

## 22.1 LAB: Caffeine levels



This section has been set as optional by your instructor.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

A half-life is the amount of time it takes for a substance or entity to fall to half its original value. Caffeine has a half-life of about 6 hours in humans. Given caffeine amount (in mg) as input, output the caffeine level after 6, 12, and 24 hours.

Output each floating-point value with two digits after the decimal point, which can be achieved by executing

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

 once before all other cout statements.

Ex: If the input is:

```
100
```

the output is:

```
After 6 hours: 50.00 mg
After 12 hours: 25.00 mg
After 24 hours: 6.25 mg
```

Note: A cup of coffee has about 100 mg. A soda has about 40 mg. An "energy" drink (a misnomer) has between 100 mg and 200 mg.

539740.3879454.qx3zqy7

LAB  
ACTIVITY

22.1.1: LAB: Caffeine levels

0 / 10



main.cpp

Load default template...

```
1 #include <iostream>
2 #include <iomanip> //For setprecision
3 using namespace std;
4
5 int main() {
6     double caffeineMg; // "double" supports floating-point like 75.5, versus
7
8     cin >> caffeineMg;
9     cout << fixed << setprecision(2); // All later cout's will print floati
10    // Ex: 3.60
11
12    /* Type your code here. */
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

```
13  
14     return 0;  
15  
16
```

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

©zyBooks 01/31/24 18:09 1939727Rob DaglioMDCCOP2335Spring2024**Enter program input (optional)**

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**

Coding trail of your work

[What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.2 LAB: Driving costs



This section has been set as optional by your instructor.

Driving is expensive. Write a program with a car's gas mileage (miles/gallon) and the cost of gas (dollars/gallon) as floating-point input, and output the gas cost for 20 miles, 75 miles, and 500 miles.

©zyBooks 01/31/24 18:09 1939727MDCCOP2335Spring2024

Output each floating-point value with two digits after the decimal point, which can be achieved by executing

`cout << fixed << setprecision(2);` once before all other cout statements. Note: End with a newline.

Ex: If the input is:

25.0 3.1599

where the gas mileage is 25.0 miles/gallon and the cost of gas is \$3.1599/gallon, the output is:

2.53 9.48 63.20

Note: Real per-mile cost would also include maintenance and depreciation.

539740.3879454.qx3zqy

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

LAB ACTIVITY

22.2.1: LAB: Driving costs

0 / 10



main.cpp

Load default template...

```

1 #include <iostream>
2 #include <iomanip>      //For setprecision
3 using namespace std;
4
5 int main() {
6
7     // Type your declarations and any other code before your cout's here.
8
9     cout << fixed << setprecision(2);    // All later cout's will print floating
10    ..... // Ex: 3.60
11    // Type your cout code here
12
13    return 0;
14 }
15

```

Develop mode

Submit mode

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Run program

Input (from above)

main.cpp  
(Your program)

Output

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

## 22.3 LAB: Phone number breakdown



This section has been set as optional by your instructor.

Given a long long integer representing a 10-digit phone number, output the area code, prefix, and line number using the format (800) 555-1212.

Ex: If the input is:

8005551212

the output is:

(800) 555-1212

Hint: Use % to get the desired rightmost digits. Ex: The rightmost 2 digits of 572 is gotten by  $572 \% 100$ , which is 72.

Hint: Use / to shift right by the desired amount. Ex: Shifting 572 right by 2 digits is done by  $572 / 100$ , which yields 5. (Recall integer division discards the fraction).

For simplicity, assume any part starts with a non-zero digit. So 0119998888 is not allowed.

539740.3879454.qx3zqy7

LAB  
ACTIVITY

22.3.1: LAB: Phone number breakdown

0 / 10



©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

[Load default template...](#)

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     long long phoneNumber;
```

```
7     cin >> phoneNumber;  
8  
9     /* Type your code here */  
10    return 0;  
11 }  
12  
13 }
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

**Enter program input (optional)**

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**

Coding trail of your work

[What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.4 LAB: Musical note frequencies

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024



This section has been set as optional by your instructor.

On a piano, a key has a frequency, say  $f_0$ . Each higher key (black or white) has a frequency of  $f_0 \cdot r^n$ , where  $n$  is the distance (number of keys) from that key, and  $r$  is  $2^{(1/12)}$ . Given an initial key frequency, output that frequency and the next 3 higher key frequencies.

Output each floating-point value with two digits after the decimal point using the following statement once before all other `cout` statements:

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

Include the units ("Hz") and a newline after each frequency, including the last.

Ex: If the input is:

