

## Object Oriented Programming 11206

### First Exam, Fall 2017/2018

Instructors:

Dr. Raad Al-Qassas

Dr. Nailah Al-Madi

Dr. Anas Abu Talib

Student Name

Student Number

Section Number /Doctor

---

---

---

Question	Points	Score
1	18	
2	16	
3	43	
4	23	
Total	100	

Question 1 (18 points) : Trace the following programs and write the **generated output in the boxes below only?**

A (8 points)	B (10 points)
<pre>#include &lt;iostream&gt; using namespace std; class myClass {     int code;     int count;  public:     myClass()     {         count = 1;         code= count++;     }      void getvalues(int x, int &amp;y){         x = count;         y = code;     }     ~myClass(){         cout &lt;&lt; count &lt;&lt; endl;     } };  int main() {      myClass obj1,obj2;     int val1 = 3,val2 = 5;     obj2.getvalues(val1,val2);     cout&lt;&lt;"\nval1 :"&lt;&lt;val1;     cout&lt;&lt;"\nval2 :"&lt;&lt;val2;     return 0; }</pre>	<pre>#include &lt;iostream&gt; using namespace std; class Point { private:     int x, y; public:     Point() {         x = y = 0;         cout&lt;&lt;"AAAA\n";     }     Point(int ix, int iy) {         x = ix; y = iy;         cout&lt;&lt;"BBBB\n";     }     Point(const Point&amp; p) {         x = p.x; y = p.y;         cout&lt;&lt;"CCCC\n";     } };  void foo(Point p) {     Point c = p;     cout &lt;&lt;"DDDD\n"; }  int main() {     Point a(2,3);     Point b;     foo(a);     return 0; }</pre>
<p>Output</p> <p>Val1 = 3 Val2 = 1 2 2</p>	<p>Output</p> <p>BBBB AAAA CCCC CCCC DDDD</p>

**Question 2 (16 points):** Given the following code, indicate whether or not each of the following lines (a) through (h) is legal or illegal. If it is illegal you have to give a reason.

```
#include <iostream>
using namespace std;
class C
{
private:
    int x = 9;           // (a)
public:
    int y;               // (b)
    C(){};
    C(int x_val, int y_val){x=x_val; y=y_val;}
    int C (int x,int y, int Z){} // (c)
    int Fn(){return x;}
};
int main()
{
    C c1(7, 2);          // (d)
    C c3;                // (e)
    cout << c1.x;        // (f)
    c1.y = 5;            // (g)
    int n = c1.Fn(7);    // (h)
    return 0;
}
```

line	legal	illegal	reason
a		X	A private data member is giving a value in declaration
b	X		
c		X	Constructors does not have return type
d	X		
e	X		
f		X	X is private and cannot be accessed from main
g	X		
h		X	In its definition Fn does not receive parameters and in the call parameters are provided

### Question 3 (43 points):

Define a class **House** which has the following data members:

- **id** (integer): an identification number of the house.
- **member** (integer): the number of members of the house .
- **income** (double): the annual income (الدخل السنوي) of the house .
- **area** (float): the area of the house

The class should contain the following methods:

- A default constructor to set **member**, **area** and **income** to 0
- An initializer (parametrized) constructor to set **member**, **area** and **income**
- A function named **setInfo** to set values for **id**, **member**, **area** and **income** through the passed parameters.
- A function **getId** which returns the **id**.
- A boolean function named **povertyLevel** () that returns true if the **income** is below the poverty level (خط الفقر), and false otherwise. The poverty level (p) is computed according to the following equation:  
$$P = 4000 + 450 * (\text{member} - 2)$$
- A boolean function named **hasMoreIncome(house & H)** that compares the income of the current object is more than income of the parameter object H
- A function that returns the house **utilization** (نسبة الاستفادة), which is calculated by dividing the number of members over the house area.

**Hint: You need to do the following, otherwise grades will be deducted**

- \* Separate class declaration and implementation
- \* Validate the values to be stored in the data members

### Question 4 (23 points):

Write main to test the class **House** you have written in the previous question, which does the following (in sequence).

- Define two objects of type House named H1 that uses the default constructor and H2 which has 5 members, an area 190 and income of 1000.
- Declare an array of **House** objects of size 12
- Let user fill the values of each object in the array interactively.
- Determine the number of houses having income below the poverty level.
- Find the ID of the house with the highest income by searching the array of objects using the **hasMoreIncome** function.

```

#include <iostream>
using namespace std;
class House {
public:
    House();
    House(int, float, float);
    void setInfo(int, int, float, float);
    int getID();
    bool PovertyLevel();
    bool hasMoreIncome(House &H);
    double Utilization();
private:
    int ID, member;
    float income, area;
};
House::House() {
    member = area = income = 0;
}
House::House(int a, float b, float c) {
    member = (a>=0)?a:0;
    area = (b>=0)?b:0;
    income = (c>=0)?c:0;
}
void House::setInfo(int i, int a, float b, float c) {
    ID = (i>=0)?i:0;
    member = (a>=0)?a:0;
    area = (b>=0)?b:0;
    income = (c>=0)?c:0;
}
int House::getID() {
    return ID;
}
bool House::PovertyLevel() {
    float p = 4000 + 450*(member -2);
    return income < p;
}
bool House::hasMoreIncome(House &H) {
    return income > H.income;
}
double House::Utilization() {
    if (area == 0) return 0;
    return member/area;
}

```

```

int main() {
    House h1;
    House h2(5,190,1000);
    //-----
    House arr[12];
    //-----
    int id, mem;
    double income;
    float area;
    for(int i=0; i<12;i++){
        cin >> id >> mem >> income >>area;
        arr[i].setInfo(id, mem, area, income);
    }
    //-----
    int c=0;
    for(int i=0; i<12;i++){
        if(arr[i].PovertyLevel())
            c++;
    }
    //-----
    int maxID=0;
    for(int i=1;i<12;i++){
        if(arr[i].hasMoreIncome(arr[maxID]))
            maxID=i;
    }
    cout<<arr[maxID].getID();
    return 0;
}

```