



San Francisco Bay University

CS360L - Programming in C and C++ Lab Lab Assignment #2

Due day: 2/27/2024

Instruction:

1. Push the answer sheets/source code to Github
 2. Please follow the code style rule like programs on handout.
 3. Overdue lab assignment submission can't be accepted.
 4. Take academic honesty and integrity seriously (Zero Tolerance of Cheating & Plagiarism)
-
1. Given a *student* class with the members and methods as follows, write a C++ test program (a.k.a. main function) to display *names*, *courseNum* and grades of 3 students who have appeared in the examination. Declare the class of *name*, *courseNum*. and *grade*. Create an array of class objects. Read and display the contents of the array.

```
#include <iostream>

using std::cout;
using std::cin;

#define MAX 10

class student {
private:
    char name[30];
    int courseNum;
    int total;
    float perc;
public:
    void getDetails(void); //member function to get
student's details
    void putDetails(void); //member function to print
student's details
};

void student::getDetails(void) //member function
definition, outside of the class
{
    cout << "Enter name: " ;
    cin >> name;
    cout << "Enter course number: ";
```

```

    cin >> courseNum;
    cout << "Enter total grades out of 500: ";
    cin >> total;
    perc=(float)total/500*100;
}
void student:: putDetails(void) //member function
definition, outside of the class
{
    cout << "Student details:\n";
    cout << "Name:"<< name << ",course Number:" << courseNum
<< ",Total:" << total << ",Percentage:" << perc;
}

int main(void){
    //Write your program here

    return 0;
}

```

Output

```

Enter total number of students: 3
Enter details of student 1:
Enter name: Karthik
Enter course number: 1201
Enter total marks out of 500: 456

```

```

Enter details of student 2:
Enter name: Mahesh
Enter course number: 1202
Enter total marks out of 500: 398

```

```

Enter details of student 3:
Enter name: Kiran
Enter course number: 1203
Enter total marks out of 500: 456

```

```

Details of student 1:
Student details:
Name: Karthik, course Number: 1201, Total: 456, Percentage:
91.2

```

```

Details of student 2:
Student details:
Name: Mahesh, course Number: 1202, Total: 398,
Percentage:79.6

```

```

Details of student 3:

```

Student details:

Name: Kiran, course Number: 1203, Total: 456, Percentage: 91.2



The screenshot shows a C++ program in a Replit IDE. The code defines a `student` class with attributes `name`, `courseNum`, `total`, and `perc`. It includes a `getDetails` method that prompts the user for these values and calculates the percentage. The console output shows the program being run, with input for three students: Karthik (1201, 456, 91.2%), Mahesh (1202, 398, 79.6%), and Kiran (1203, 456, 91.2%).

```
1 #include <iostream>
2 using namespace std;
3
4 #define MAX 10
5
6 class student {
7 private:
8     char name[30];
9     int courseNum;
10    int total;
11    float perc;
12
13 public:
14    void getDetails(void) {
15        cout << "Enter name: ";
16        cin >> name;
17        cout << "Enter course number: ";
18        cin >> courseNum;
19        cout << "Enter total grades out of 500: ";
20        cin >> total;
21        perc = (float)total / 500 * 100;
22    }
23
24    void putDetails(void) {
25        cout << "Student details:\n";
26        cout << "Name:" << name << ",course Number:" << courseNum << ",Total:" << total <<
27        ",Percentage:" << perc;
```

The screenshot shows the same C++ program, but with a `main` function that uses a loop to process multiple students. The `main` function prompts for the number of students, then iterates through them, calling `getDetails` and `putDetails` for each. The console output shows the program being run, with input for three students: Karthik (1201, 456, 91.2%), Mahesh (1202, 398, 79.6%), and Kiran (1203, 456, 91.2%).

```
30 int main(void) {
31     student students[MAX];
32     int n;
33
34     cout << "Enter total number of students: ";
35     cin >> n;
36
37     for (int i = 0; i < n; ++i) {
38         cout << "Enter details of student " << i + 1 << ":\n";
39         students[i].getDetails();
40     }
41
42     for (int i = 0; i < n; ++i) {
43         cout << "\nDetails of student " << i + 1 << ":\n";
44         students[i].putDetails();
45     }
46
47     return 0;
48 }
```

```

~/Swekchha19700CS360L$ ./result1
Enter total nu3
Enter details of student 1:
Enter name: Karthik
Enter course number: 1201
Enter total grades out of 500: 456
Enter details of student 2:
Enter name: Mahesh
Enter course number: 1202
Enter total grades out of 500: 398
Enter details of student 3:
Enter name: Kiran
Enter course number: 1203
Enter total grades out of 500: 456

Details of student 1:
Student details:
Name:Karthik,course Number:1201,Total:456,Percentage:91.2
Details of student 2:
Student details:
Name:Mahesh,course Number:1202,Total:398,Percentage:79.6
Details of student 3:
Student details:
Name:Kiran,course Number:1203,Tota
l:456,Percentage:91.2~/Swekchha197
~/Swekchha19700CS360L$ 

