Conventions: Name your C programs $hw\mathbf{x}p\mathbf{y}.c$ where x corresponds to the homework number, and y corresponds to the problem number. For example, the C program for homework 1, problem 1 should be named as $hw\mathbf{1}p\mathbf{1}.c$.

Write comments to your programs. Programs with no comments will receive PARTIAL credit. For each program that you turn in, at least the following information should be included at the beginning of your file as comments

- Author:
- Date created:
- Brief description of the program:
    - input(s):
    - output(s):
    - brief description or relationship between inputs and outputs

Submission Instructions: Use the dropbox on D2L to submit your homework. Submit the *hw1p1.c* and *hw1p2.c* files only.

1 Tile Calculator (35 points)

A rectangular room has length L and width W. We wish to cover the floor with square tiles. Given the room dimensions, the owner needs to know how many tiles to purchase, and the total cost of the purchase.

Write a C program that performs the following tasks

1. Prompts the user for the following information:
    - Length of the room in inches (to the nearest inch)
    - Width of the room in inches (to the nearest inch)
    - Length of one side of the tile in inches (to the nearest inch)
    - Price per tile in dollars (to the nearest penny)
    - Percent sales tax to be included in the final price
2. Calculate and display on the screen, the total area of the room to be tiled (in square inches)
3. Calculate and display on the screen, the number of tiles to be purchased (only whole tiles can be purchased).
4. Calculate and display on the screen, the total cost of the tiles before sales tax (in dollars)
5. Calculate and display on the screen, the total cost of the tiles including sales tax (in dollars)

Sample Code Execution: Red text indicates information entered by the user

```
Enter in the length of the room to be tiled (inches)   117
Enter in the width of the room to be tiled (inches)   100
Enter in the length of one side of a single tile (inches)   5
Enter in the cost of a single square tile (dollars)   4.25
Enter in the percent sales tax (percent)   9

The total area to be tiled is 11700 square inches
The total number of tiles to be purchased is 480
The cost of the purchase before tax is $2040.00
The cost of the purchase including tax is $2223.60
```

Sample Code Execution: Red text indicates information entered by the user

```
Enter in the length of the room to be tiled (inches)   183
Enter in the width of the room to be tiled (inches)   269
Enter in the length of one side of a single tile (inches)   8
Enter in the cost of a single square tile (dollars)   2.45
Enter in the percent sales tax (percent)   9.2

The total area to be tiled is 49227 square inches
The total number of tiles to be purchased is 782
The cost of the purchase before tax is $1915.90
The cost of the purchase including tax is $2092.16
```

2   An Object in Free Fall (35 points)

An object is allowed to free fall under constant gravity from rest. We are interested in computing the time it takes to fall a given distance and the velocity of the object after falling the specified distance. We are also interested in determining how these numbers change under different gravitational fields. The equations that we will be using to calculate these values are

$$t = \sqrt{\frac{2 \cdot d}{g}},$$

where t is the period of time it takes to fall a distance d under constant acceleration g.

$$V = g \cdot t,$$

where V is the velocity of the object after time t.

Note: These equations assume that the object is initially at rest and the object is falling without being affected by any other force.

Write a C program that performs the following tasks

1. Prompts the user for the following information:

   - The distance travelled by the object (in meters)

   - The constant acceleration applied to the object (in $\frac{meters}{s^2}$)

2. Calculate and display on the screen, the total time required to fall a distance d (in seconds)

3. Calculate and display on the screen, the velocity of the object after falling the distance d (in $\frac{meters}{s}$)

Sample Code Execution (Earth's Gravity): **Red text indicates information entered by the user**

```
Enter the distance that the object will travel (meters)   228.6
Enter the constant acceleration caused by the gravitation field (meters/s^2)   9.80665

The object will travel 228.60 meters in 6.83 seconds
After falling for 6.83 seconds the object will be traveling  66.96 meters/second
```

Sample Code Execution (Moon's Gravity): **Red text indicates information entered by the user**

```
Enter the distance that the object will travel (meters)   228.6
Enter the constant acceleration caused by the gravitation field (meters/s^2)   1.6344

The object will travel 228.60 meters in 16.73 seconds
After falling for 16.73 seconds the object will be traveling 27.34 meters/second
```

Sample Code Execution (Mars' Gravity): **Red text indicates information entered by the user**

```
Enter the distance that the object will travel (meters)   228.6
Enter the constant acceleration caused by the gravitation field (meters/s^2)   3.72

The object will travel 228.60 meters in  11.09 seconds
After falling for 11.09 seconds the object will be traveling 41.24 meters/second
```

3 Lab 1 Assignment (30 points)

The assignment will be handed out during your lab time.