```
440.0
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

(which is the A key near the middle of a piano keyboard), the output is:

```
440.00 Hz  
466.16 Hz  
493.88 Hz  
523.25 Hz
```

Note: To compute the next 3 higher key frequencies, use one statement to compute  $r = 2^{(1/12)}$  using the `pow` function (remember to include the `cmath` library). Then use that  $r$  in subsequent statements that use the formula  $f_n = f_0 * r^n$  with  $n$  being 1, 2, and finally 3.

539740.3879454.qx3zqy7

**LAB ACTIVITY**

22.4.1: LAB: Musical note frequencies

0 / 10



main.cpp

[Load default template...](#)

```
1 #include <iostream>  
2 #include <iomanip>  
3  
4 using namespace std;  
5  
6 int main() {  
7  
8     /* Type your code here. Include the math library above first. */  
9  
10    return 0;  
11 }  
12
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Develop mode**

**Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

**Enter program input (optional)**

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**

(Your program)

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Output

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.5 LAB: Input: Mad Lib



This section has been set as optional by your instructor.

Mad Libs are activities that have a person provide various words, which are then used to complete a short story in unexpected (and hopefully funny) ways.

Complete the program to read the needed values from input, that the existing output statement(s) can use to output a short story.

Ex: If the input is:

```
Eric 12 cars Chipotle
```

the output is:

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

```
Eric buys 12 different types of cars at Chipotle.
```

539740.3879454.qx3zqy7

**LAB ACTIVITY**

22.5.1: LAB: Input: Mad Lib

0 / 10



```
1 #include <iostream>
2 #include <string>
3 using namespace std;
4
5 int main() {
6     string firstName;
7     int wholeNumber;
8     string pluralNoun;
9     string genericLocation;
10
11    /* Type your code here. */
12
13    cout << firstName << " buys " << wholeNumber << " different types of " <<
14    pluralNoun << endl;
15
16}
```

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

Develop mode

Submit mode

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

Run program

Input (from above)



main.cpp  
(Your program)



Output

Program output displayed here

Coding trail of your work

[What is this?](#)

©zyBooks 01/31/24 18:09 1939727

History of your effort will appear here once you begin working  
on this zyLab.

Rob Daglio  
MDCCOP2335Spring2024

## 22.6 LAB: Pizza party



This section has been set as optional by your instructor.

Given the number of people attending a pizza party, output the number of people, number of pizzas needed, and the total cost for the number of pizzas. For the calculation, assume that people eat 2 slices on average and each pizza has 12 slices and costs \$14.95.

Output each floating-point value with two digits after the decimal point using the following statement once before all other `cout` statements:

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

Ex: If the input is:

```
20
```

the output is:

```
People: 20
Pizza(s) needed: 4
Cost for 4 pizza(s): $59.80
```

Hint: Use the `ceil()` function to round up the number of pizzas so that enough pizzas are ordered.

539740.3879454.qx3zqy7

LAB  
ACTIVITY

22.6.1: LAB: Pizza party

0 / 10



main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <iomanip>
3 #include <cmath>
4 using namespace std;
5
6 int main() {
7     int people;
8     int numPizzas;
9     double cost;
10
11    /* Type your code here. */
12
13    return 0;
14 }
```

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

**Enter program input (optional)**

If your code requires input values, provide them here.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024 //

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**

Coding trail of your work

[What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.7 LAB: Square root



This section has been set as optional by your instructor.

Given a floating-point number (double) as input, output the square root of the given number. Use the appropriate math function to perform the operation. End the output with a newline.

