CPRE 1850 - SOLVING SIMPLE PROBLEMS IN C

LAB 2
SECTION CN

SUBMITTED BY:

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Lab Problems

This lab contains 5 unique problems to solve.

1. Creating a new file (lab2_1.c) using lab2_skel.c as our template.
2. Debugging a simple input problem and creating a new version of the file to compute 3d rectangular prisms.
3. Debugging operator mistakes in the lab2_3.c file
4. Printing out to the terminal several integers and doubles and doing basic calculations.
5. Creating a program to compute sides of a triangle using Pythagoras theorem.

Analysis

This lab requires use of a number of problem-solving techniques, particularly in data types and in syntax. The lab was clearly designed to force us to analyze the way we wrote things and to identify potential holes in our knowledge.

Design

While a simple majority of the solutions were given to us in a way that indicated a particular preferred syntax, whenever possible I chose to add some separation to make the end file make more sense to other readers. I also used constants instead of so-called “magic numbers” to avoid potential mistakes or confusion.

Testing

Each file was run multiple times with a variety of inputs (if applicable). These test admirably arbitrary tests indicated that the programs ran as they should, but without a proper rigorous unit test it is unknown what limits these files may have. Despite this, all files ran correctly given the sample inputs from the lab 2 outline.

Comments

This lab was not particularly challenging given my vast prior programming experience, but it did provide me an opportunity to remind myself of the unique attributes of the C programing language.

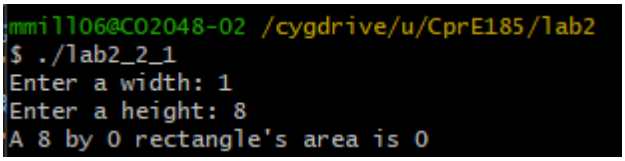
lab2_1.c

```c
/*--------------------------------------------------------------------------------
-                                                CPRE 185 Lab 02
-       Name: Maxwell (Max) Miller
-       Section: 1670-03 & 1670-CN
-       NetID: mmill06
-       Date: 9-22-2025
--------------------------------------------------------------------------------*/



/* Comments Removed for clarity */

#include <stdio.h>
#include <math.h>

int main()
{
    return 0;
}
```

lab2_2_1.c

```c
/*--------------------------------------------------------------------------
-                                                CPRE 185 Lab 02
-       Name: Maxwell (Max) Miller
-       Section: 1670-03 & 1670-CN
-       NetID: mmill06
-       Date: 9-22-2025
--------------------------------------------------------------------------*/

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


/*--------------------------------------------------------------------------
-                                   Defines
--------------------------------------------------------------------------*/


/*--------------------------------------------------------------------------
-                                   Prototypes
--------------------------------------------------------------------------*/


/*--------------------------------------------------------------------------
-                                                        Implementation
--------------------------------------------------------------------------*/

int main()
{

    /* Put your code after this line */
    int x,y;
    printf("Enter a width: ");
    scanf("%d", &x);
    printf("Enter a height: ");
    scanf("%d", &x);
    printf("A %d by %d rectangle's area is %d\n", x, y, x * y);

    return 0;

}
```

Output:



lab2_2_2.c

```c
/*--------------------------------------------------------------------------
-                                                CPRE 185 Lab 02
-       Name: Maxwell (Max) Miller
-       Section: 1670-03 & 1670-CN
-       NetID: mmill06
-       Date: 9-22-2025
--------------------------------------------------------------------------*/

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


/*--------------------------------------------------------------------------
-                                     Defines
--------------------------------------------------------------------------*/

/*--------------------------------------------------------------------------
-                                    Prototypes
--------------------------------------------------------------------------*/


/*--------------------------------------------------------------------------
-                                  Implementation
--------------------------------------------------------------------------*/

int main()
{

    /* Put your code after this line */
    int x,y,z;
    printf("Enter a width: ");
    scanf("%d", &x);
    printf("Enter a length: ");
    scanf("%d", &y);
    printf("Enter a height: ");
    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;

}
```

Output:

```
mmill06@CO2048-02 /cygdrive/u/CprE185/lab2
$ ./lab2_2_1
Enter a width: 1
Enter a height: 8
A 8 by 0 rectangle's area is 0
```

lab2_3.c

```c
/*-----------------------------------------------------------------------------
-                                                 CPRE 185 Lab 02
-       Name: Maxwell (Max) Miller
-       Section: 1670-03 & 1670-CN
-       NetID: mmill06
-       Date: 9-22-2025
-----------------------------------------------------------------------------*/

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


/*-----------------------------------------------------------------------------
-                                    Defines
-----------------------------------------------------------------------------*/



/*-----------------------------------------------------------------------------
-                                   Prototypes
-----------------------------------------------------------------------------*/


/*-----------------------------------------------------------------------------
-                                  Implementation
-----------------------------------------------------------------------------*/

int main()
{
    int integerResult;
    double decimalResult;

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

    integerResult = 2 + 3;
    printf("The value of 2+3 is %d\n", integerResult);

    decimalResult = 1.0 / 22.0;
    printf("The value 1.0/22.0 is %lf\n", decimalResult);

    return 0;
}
```