```

2. Complete two methods, `get_data()` and `print_data()` within the given class `sample` based on the running results shown as below

```

#include<iostream>

using std::cout;
using std::cin;
using std::endl;

class sample{
private:
    int a;
    char b;
    float c;

public:
    void get_data(){
        //Write your program here
    }
    void print_data(){
        //Write your program here
    }
}

```

```

    }
};
int main(void){
    sample s;
    s.get_data();
    s.print_data();

    return 0;
}

```

Output

```

Enter an integer value:12
Enter a character: S
Enter a float value: 12.12
Values read from keyboard are
Integer value: 12
character is :S
float value is :12.12
→

```

The screenshot displays a C++ Replit environment with the following components:

- Files Panel (Left):** Lists `main.cpp`, `result1`, `result2`, and `second.cpp`.
- Code Editor (Center):** Shows the implementation of the `sample` class in `second.cpp`.


```

1 #include<iostream>
2 using namespace std;
3
4 class sample {
5 private:
6     int a;
7     char b;
8     float c;
9
10 public:
11     void get_data() {
12         cout << "Enter an integer value: ";
13         cin >> a;
14         cout << "Enter a character: ";
15         cin >> b;
16         cout << "Enter a float value: ";
17         cin >> c;
18     }
19
20     void print_data() {
21         cout << "Values read from keyboard are\n";
22         cout << "Integer value: " << a << "\ncharacter is : " << b << "\nfloat value is : " << c <<
23         endl;
24     }
25
26 int main(void) {
27     sample s;

```
- Console (Right):** Shows the execution output, including file listings and the program's execution results:


```

~/Swekchha19700CS360L$ ls
main      Makefile  result1
main.cpp  replit.nix  second.cpp
~/Swekchha19700CS360L$ g++ second.cpp
-o result2
~/Swekchha19700CS360L$ ./result2
Enter an integer v12
Enter a character: S
Enter a float value: 12.12
Values read from keyboard are
Integer value: 12
character is :S
float value is :12.12
~/Swekchha19700CS360L$

```
- Bottom Bar:** Includes a status bar with temperature (8°C), search, and system clock (9:12 PM, 2/27/2024).

The screenshot shows a Replit IDE window for a project named 'Swekchha_19700_CS360L'. The editor has two tabs: 'main.cpp' and 'second.cpp'. The 'second.cpp' tab is active, showing the following C++ code:

```
25
26 int main(void) {
27     sample s;
28     s.get_data();
29     s.print_data();
30
31     return 0;
32 }
33
```

The terminal on the right shows the execution of the program. It starts with a shell prompt, followed by running 'ls' which lists 'main', 'Makefile', 'repl.it.nix', 'result1', and 'second.cpp'. Then, 'g++ second.cpp -o result2' is run. Finally, './result2' is executed, which prompts the user for input. The user enters '12' for an integer, 'S' for a character, and '12.12' for a float. The program then prints the values read from the keyboard.

```
~/Swekchha19700CS360L$ ls
main  Makefile  repl.it.nix  result1  second.cpp
~/Swekchha19700CS360L$ g++ second.cpp
~$ ./result2
Enter an integer v12
Enter a character: S
Enter a float value: 12.12
Values read from keyboard are
Integer value: 12
character is :S
float value is :12.12
~/Swekchha19700CS360L$
```

```
~/Swekchha19700CS360L$ ./result2
Enter an integer v12
Enter a character: S
Enter a float value: 12.12
Values read from keyboard are
Integer value: 12
character is :S
float value is :12.12
~/Swekchha19700CS360L$
```

3. Write a class called *Rectangle* that has floating point data members' *Length* and *width*. The class has the following member functions: *void setLength(float)* to set the *Length* data member; *void setwidth(float)* to set the *width* data member; *float perimeter(void)* to calculate and return the perimeter of the rectangle; *float area(void)* to calculate and return the area of the rectangle; *void show(void)* to display the *Length* and *width* of the rectangle; *int sameArea(Rectangle)* that has one parameter of type *Rectangle*, and *sameArea* returns *1* if the two *Rectangles* have the same area, otherwise returns *0* if they don't.