Output each floating-point value with two digits after the decimal point using the following statement once before all other `cout` statements:

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

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Ex: If the input is:

```
9.0
```

the output is:

```
Square root of 9.00 = 3.00
```

**LAB  
ACTIVITY**

## 22.7.1: LAB: Square root

0 / 10



## main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <iomanip>
3 #include <math.h>
4 using namespace std;
5
6 int main() {
7     double value;
8
9     /* Type your code here */
10
11    return 0;
12 }
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

**Enter program input (optional)**

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Coding trail of your work

[What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.8 LAB: Volume and area of cylinder



This section has been set as optional by your instructor.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

The volume and area of a cylinder are calculated as:

- Volume =  $\pi r^2 h$
- Area =  $2\pi r h + 2\pi r^2$

Given the radius and height of a cylinder as floating-point (double) numbers, output the volume and area of the cylinder.

Hint: Use pow() and M\_PI in your calculations.

Output each floating-point value with two digits after the decimal point using the following statement once before all other `cout` statements:

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

Ex: If the input is:

```
5.2 8.1
```

where 5.2 is the radius of the cylinder and 8.1 is the height of the cylinder, then the output is:

```
Volume (cubic inches): 688.08
Surface area (square inches): 434.55
```

539740.3879454.qx3zqy7

LAB  
ACTIVITY

22.8.1: LAB: Volume and area of cylinder

0 / 10



main.cpp

[Load default template...](#)

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

```
1 #include <iostream>
2 #include <iomanip>
3 #include <math.h>
4 using namespace std;
5
6 int main() {
7     double radius;
8     double height;
9     double volume;
10    ...
```

```

10     double area;
11
12     /* Type your code here */
13
14     return 0;
15 }
```

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

**Run program**

Input (from above)


**main.cpp**  
 (Your program)


Output

Program output displayed here

 Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.9 LAB: Ordering pizza



This section has been set as optional by your instructor.

©zyBooks 01/31/24 18:09 1939727
Rob Daglio
MDCCOP2335Spring2024

A local pizza shop is selling a large pizza for \$14.99. Given the number of pizzas to order as input, output the subtotal for the pizzas, and then output the total after applying a sales tax of 8%.

Output each floating-point value with two digits after the decimal point using the following statement once before all other `cout` statements:

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

Ex: If the input is:

3

the output is:

```
Pizzas: 3
Subtotal: $44.97
Total due: $48.57
```

539740.3879454.qx3zqy7

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

LAB  
ACTIVITY

22.9.1: LAB: Ordering pizza

0 / 10



main.cpp

Load default template...

```
1 #include <iostream>
2 #include <iomanip>
3 #include <math.h>
4 using namespace std;
5
6 int main() {
7     int numPizza;
8     double subTotal;
9     double totalDue;
10
11    /* Type your code here */
12
13    return 0;
14 }
```

Develop mode

Submit mode

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Run program

Input (from above)

main.cpp  
(Your program)

Output

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio  
MDCCOP2335Spring2024

## 22.10 LAB: Postfix of 5



This section has been set as optional by your instructor.

The postfix of 5 is the last five characters of a string. Given a string input, output the last five characters of that string. Assume the string will always have at least five characters.

Hint: Use the string method `substr()`.

Ex: If the input is:

chicken

the output is:

Postfix: icken

539740.3879454.qx3zqy7

LAB ACTIVITY

22.10.1: LAB: Postfix of 5

0 / 10



main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <string>
3
4 using namespace std;
5
6 int main() {
7     string s;
8     string result;
9
10    /* Type your code here */
11
12    return 0;
```

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

13

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Rob Daglio  
MDCCOP2335Spring2024**Enter program input (optional)**

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.11 LAB: Prefix of 5



This section has been set as optional by your instructor.

The prefix of 5 is the first five characters of a string. Given a string input, output the first five characters of that string. Assume the string will always have at least five characters.

Outcomes 01/31/24 19:00 1939727  
Rob Daglio  
MDCCOP2335Spring2024

Hint: Use the string method **substr()**.

Ex: If the input is:

**fantastic**

the output is:

Prefix: fanta

539740.3879454.qx3zqy7

**LAB  
ACTIVITY**

22.11.1: LAB: Prefix of 5

0 / 10



©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP233Spring2024

[Load default template...](#)

main.cpp