Output:

```
mmill06@CO2048-02 /cygdrive/u/CprE185/lab2
$ ./lab2_3
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
```

lab2_4.c

```c
/*---------------------------------------------------------------------------
-                                                CPRE 185 Lab 02
-       Name: Maxwell (Max) Miller
-       Section: 1670-03 & 1670-CN
-       NetID: mmill06
-       Date: 9-22-2025
---------------------------------------------------------------------------*/

/*---------------------------------------------------------------------------
-                                    Includes
---------------------------------------------------------------------------*/

#include <stdio.h>
#include <math.h>


/*---------------------------------------------------------------------------
-                                     Defines
---------------------------------------------------------------------------*/



/*---------------------------------------------------------------------------
-                                    Prototypes
---------------------------------------------------------------------------*/


/*---------------------------------------------------------------------------
-                                  Implementation
---------------------------------------------------------------------------*/
double circle_area(double cir) {
    const double PI = 3.1415;

    // Radius = circumference / PI
    double r = cir / PI;

    // Area = PI * r^2
    return PI * r * r;
}

double ft_to_m(double ft) {
    // Conversion factor of meter per ft
    const double FT_TO_METERS = 0.3048;

    return ft * FT_TO_METERS;
}

double f_to_c(double f) {
    // c = (F - 32) / 1.8)
    return (f - 32.0) / 1.8;
}
```

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```c
int main()
{

    /* Put your code after this line */
    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("6427 + 1725 = %d\n",         a);
    printf("(6971 * 3925) - 95 = %d\n", b);
    printf("79 + 12 / 5 = %.2f\n",      c);
    printf("3640.0 / 107.9 = %.2f\n",    d);
    printf("(22 / 3) * 3 = %d\n",        e);
    printf("22 / (3 * 3) = %d\n",        f);
    printf("22 / (3 * 3) = %.2f\n",      g);
    printf("22 / 3* 3 = %.2f\n",         h);
    printf("(22.0 / 3) * 3.0 = %.2f\n", i);
    printf("22.0 / (3 * 3.0) = %d\n",    j);
    printf("22.0 / 3.0 * 3.0 = %.2f\n", k);

    double circle_c = 23.567;
    double area = circle_area(circle_c);

    double ft = 14.0;
    double m = ft_to_m(ft);

    double degF = 76;
    double degC = f_to_c(degF);

    printf("Circle of circumference %.2f = circle of area %.2f\n", circle_c, area);
    printf("%.0f ft = %.2f m\n", ft, m);
    printf("%.0f F = %.2f c\n", degF, degC);


    return 0;

}
```

Output:

```
mmill06@CO2048-02 /cygdrive/u/CprE185/lab2
$ ./lab2_4
6427 + 1725 = 8152
(6971 * 3925) - 95 = 27361080
79 + 12 / 5 = 81.00
3640.0 / 107.9 = 33.73
(22 / 3) * 3 = 21
22 / (3 * 3) = 2
22 / (3 * 3) = 2.00
22 / 3* 3 = 21.00
(22.0 / 3) * 3.0 = 22.00
22.0 / (3 * 3.0) = 2
22.0 / 3.0 * 3.0 = 22.00
Circle of circumference 23.57 = circle of area 176.80
14 ft = 4.27 m
76 F = 24.44 c
```

lab2_5.c

```c
/*---------------------------------------------------------------------------
-                                                  CPRE 185 Lab 02
-       Name: Maxwell (Max) Miller
-       Section: 1670-03 & 1670-CN
-       NetID: mmill06
-       Date: 9-22-2025
---------------------------------------------------------------------------*/

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


/*---------------------------------------------------------------------------
-                                   Defines
---------------------------------------------------------------------------*/


/*---------------------------------------------------------------------------
-                                  Prototypes
---------------------------------------------------------------------------*/


/*---------------------------------------------------------------------------
-                                Implementation
---------------------------------------------------------------------------*/
int main()
{
    double a, b, c;
    double filler;
    /* Put your code after this line */

    printf("a = ");
    scanf("%lf", &a);

    printf("b = ");
    scanf("%lf", &b);

    c = sqrt(a*a + b*b);

    printf("c = %.2f\n", c);

    return 0;
}
```

Output:

```
mmill06@CO2048-02 /cygdrive/u/CprE185/lab2
$ ./lab2_5
a = 5
b = 9
c = 10.30
```