

**SOLVING SIMPLE PROBLEMS IN C**

**LAB 2 SECTION 1**

**SUBMITTED BY:**

**ETHAN GRIESMAN**

**SUBMISSION DATE:**

**9/13/2022**

## Lab Problem

The purpose of this lab is to create several C programs that solve simple math problems. The programs must follow the instruction and able to solve math problems correctly. The objective of this lab to become familiar with writing simple C programs.

## Analysis

- 1) The problem states that I need to modify the lab2\_skel.c file and display our identifications in the file, and save as lab2\_1.c.
- 2) The problem states that I need to create a new file, titled lab2\_2\_1.c that calculates the area of a rectangle, and then change the code to make the program able to calculate the volume of a rectangular prism, renaming to lab2\_2\_2.c
- 3) The problem states that I must run the program, lab2\_3.c, parse through the code to identify any errors in syntax, make corrections, and then run the corrected code to obtain the desired output.
- 4) The problem states that I create a new program, lab2\_4.c, to perform mathematical calculations using both integers and doubles, and then output the result. All saved as lab2\_4.c.
- 5) For the final problem, I am to create a new program to calculate the length of one side of a triangle using the Pythagorean theorem.

## Design

### **PROBLEM #1:**

```

1  - /*-----
2  -                                     CPRE 185 Lab 02
3  -   Name: Ethan Griesman
4  -   Section: 6
5  -   NetID: 726187474
6  -   Date: 9/7/2022
7  - -----
8

```

## **PROBLEM #2:**

We had to create a simple program that performed the calculations of a user inputted rectangle (area) and rectangular prism (volume). To do this I broke down the problem the way I would do it on pencil and paper. For the rectangles area the order went like as follows:

- 1) Gather two, in this case arbitrary, integers from the user
- 2) Compute the area with the formula (length\*width).
- 3) Display the area of the rectangle.

### **RESULT:**

```

egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./out
Enter a width: 18
Enter a height: 15
A 18 by 15 rectangle's area is 270

```

And for the volume of the rectangular prism I used a similar method to break down the process of computing the volume:

- 1) Gather three integers from the user.
- 2) Compute the volume with the formula (length\*width\*height).
- 3) Display the volume of the rectangular prism.

### **RESULT:**

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab2_2_2
Enter a width: 2
Enter a height: 64
Enter a depth: 8
A 2 by 64 by 8 rectangular prism's volume is 1024
```

### **PROBLEM #3:**

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ gcc lab2_3.c -o lab2_3

egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab2_3.exe
The value of 77/5 is 0.000000, using integer math
The value of 2+3 is 0
The value 1.0/22.0 is 1952257862
```

For the following problem, we were instructed to run a program with an unknown amount of errors, observe the incorrect output (shown above), parse through the source code and identify all syntax errors, correct them, and then run the following result.

What I found was, for the first line of code, %lf, which is the directory exclusive to floats, was used in place of %d, which is the directory exclusive to integers. As a result, the output was 0 because the result of 77/5 is not an integer, and the entire purpose of the code is to spit out an integer result, even if it isn't the exact answer (which is 15.4).

For the second line of code, the correct directory is used, but it isn't being called to an integer, hence the output of 0 instead of the obvious integer answer of 2+3 being 5. Whenever %d or %lf is used, it needs to be followed by ", { Whatever you want it to act on};" in order for the program to execute. Lastly, the third line of code has an incorrect identifier acting on decimalResult. %d, as mentioned previously, is only for integers, and our objective within this code is to obtain a decimal, or double output.

Upon making all necessary corrections, the output is as follows:

### **RESULT:**

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab2_3.exe
The value of 77/5 is 15, using integer math
The value of 2+3 is 5
The value 1.0/22.0 is 0.045455
```

### **PROBLEM #4:**

For the fourth problem, our objective was to create a new program to perform simple arithmetic and other mathematical calculations such as finding the area of a circle, converting Fahrenheit to Celsius, and converting feet to meters. I started off by writing out the code with proper syntax, and then at the very end, I printed the output using %lf and %d where necessary, while inserting a new line after each. The result is the following.

#### RESULT:

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab2_4.exe
8152
27361080
81.000000
33.734940
21
2
2.000000
21.000000
22.000000
2
22.000000
```

Next, our task was to perform a few easy math calculations, starting with finding the area of a circle with a given circumference of 23.567. For the formula, all that is needed is the circumference, because with it we know the diameter  $d$ , and with the diameter  $d$ , we can find the area. Expressing the area as  $A = \pi * (d^2 / 4)$  and substituting the circumference divided by  $\pi$  in for the diameter, the equation simplifies to  $A = (C^2 / (4 * \pi))$ .

#### RESULT:

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab2_4_2.exe
The area of the circle is 44.197605.
```

After that, we are to convert 14 feet to meters. I obtained the formula for this by knowing that there are roughly 3.28 feet per meter. From this, it's just a matter of simple dimensional analysis to convert over to meters, with the end result output as a double.

#### RESULT:

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ gcc lab4_3.c -o lab4_3

egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab4_3.exe
14.000000 feet is equal to 4.267200 meters.
```

Lastly, we were instructed to convert 76 degrees Fahrenheit to Centigrade. For this formula, I used the given formula of  $C = ((F - 32) / 1.8)$ .