```
1 #include <iostream>
2 #include <string>
3
4 using namespace std;
5
6 int main() {
7     string s;
8     string result;
9
10    /* Type your code here */
11
12    return 0;
13 }
```

[Develop mode](#)

[Submit mode](#)

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

[Run program](#)

Input (from above)



main.cpp

(Your program)

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP233Spring2024

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.12 LAB: Convert from seconds

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024



This section has been set as optional by your instructor.

People find it easier to read time in seconds, minutes, and hours rather than just seconds.

Write a program that reads in seconds as input, and outputs the time in seconds, minutes, and hours.

Ex: If the input is:

4000

the output is:

Seconds: 40  
Minutes: 6  
Hours: 1

539740.3879454.qx3zqy7

LAB ACTIVITY

22.12.1: LAB: Convert from seconds

0 / 10



main.cpp

Load default template...

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     int seconds;
6     int minutes;
7     int hours;
8
9     /* Type your code here. */
10
11    return 0;
12 }
```

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

**Enter program input (optional)**

If your code requires input values, provide them here.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**

Coding trail of your work

[What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.13 LAB: Convert to seconds



This section has been set as optional by your instructor.

Write a program that reads in seconds, minutes, and hours as input, and outputs the time in seconds only.

Ex: If the input is:

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

40 6 1

where 40 is the number of seconds, 6 is the number of minutes, and 1 is the number of hours, the output is:

4000 seconds

**LAB  
ACTIVITY**

## 22.13.1: LAB: Convert to seconds

0 / 10

**main.cpp**[Load default template...](#)

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     int seconds;
6     int minutes;
7     int hours;
8
9     /* Type your code here. */
10
11    return 0;
12 }
13
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

**Enter program input (optional)**

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Coding trail of your work

[What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.14 LAB: Hypotenuse



This section has been set as optional by your instructor.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Given two numbers that represent the lengths of a right triangle's legs (sides adjacent to the right angle), output the length of the third side (i.e. hypotenuse) with two digits after the decimal point. This formula for this is called Pythagorean's Theorem, as shown:

$$c = \sqrt{a^2 + b^2}$$

Where a and b are the legs of the right triangle and c is the hypotenuse.

Output each floating-point value with two digits after the decimal point using the following statement once before all other cout statements:

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

Ex: If the input is:

```
3.00 4.00
```

the output is:

```
Right triangle has side lengths 3.00 and 4.00
Hypotenuse is 5.00
```

539740.3879454.qx3zqy

LAB  
ACTIVITY

22.14.1: LAB: Hypotenuse

0 / 10



main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <iomanip>
3 #include <cmath>
4 using namespace std;
5
6 int main() {
7
8     /* Type your code here. */
9
10    return 0;
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

11 {

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

Program output displayed here

Coding trail of your work

[What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.15 LAB: Midfix of 5



This section has been set as optional by your instructor.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

The midfix of 5 is the middle five characters of a string. Given a string input, output the middle five characters of that string with a new line at the end. Assume the string length is always odd and at least five characters.

Hint: Use the string function **substr()**.

Ex: If the input is:

```
xxxplanexxx
```

the output is:

```
Midfix: plane
```

539740.3879454.qx3zqy7

LAB  
ACTIVITY

22.15.1: LAB: Midfix of 5

©zyBooks 01/31/24 18:09 1939727

Rob Daglio 0 / 10

MDCCOP2335Spring2024

main.cpp

Load default template...

```
1 #include <iostream>
2 #include <string>
3 using namespace std;
4
5 int main() {
6
7     /* Type your code here. */
8
9     return 0;
10 }
```

Develop mode

Submit mode

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

Run program

Input (from above)



©zyBooks 01/31/24 18:09 1939727

Rob Daglio

main.cpp  
(Your program)

Output

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio  
MDCCOP2335Spring2024

## 22.16 LAB: Area of a triangle



This section has been set as optional by your instructor.

Using Heron's formula, you can calculate the area of a triangle if you know the lengths of all three sides. Given the length of each side of a triangle as input, calculate the area of the triangle using Heron's formula as follows:

1.  $s = \text{half of the triangle's perimeter}$
2.  $\text{area} = \text{the square root of } s * (s - a) * (s - b) * (s - c)$ , where  $a$ ,  $b$ , and  $c$  are each sides of the triangle.

Hint: Use the math function `sqrt()` for calculating the square root.