- a. Create *Rectangle* class first

```

class Rectangle {
private:
    float length;
    float width;

public:
    void setLength(float l) {
        length = l;
    }

    void setWidth(float w) {
        width = w;
    }

    float perimeter() {
        return 2 * (length + width);
    }

    float area() {
        return length * width;
    }

    void show() {
        cout << "Length: " << length << ", Width: " << width << endl;
    }

    int sameArea(Rectangle r) {
        return area() == r.area();
    }
};

```

- b. Write *main* function to create two *rectangle* objects. Set the *length* and *width* of the first rectangle to 5 and 2.5, and set the *length* and *width* of the second rectangle to 5 and 18.9. Display each *rectangle* and its area and perimeter.

→

```

int main() {
    Rectangle r1, r2, r3;
    r1.setLength(5);
    r1.setWidth(2.5);
    r2.setLength(5);
    r2.setWidth(18.9);
    r3.setLength(15);
    r3.setWidth(6.3);
}

```

- c. Check whether the two *Rectangles* have the same area and print a message indicating the result. Set the *Length* and *width* of the first *rectangle* to 15 and 6.3. Display each *Rectangle* and its area and perimeter again. Again, verify whether the two *Rectangles* have the same area and print a message indicating the result

→

```
cout << "Rectangles 1 and 2 have the same area: " << (r1.sameArea(r2) ? "Yes" : "No") << endl;
cout << "Rectangles 1 and 3 have the same area: " << (r1.sameArea(r3) ? "Yes" : "No") << endl;
```

```
~/SwekCma19700CS300L$ ./results
Rectangle 1:
Length: 5, Width: 2.5
Area: 12.5, Perimeter: 15
Rectangle 2:
Length: 5, Width: 18.9
Area: 94.5, Perimeter: 47.8
Rectangle 3:
Length: 15, Width: 6.3
Area: 94.5, Perimeter: 42.6
Rectangles 1 and 2 have the same
area: No
Rectangles 1 and 3 have the same
area: No
(Sun)kh49700CS300L$
```

4. Create a class called *MusicIns* to contain three methods *void string(void)*, *void wind(void)* and *void perc(void)*. Each of these methods should initialize a member *string* type *instrument* array to contain the following
 - a. *Veena, guitar, sitar, sarod* and *mandolin* under *void string(void)* method
 - b. *Flute, clarinet, saxophone, nadaswaram* and *piccolo* under *void wind(void)* method
 - c. *Table, mridangam, bongos, drums* and *tambour* under *void perc(void)* method

It should also have two methods called *void get(void)* and *void show(void)* to display the contents of the arrays initialized. The *void get(void)* methods must display a menu as follows

- a. The values of *instrument* array within *void string(void)* method
- b. The values of *instrument* array within *void wind(void)* method
- c. The values of *instrument* array within *void perc(void)* method