## RESULT:

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab2_4_3.exe
76.000000 degrees Fahrenheit is equal to 24.444444 degrees Centigrade.
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
```

## PROBLEM #5:

For our last problem, we were assigned to calculate the length of the longest leg, or hypotenuse, of a triangle with given length values assigned to doubles, and outputting the result. My strategy for executing this code comprised of defining sides a, b, and c. Then I prompted the user to input in those values. My next step was creating an intermediate double, which would be the square root of both sides squared, itself declared as a double that equaled the sum of both sides squared. I then stored the answer as a double and used printf to output the length of the hypotenuse as a double.

## RESULT:

```
egriesma@C02048-06 /cygdrive/u/CPR_E_185/LAB2
$ ./lab2_5.exe
Enter value for side a:5
Enter value for side b:9
The length of the hypotenuse is 10.295630
```

## Testing

In order to verify the results of the solution, I ran all programs three times to make sure the output remained the same. I also double checked by doing several calculations by hand, such as the circle area and temperature conversions, as well as the hypotenuse calculation.

## Comments

In this lab, every problem is very helpful and informative, especially the third one which was the debug one. Just like what the instruction said, those mistakes are often made while we are programming. I've made many similar mistakes just by doing the homework. I think it's very important for all programmers to learn from our mistakes and try not to make that mistake again. Some mistakes I think I made include: not cutting off some of my output after a certain number of decimal places, and perhaps not being more concise in my code (i.e writing out Degreesfahrenheit instead of some abbreviation)

```

/*-----
-----
-                                     CPRE 185 Lab 02
-      Name: Ethan Griesman
-      Section: 6
-      NetID: 726187474
-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    /* Put your code after this line */

    return 0;
}

```

```

/*-----
-----
-                                     CPRE 185 Lab 02
-      Name: Ethan Griesman
-      Section: 6
-      NetID: 726187474
-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    int x, y;
    printf("Enter a width: ");
    scanf("%d", &x);
    printf("Enter a height: ");
    scanf("%d", &y);
    printf("A %d by %d rectangle's area is %d\n", x, y, x*y);

    return 0;
}

```



```

}
/*-----
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-      NetID: 726187474
-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    int x, y, z;
    printf("Enter a width: ");
    scanf("%d", &x);
    printf("Enter a height: ");
    scanf("%d", &y);
    printf("Enter a depth: ");
    scanf("%d", &z);
    printf("A %d by %d by %d rectangular prism's volume is %d\n", x,
y, z,  x*y*z);

    return 0;
}

```

```

/*-----
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-      NetID: 726187474
-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    int integerResult;
    double decimalResult;

    integerResult = 77 / 5;
    printf("The value of 77/5 is %d, using integer math\n",
integerResult);
    // using float instead of %d for an integer

    integerResult = 2 + 3;
    printf("The value of 2+3 is %d\n");
    //not assigning %d to an integer

    decimalResult = 1.0 / 22.0;
    printf("The value 1.0/22.0 is %d\n", decimalResult);
    // using wrong identifier, should be %lf instead of %d

    return 0;
}

```

```

/*-----
-----
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-      NetID: 726187474
-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    int a = 6427 + 1725;
    int b = (6971 * 3925) - 95;
    double c = 79 + 12 / 5;
    double d = 3640.0 / 107.9;
    int e = (22 / 3) * 3;
    int f = 22 / (3 * 3);
    double g = 22 / (3 * 3);
    double h = 22 / 3 * 3;
    double i = (22.0 / 3) * 3.0;
    int j = 22.0 / (3 * 3.0);
    double k = 22.0 / 3.0 * 3.0;
    printf("%d\n% d\n%lf\n% lf\n% d\n%d\n% lf\n% lf\n% lf\n% d\n%
lf\n", a, b, c, d, e, f, g, h, i, j, k);

    return 0;
}

```

```

/*-----
-----
-
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-   NetID: 726187474
-   Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    double circum = 23.567;
    double area = (circum * circum) / (4*MI_PI);
    printf("The area of the circle is %lf.", area);

    return 0;
}

```

```

/*-----
-----
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-      NetID: 726187474
-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    double feet = 14;
    double feetPerMeter = 3.2808399;

    printf("%lf feet is equal to %lf meters.", feet, feet /
feetPerMeter);

    return 0;
}

```

```

/*-----
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-      NetID: 726187474
-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    double Degreesfahrenheit = 76.0;
    double Degreescentigrade = ((Degreesfahrenheit - 32.0) / 1.8);

    printf("%lf degrees Fahrenheit is equal to %lf degrees
Centigrade.", Degreesfahrenheit, Degreescentigrade);

    return 0;
}

```

```

/*-----
-----
-
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-      Date: 9/7/2022
-----
-----*/

/*-----
-----
-                                     Includes
-----
-----*/
#include <stdio.h>
#include <math.h>

int main()
{
    double a;
    double b;
    double c;
    double filler;
    printf("Enter value for side a:");
    scanf("%lf", &a);
    printf("Enter value for side b:");
    scanf("%lf", &b);
    double squared = (a * a) + (b * b);

    filler = sqrt(squared);
    double ans = filler;
    printf("The length of the hypotenuse is %lf", ans);

    return 0;
}

```