Output the floating-point value of the area with two digits after the decimal point using the following statement once before all other `cout` statements:

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

Ex: If the input for  $a$ ,  $b$ , and  $c$  is:

```
3.0 4.0 5.0
```

the output is:

```
Triangle area = 6.00
```

539740.3879454.qx3zqy7

LAB  
ACTIVITY

22.16.1: LAB: Area of a triangle

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio 0 / 10  
MDCCOP2335Spring2024

main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <iomanip>
3 #include <cmath>
4 using namespace std;
```

```
5
6 int main() {
7
8     /* Type your code here. */
9
10    return 0;
11 }
12
```

@zyBooks 01/31/24 18:09 1939727

Rob Daglio  
MDCCOP2335Spring2024**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

@zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

This section has been set as optional by your instructor.

**Program Specifications** Write a program to calculate the cost for replacing carpet for a single room. Carpet is priced by square foot. Total cost includes carpet, labor and sales tax. Dollar values are output

with two decimals, which can be achieved by executing `cout << fixed << setprecision(2);` once before all other cout statements.

Note: This program is designed for *incremental development*. Complete each step and submit for grading before starting the next step. Only a portion of tests pass after each step but confirm progress.

**Step 1 (2 pts).** Read from input the carpet price per square foot (double), room width (int) and room length (int). Calculate the room area in square feet. Calculate the carpet price based on square feet with an additional 20% for waste. Output square feet and carpet cost. Submit for grading to confirm 1 test passes.

Ex: If the input is:

```
1.10 15 12
```

the output is:

```
Room: 180 sq ft  
Carpet: $237.60
```

**Step 2 (2 pts).** Calculate the labor cost for installation (\$0.75 per actual square foot). Output labor cost. Submit for grading to confirm 2 tests pass.

Ex: If the input is:

```
0.95 10 16
```

the output is:

```
Room: 160 sq ft  
Carpet: $182.40  
Labor: $120.00
```

**Step 3 (2 pts).** Calculate sales tax (7%) on carpet and labor cost. Total cost includes carpet, labor and sales tax. Output sales tax and total cost. Submit for grading to confirm 3 tests pass.

Ex: If the input is:

```
1.25 8 8
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

the output is:

```
Room: 64 sq ft  
Carpet: $96.00  
Labor: $48.00
```

**Tax:** \$10.08  
**Cost:** \$154.08

**Step 4 (2 pts).** Repeat steps 1-3 including additional input for a second order (one order per line). Maintain total sales for both orders. Output information for each order with a heading and then total sales for both orders. Submit for grading to confirm 4 tests pass.

Ex: If the input is:

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

```
0.95 12 12
1.25 8 18
```

the output is:

```
Order #1
Room: 144 sq ft
Carpet: $164.16
Labor: $108.00
Tax: $19.05
Cost: $291.21
```

```
Order #2
Room: 144 sq ft
Carpet: $216.00
Labor: $108.00
Tax: $22.68
Cost: $346.68
```

Total Sales: \$637.89

**Step 5 (2 pts).** Repeat steps 1-3 including additional input for a third order (one order per line). Maintain total sales for all orders. Output information for each order with a heading and then total sales for all orders. Submit for grading to confirm all tests pass.

Ex: If the input is:

```
0.95 12 12
1.25 8 18
1.12 10 17
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

the output is:

```
Order #1
Room: 144 sq ft
Carpet: $164.16
```

Labor: \$108.00

Tax: \$19.05

Cost: \$291.21

Order #2

Room: 144 sq ft

Carpet: \$216.00

Labor: \$108.00

Tax: \$22.68

Cost: \$346.68

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Order #3

Room: 170 sq ft

Carpet: \$228.48

Labor: \$127.50

Tax: \$24.92

Cost: \$380.90

Total Sales: \$1018.79

539740.3879454.qx3zqy7

LAB  
ACTIVITY

22.17.1: LAB\*: Program: Carpet sales

0 / 10



main.cpp

Load default template...

```
1 #include <iostream>
2 #include <iomanip>
3 using namespace std;
4
5 int main() {
6
7     /* Type your code here. */
8
9     return 0;
10 }
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

Develop mode

Submit mode

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first

box, then click **Run program** and observe the program's output in the second box.

### Enter program input (optional)

If your code requires input values, provide them here.

