

Lab 3

LAB 3.1 Working with the `cin` Statement

Bring in the program `bill.cpp` from the Lab 3 folder. The code is listed below:

```
// This program will read in the quantity of a particular item and its price.
// It will then print out the total price.
// The input will come from the keyboard and the output will go to
// the screen.

// PLACE YOUR NAME HERE

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

int main()
{
    int quantity;           // contains the amount of items purchased
    float itemPrice;        // contains the price of each item
    float totalBill;        // contains the total bill.

    cout << setprecision(2) << fixed << showpoint; // formatted output
    cout << "Please input the number of items bought" << endl;

    // Fill in the input statement to bring in the quantity.

    // Fill in the prompt to ask for the price.

    // Fill in the input statement to bring in the price of each item.

    // Fill in the assignment statement to determine the total bill.

    // Fill in the output statement to print total bill,
    // with a label to the screen.

    return 0;
}
```

Exercise 1

Complete the program so that a sample run inputting 22 for the number of items bought and 10.98 for the price of each item will produce the results below.

Sample run of the program.

```
Please input the number of items bought
22
Please input the price of each item
10.98
```

```
The total bill is $241.56
```

Exercise 2

Once you have the program working, change the instruction:

```
cout << setprecision (2) << fixed << showpoint;
```

to

```
cout << setprecision(2) << showpoint;
```

Rerun the program with the same data given in Exercise 1 above and record your results. What do you think the fixed attribute in the `cout` statement does?

Exercise 3

Now put the `fixed` attribute back in and change the instruction to make the precision 4. Rerun the program with the same data given in Exercise 1 and record your results. What do you think the `setprecision()` attribute in the `cout` statement does?

The attribute `showpoint` forces all floating point output to show a decimal point even if the values are whole numbers. In some environments this is done automatically.

Exercise 4

Add the following directive to the program: `#include <string>` in the header. Alter the program so that the program first asks for the name of the product (which can be read into a string object) so that the following sample run of the program will appear.

Please input the name of the item

Milk

Please input the number of items bought

4

Please input the price of each item

1.97

The item that you bought is Milk

The total bill is \$7.88

Now alter the program, if you have not already done so, so that the name of an item could include a space within its string.

Please input the name of the item

Chocolate Ice Cream

Please input the number of items bought

4

Please input the price of each item

1.97

The item that you bought is Chocolate Ice Cream

The total bill is \$7.88

LAB 3.2 Formatting Output

Look at the following table:

| PRICE | QUANTITY |
|-------|----------|
| 1.95 | 8 |
| 10.89 | 9 |

Assume that from the left margin, the price takes up fifteen spaces. We could say that the numbers are right justified in a 15-width space. Starting where the price ends, the next field (quantity) takes up twelve spaces. We can use the formatted output from Lab 3.1 and the statement `setw(n)` where `n` is some integer to indicate the width to produce such tables.

Bring in the program `tabledata.cpp` from the Lab 3 folder. The code is as follows:

```
// This program will bring in two prices and two quantities of items
// from the keyboard and print those numbers in a formatted chart.

//PLACE YOUR NAME HERE

#include <iostream>
#include _____ // Fill in the code to bring in the library for
// formatted output.
using namespace std;

int main()
{
    float price1, price2;          // The price of 2 items
    int   quantity1, quantity2;    // The quantity of 2 items

    cout << setprecision(2) << fixed << showpoint;
    cout << "Please input the price and quantity of the first item" << endl;

    // Fill in the input statement that reads in price1 and
    // quantity1 from the keyboard.

    // Fill in the prompt for the second price and quantity.

    // Fill in the input statement that reads in price2 and
    // quantity2 from the keyboard.

    cout << setw(15) << "PRICE" << setw(12) << "QUANTITY\n\n";

    // Fill in the output statement that prints the first price
    // and quantity. Be sure to use setw() statements.

    // Fill in the output statement that prints the second price
    // and quantity.

    return 0;
}
```

Exercise 1

Finish the code above by filling in the blanks and the instructions necessary to execute the following sample run. Note that two or more data items can be input at one time by having at least one blank space between them before hitting the enter key.

