name: " << p.name << endl;
        cout << "Patient age: " << p.age << endl;
        cout << "Patients medical history: " << p.medHis << endl;
    }

    void update(Patient& p, string history) {
        p.medHis = history;
        cout << "Updated medical history: " << p.medHis << endl;
    }
};

int main() {
    Patient p("RAYYAN ASIF", 18, "FEVER");
    Doctor d;
    d.display(p);
    d.update(p, "COUGH");
    return 0;
}
```

```
Patient name: RAYYAN ASIF
Patient age: 18
Patients medical history: FEVER
Updated medical history: COUGH

--------------------------------
Process exited after 0.1428 seconds with return value 0
Press any key to continue . . .
```

Question 4:

```cpp
#include <iostream>
using namespace std;

class HR;
class Manager;

class Employee {
    string name;
    double salary;
public:
    Employee(string n, double s) : name(n), salary(s) {}
    friend class HR;
};

class HR {
public:
    void updateSalary(Employee& e, double amount) {
        e.salary = amount;
    }

    string getName(Employee& e) const { return e.name; }
    double getSal(Employee& e) const { return e.salary; }

    friend class Manager;
};

class Manager {
public:
    void viewSalary(HR& h, Employee& e) {
        cout << "Employee: " << h.getName(e) << " | Salary: " << h.getSal(e) << endl;
    }
};

int main() {
    Employee e("Rayyan", 30000);
    HR h;
    Manager m;

    m.viewSalary(h, e);

    h.updateSalary(e, 190000);

    cout << "After updating:" << endl;
    m.viewSalary(h, e);

    return 0;
}
```

```
Employee: Rayyan | Salary: 30000
After updating:
Employee: Rayyan | Salary: 190000

--------------------------------
Process exited after 0.1407 seconds with return value 0
Press any key to continue . . .
```

Question 5:

```cpp
#include <iostream>
using namespace std;

class HomeAssistant;
class EnergyMonitor;

class SmartDevice {
    string deviceName;
    int usage;
    string status;
public:
    SmartDevice(string d, int u, string s) : deviceName(d), usage(u), status(s) {}
    friend class HomeAssistant;
    friend class EnergyMonitor;
};

class HomeAssistant {
public:
    void changeStatus(SmartDevice& s, string newStat) {
        s.status = newStat;
    }
    friend class EnergyMonitor;
};

class EnergyMonitor {
    static int energy;
public:
    int energyConsumption(SmartDevice& s) {
        if (s.status == "on") {
            energy += s.usage;
        }
        return energy;
    }

    static int getEnergy() {
        return energy;
    }
};

int EnergyMonitor::energy = 0;

int main() {
    SmartDevice s1("Fan", 12, "off");
    SmartDevice s2("Light", 9, "on");
    SmartDevice s3("TV", 20, "off");

    HomeAssistant h;
    h.changeStatus(s3, "on");

    EnergyMonitor e;

    cout << "Energy consumed by Light: " << e.energyConsumption(s2) << endl;
    cout << "Energy consumed after turning on TV: " << e.energyConsumption(s3) << endl;

    cout << "Total energy consumption: " << EnergyMonitor::getEnergy() << endl;

    return 0;
}
```

```
Energy consumed by Light: 9
Energy consumed after turning on TV: 29
Total energy consumption: 29


--------------------------------
Process exited after 0.1486 seconds with return value 0
Press any key to continue . . .
```

Question 6:

```
#include <iostream>
using namespace std;

class HR;
class Payroll;
class Employee{
    string name;
    double salary;
    int workHours;
public:
    Employee(string n,double s,int w):name(n),salary(s),workHours(w){}
    friend class HR;
    friend void computeFinalSalary(Employee& e);
};
class HR{
public:
    void updateSalary(Employee& e,double newSalary){
        e.salary=newSalary;
    }
    void updateWorkHours(Employee& e,int newHours){
        e.workHours=newHours;
    }
};

void computeFinalSalary(Employee& e) {
    double finalSalary = e.salary;
    if (e.workHours > 40) {
        finalSalary += 5000;
    }
    else if (e.workHours < 30) {
        finalSalary -= 3000;
    }
    cout << "Final salary for " << e.name << ": $" << finalSalary << endl;
}

int main() {
    Employee emp("Rayyan", 150000, 18);
    HR hr;

    hr.updateSalary(emp, 100000);
    hr.updateWorkHours(emp, 45);

    computeFinalSalary(emp);

    return 0;
}
```

```
Final salary for Rayyan: $105000


--------------------------------
Process exited after 0.139 seconds with return value 0
Press any key to continue . . .
```

Question 7:

```cpp
#include <iostream>
using namespace std;

class InventoryManager;
class Product {
    string productName;
    double price;
    int stockQuantity;

public:
    Product(string p, double pr, int s) : productName(p), price(pr), stockQuantity(s) {}

    friend class InventoryManager;
    friend void applyDiscount(Product& p, double discountPercent);
};

class InventoryManager {
public:
    void displayStock(Product& p) {
        cout << "Product: " << p.productName << endl;
        cout << "Price: $" << p.price << endl;
        cout << "Stock: " << p.stockQuantity << endl;
    }

    void updateStock(Product& p, int newStock) {
        p.stockQuantity = newStock;
    }
};

void applyDiscount(Product& p, double discountPercent) {
    p.price -= p.price * (discountPercent / 100);
    cout << "Discount applied! New price: $" << p.price << endl;
}

int main() {
    Product prod("Laptop", 1200, 50);
    InventoryManager manager;

    manager.displayStock(prod);
    applyDiscount(prod, 15);
    manager.updateStock(prod, 45);
    manager.displayStock(prod);

    return 0;
}
```

```
Product: Laptop
Price: $1200
Stock: 50
Discount applied! New price: $1020
Product: Laptop
Price: $1020
Stock: 45

--------------------------------
Process exited after 0.1559 seconds with return value 0
Press any key to continue . . .
```