**Run program**

Input (from above)

MD**main.cpp**35Spring2024

(Your program)

Outp

### Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.18 LAB\*: Program: Pizza party weekend



This section has been set as optional by your instructor.

**Program Specifications.** Write a program to calculate the cost of hosting three pizza parties on Friday, Saturday and Sunday. Read from input the number of people attending, the average number of slices per person and the cost of one pizza. Dollar values are output with two decimal points, which can be achieved by executing `cout << fixed << setprecision(2);` once before all other cout statements.

Note: this program is designed for *incremental development*. Complete each step and submit for grading before starting the next step. Only a portion of tests pass after each step but confirm progress.

**Step 1 (2 pts).** Read from input the number of people (int), average slices per person (double) and cost of one pizza (double). Calculate the number of whole pizzas needed (8 slices per pizza). There will likely be leftovers for breakfast. Hint: Use the `ceil()` function found in the cmath library to round up to the nearest whole number and convert to an integer. Calculate and output the cost for all pizzas.

Submit for grading to confirm 1 test passes.

Ex: If the input is:

```
10 2.6 10.50
```

The output is:

```
Friday Night Party  
4 Pizzas: $42.00
```

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

**Step 2 (2 pts).** Calculate and output the sales tax (7%). Calculate and output the delivery charge (20% of cost including tax). Submit for grading to confirm 2 tests pass.

Ex: If the input is:

```
10 2.6 10.50
```

The output is:

```
Friday Night Party  
4 Pizzas: $42.00  
Tax: $2.94  
Delivery: $8.99
```

**Step 3 (2 pts).** Calculate and output the total including pizza, tax and delivery. Submit for grading to confirm 3 tests pass.

Ex: If the input is:

```
10 2.6 10.50
```

The output is:

```
Friday Night Party  
4 Pizzas: $42.00  
Tax: $2.94  
Delivery: $8.99  
Total: $53.93
```

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

**Step 4 (2 pts).** Repeat steps 1 - 3 with additional inputs for Saturday night (one order per line).

Maintain and output a separate total for both parties. Submit for grading to confirm 5 tests pass.

Ex: If the input is:

9	2.5	10.95
14	3.2	14.95

The output is:

**Friday Night Party**

**3 Pizzas: \$32.85**

**Tax: \$2.30**

**Delivery: \$7.03**

**Total: \$42.18**

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Saturday Night Party**

**6 Pizzas: \$89.70**

**Tax: \$6.28**

**Delivery: \$19.20**

**Total: \$115.17**

**Weekend Total: \$157.35**

**Step 5 (2 pts).** Repeat steps 1 - 3 with additional inputs for Sunday night (one order per line). Maintain and output a total for all parties. Submit for grading to confirm all tests pass.

Ex: If the input is:

6	2.8	10.95
22	2.1	12.95
12	1.8	14.95

The output is:

**Friday Night Party**

**3 Pizzas: \$32.85**

**Tax: \$2.30**

**Delivery: \$7.03**

**Total: \$42.18**

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Saturday Night Party**

**6 Pizzas: \$77.70**

**Tax: \$5.44**

**Delivery: \$16.63**

**Total: \$99.77**

**Sunday Night Party**

**3 Pizzas: \$44.85**

Tax: \$3.14  
Delivery: \$9.60  
Total: \$57.59

Weekend Total: \$199.53

539740.3879454.qx3zqy7

**LAB ACTIVITY**

22.18.1: LAB\*: Program: Pizza party weekend

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio 0 / 10  
MDCCOP2335Spring2024

main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <iomanip>
3 #include <cmath>
4 using namespace std;
5
6 int main() {
7
8     /* Type your code here. */
9
10    return 0;
11 }
```

**Develop mode**

**Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

**Run program**

Input (from above)



©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024 →  
**main.cpp**  
(Your program) → Output

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

## 22.19 LAB\*: Program: Painting a wall



This section has been set as optional by your instructor.

**Program Specifications** Write a program to calculate the cost to paint a wall. Amount of required paint is based on the wall area. Total cost includes paint and sales tax.

Note: This program is designed for *incremental development*. Complete each step and submit for grading before starting the next step. Only a portion of tests pass after each step but confirm progress.

**Step 1 (2 pts).** Read from input wall height, wall width, and cost of one paint can (doubles). Calculate and output the wall's area to one decimal place using `cout << fixed << setprecision(1);` once before all other cout statements. Submit for grading to confirm 1 test passes.

Ex: If the input is:

```
12.0 15.0 29.95
```

the output is:

```
Wall area: 180.0 sq ft
```

**Step 2 (2 pts).** Calculate and output the amount of paint needed to three decimal places. One gallon of paint covers 350 square feet. Submit for grading to confirm 2 tests pass.

Ex: If the input is:

```
12.0 15.0 29.95
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

the output is:

```
Wall area: 180.0 sq ft
Paint needed: 0.514 gallons
```

**Step 3 (2 pts).** Calculate and output the number of 1 gallon cans needed to paint the wall. Extra paint may be left over. Hint: Use ceil() to round up to the nearest gallon and convert to an integer. Submit for grading to confirm 4 tests pass.

Ex: If the input is:

```
12.0 15.0 29.95
```

©zyBooks 01/31/24 18:09 1939727

the output is:

Rob Daglio  
MDCCOP2335Spring2024

```
Wall area: 180.0 sq ft
Paint needed: 0.514 gallons
Cans needed: 1 can(s)
```

**Step 4 (4 pts).** Calculate and output the paint cost, sales tax of 7%, and total cost. Dollar values are output with two decimal places. Submit for grading to confirm all tests pass.

Ex: If the input is:

```
8.0 8.0 49.20
```

the output is:

```
Wall area: 64.0 sq ft
Paint needed: 0.183 gallons
Cans needed: 1 can(s)
Paint cost: $49.20
Sales tax: $3.44
Total cost: $52.64
```

539740.3879454.qx3zqy7

**LAB ACTIVITY**

22.19.1: LAB\*: Program: Painting a wall

0 / 10



main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <iomanip>
3 #include <cmath>
4 using namespace std;
5
6 int main() {
7     /* Type your code here. */
8
9     return 0;
10}
11
```

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
// needed for setprecision() and fixed  
// needed for ceil()  
MDCCOP2335Spring2024

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio  
MDCCOP2335Spring2024

**Enter program input (optional)**

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

**Program output displayed here**Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

## 22.20 LAB: Find the resulting data type using auto

In this lab, variables declared as `auto` are used to determine the resulting data type of operations involving various data types.

©zyBooks 01/31/24 18:09 1939727  
Rob Daglio

Given the variables declared in `main()`, complete the program that does the following tasks:

1. Read the input according to the order of the variables declared.
2. Perform the calculations given below.
3. Output the results.
4. Output the names and data types of all variables.

Declare result1, result2, and result3 using the auto type with the following expressions:

- result1 is the sum of shortA and longLongC.
- result2 is the sum of intB and doubleD.
- result3 is the sum of result1 and result2.

Ex: If the input is:

5 10 15 2.5

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

then the output is:

```
result1 = 20
result2 = 12.5
result3 = 32.5
```

Data types:

```
shortA: s
intB: i
longLongC: x
doubleD: d
result1: x
result2: d
result3: d
```

The table below shows the storage information of various data types in C++:

Data type	Storage size	Range	Returned value of typeid's name()
short	16 bits	-32,768 to 32,767	s
int	32 bits	-2,147,483,648 to 2,147,483,647	i
long long	64 bits	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807	x
double	64 bits	+/-1.7x10 <sup>+-308</sup>	©zyBooks 01/31/24 18:09 1939727 Rob Daglio

539740.3879454.qx3zqy7

MDCCOP2335Spring2024

**LAB ACTIVITY**

22.20.1: LAB: Find the resulting data type using auto

0 / 10



main.cpp

[Load default template...](#)

```
1 #include <iostream>
2 #include <typeinfo>
3 using namespace std;
4
5 int main() {
6     short shortA;
7     int intB;
8     long long longLongC;
9     double doubleD;
10
11    /* Type your code here. */
12
13    return 0;
14 }
15
```

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

### Enter program input (optional)

If your code requires input values, provide them here.

**Run program**

Input (from above)

**main.cpp**  
(Your program)

Output

### Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

©zyBooks 01/31/24 18:09 1939727

Rob Daglio

MDCCOP2335Spring2024