Please input the price and quantity of the first item
1.95 8

Please input the price and quantity of the second item
10.89 9

| PRICE | QUANTITY |
|-------|----------|
| 1.95 | 8 |
| 10.89 | 9 |

LAB 3.3 Arithmetic Operations and Math Functions

Bring in the program `righttrig.cpp` from the Lab 3 folder. The code is as follows:

```
// This program will input the value of two sides of a right triangle and then
// determine the size of the hypotenuse.
```

```
// PLACE YOUR NAME HERE

#include <iostream>
#include <cmath>    // needed for math functions like sqrt()
using namespace std;

int main()
{
    float a, b;    // the smaller two sides of the triangle
    float hyp;     // the hypotenuse calculated by the program

    cout << "Please input the value of the two sides" << endl;
    cin >> a >> b;

    // Fill in the assignment statement that determines the hypotenuse

    cout << "The sides of the right triangle are " << a << " and " << b << endl;

    cout << "The hypotenuse is " << hyp << endl;

    return 0;
}
```

The formula for finding the hypotenuse is $hyp = \sqrt{a^2 + b^2}$.

How can this be implemented in C++? Hint: You will use two pre-defined math functions (one of them twice) learned in this lesson. One of them will be “inside” the other.

Exercise 1

Fill in the missing statement so that the following sample run is implemented:

```
Please input the value of the two sides
9 3
The sides of the right triangle are 9 and 3
The hypotenuse is 9.48683
```

Exercise 2

Alter the program so that the sample run now looks like the following:

```
Please input the value of the two sides
9 3
The sides of the right triangle are 9 and 3
The hypotenuse is 9.49
```

Note: This is not a trivial change. You must include another directive as well as use the formatted features discussed in the earlier labs of this lesson. Notice that the change is made only to the value of the hypotenuse and not to the values of 9 and 3.

LAB 3.4 Working with Type Casting

Bring in the program `batavg.cpp` from the Lab 3 folder. The code follows.

```
// This program will determine the batting average of a player.
// The number of hits and at bats are set internally in the program.

// PLACE YOUR NAME HERE

#include <iostream>
using namespace std;

const int AT_BAT = 421;
const int HITS = 123;

int main()
{
    int batAvg;

    batAvg = HITS / AT_BAT           // an assignment statement
    cout << "The batting average is " << batAvg << endl;    // output the result

    return 0;
}
```

Exercise 1

Run this program and record the results. The batting average is _____ .

Exercise 2

There is a logic error in this program centering around data types. Does changing the data type of `batavg` from `int` to `float` solve the problem? Make that change and run the program again and record the result.

The batting average is _____ .

Exercise 3

Continue to work with this program until you get the correct result. The correct result should be 0.292162. Do not change the data type of the two named constants. Instead, use a `typecast` to solve the problem.

LAB 3.5 Student Generated Code Assignments

Option 1: Write a program that will read in 3 grades from the keyboard and will print the average (to 2 decimal places) of those grades to the screen. It should include good prompts and labeled output. Use the examples from the earlier labs to help you. Notice in the sample run that the answer is stored in fixed point notation with two decimal points of precision.

Sample run:

```
Please input the first grade
97
```

```
Please input the second grade
98.3
```

```
Please input the third grade
95
```

```
The average of the three grades is 96.77
```

Option 2: The Woody furniture company sells the following three styles of chairs:

| Style | Price Per Chair |
|-------------------|-----------------|
| American Colonial | \$ 85.00 |
| Modern | \$ 57.50 |
| French Classical | \$127.75 |

Write a program that will input the amount of chairs sold for each style. It will print the total dollar sales of each style as well as the total sales of all chairs in fixed point notation with two decimal places.

Sample run:

```
Please input the number of American Colonial chairs sold
20
```

```
Please input the number of Modern chairs sold
15
```

```
Please input the number of French classical chairs sold
5
```

```
The total sales of American Colonial chairs  $1700.00
```

```
The total sales of modern chairs  $862.50
```

```
The total sales of French Classical chairs  $638.75
```

```
The total sales of all chairs  $3201.25
```

Option 3: Write a program that will input total sales (sales plus tax) that a business generates for a particular month. The program will also input the state and local sales tax percentage. It will output the total sales plus the state tax and local tax to be paid. The output should be in fixed notation with 2 decimal places.

Sample run:

```
Please input the total sales for the month
1080
```

```
Please input the state tax percentage in decimal form (.02 for 2%)
0.06
```

```
Please input the local tax percentage in decimal form (.02 for 2%)
0.02
```

```
The Total sales for the month is $1080.00
```

```
Total sales without tax is $1000.00
```

```
The State tax for the month is $60.00
```

```
The Local tax for the month is $20.00
```