After that, generate test program *main.cpp* to verify the above class

→


```
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main.cpp second.cpp third.cpp fourth.cpp
fourth.cpp > Musicians > f.setString > f.setWind > f.setPerc > ...
1 #include <iostream>
2 #include <string>
3 using namespace std;
4
5 class MusicIns {
6 private:
7     string instruments[5];
8
9 public:
10 void setString() {
11     instruments[0] = "Veena";
12     instruments[1] = "Guitar";
13     instruments[2] = "Sitar";
14     instruments[3] = "Sarod";
15     instruments[4] = "Mandolin";
16 }
17
18 void setWind() {
19     instruments[0] = "Flute";
20     instruments[1] = "Clarinet";
21     instruments[2] = "Saxophone";
22     instruments[3] = "Madaswaram";
23     instruments[4] = "Piccolo";
24 }
25
26 void setPerc() {
27     instruments[0] = "Table";
28     instruments[1] = "Mridangam";
29 }
30 }
31
32 int main() {
33     MusicIns m;
34     m.setString();
35     m.setWind();
36     m.setPerc();
37     m.display();
38     return 0;
39 }
40
41 void MusicIns::display() {
42     cout << "Menu for Instrument Arrays:\n";
43     cout << "a. The values of instrument array within void setString() method\n";
44     cout << "b. The values of instrument array within void setWind() method\n";
45     cout << "c. The values of instrument array within void setPerc() method\n";
46     cout << "Enter your choice (a, b, c): ";
47     char choice;
48     choice = getche();
49     switch (choice) {
50     case 'a':
51         cout << "Values of instrument array \n";
52         for (int i = 0; i < 5; ++i) {
53             cout << instruments[i] << endl;
54         }
55         break;
56     case 'b':
57         cout << "Values of instrument array \n";
58         for (int i = 0; i < 5; ++i) {
59             cout << instruments[i] << endl;
60         }
61         break;
62     case 'c':
63         cout << "Values of instrument array \n";
64         for (int i = 0; i < 5; ++i) {
65             cout << instruments[i] << endl;
66         }
67         break;
68     }
69 }
```

```
~/Swekchha19700CS360L$ g++ fourth.cpp -o result4
~/Swekchha19700CS360L$ ./result4
Testing setString() method:
Menu for Instrument Arrays:
a. The values of instrument array within void setString() method
b. The values of instrument array within void setWind() method
c. The values of instrument array within void setPerc() method
Enter your choice (a, b, c): b
Values of instrument array
Veena
Guitar
Sitar
Sarod
Mandolin
Testing setWind() method:
Menu for Instrument Arrays:
a. The values of instrument array within void setString() method
b. The values of instrument array within void setWind() method
c. The values of instrument array within void setPerc() method
Enter your choice (a, b, c):
```

```
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  Join Replit Core
  AI (-) C++
  Ln 30, Col 30 • Spaces: 2 History

main.cpp second.cpp third.cpp fourth.cpp
fourth.cpp > Musicians > f.setString > f.setWind > f.setPerc > ...
28 instruments[1] = "Mridangam";
29 instruments[2] = "Bongos";
30 instruments[3] = "Drums";
31 instruments[4] = "Tambour";
32 }
33
34 void get() {
35     char choice;
36     cout << "Menu for Instrument Arrays:\n";
37     cout << "a. The values of instrument array within void setString() method\n";
38     cout << "b. The values of instrument array within void setWind() method\n";
39     cout << "c. The values of instrument array within void setPerc() method\n";
40     cout << "Enter your choice (a, b, c): ";
41     char choice;
42     choice = getche();
43     switch (choice) {
44     case 'a':
45         cout << "Values of instrument array \n";
46         for (int i = 0; i < 5; ++i) {
47             cout << instruments[i] << endl;
48         }
49         break;
50     case 'b':
51         cout << "Values of instrument array \n";
52         for (int i = 0; i < 5; ++i) {
53             cout << instruments[i] << endl;
54         }
55         break;
56     case 'c':
57         cout << "Values of instrument array \n";
58         for (int i = 0; i < 5; ++i) {
59             cout << instruments[i] << endl;
60         }
61         break;
62     }
63 }
```

```
~/Swekchha19700CS360L$ g++ fourth.cpp -o result4
~/Swekchha19700CS360L$ ./result4
Testing setString() method:
Menu for Instrument Arrays:
a. The values of instrument array within void setString() method
b. The values of instrument array within void setWind() method
c. The values of instrument array within void setPerc() method
Enter your choice (a, b, c): b
Values of instrument array
Veena
Guitar
Sitar
Sarod
Mandolin
Testing setWind() method:
Menu for Instrument Arrays:
a. The values of instrument array within void setString() method
b. The values of instrument array within void setWind() method
c. The values of instrument array within void setPerc() method
Enter your choice (a, b, c):
```

```
Swexchha_19700_CS360L
Run

Files
  fourth.cpp
  main.cpp
  result1
  result2
  result3
  result4
  second.cpp
  third.cpp

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fourth.cpp
57 case 'c';
58 cout << "Values of Instrument array \n";
59 for (int i = 0; i < 5; ++i) {
60   cout << instruments[i] << endl;
61 }
62 break;
63 default:
64   cout << "Invalid choice!\n";
65 }
66 }
67
68 void show() {
69   cout << "Values of Instrument array:\n";
70   for (int i = 0; i < 5; ++i) {
71     cout << instruments[i] << endl;
72   }
73 }
74 };
75
76 int main() {
77   MusicIns music;
78
79   cout << "Testing setString() method:\n";
80   music.setString();
81   music.get();
82
83   cout << "\nTesting setWind() method:\n";
84   music.setWind();
85   music.get();
86 }
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Console
~/Swexchha19700CS360L$ g++ fourth.cpp -o result4
~/Swexchha19700CS360L$ ./result4
Testing setString() method:
Menu for Instrument Arrays:
a. The values of instrument array within void setString() method
b. The values of instrument array within void setWind() method
c. The values of instrument array within void setPerc() method
Enter your choice (a, b, c): b
Values of instrument array
Veena
Guitar
Sitar
Sarod
Mandolin
Testing setWind() method:
Menu for Instrument Arrays:
a. The values of instrument array within void setString() method
b. The values of instrument array within void setWind() method
c. The values of instrument array within void setPerc() method
Enter your choice (a, b, c):
```

```
Swexchha_19700_CS360L
Run

Files
  fourth.cpp
  main.cpp
  result1
  result2
  result3
  result4
  second.cpp
  third.cpp

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fourth.cpp
79 cout << "Testing setString() method:\n";
80 music.setString();
81 music.get();
82
83 cout << "\nTesting setWind() method:\n";
84 music.setWind();
85 music.get();
86
87 cout << "\nTesting setPerc() method:\n";
88 music.setPerc();
89 music.get();
90
91 return 0;
92 }
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