Alyssa Wang

GNG 1106 - Assignment 1

QUESTION 1

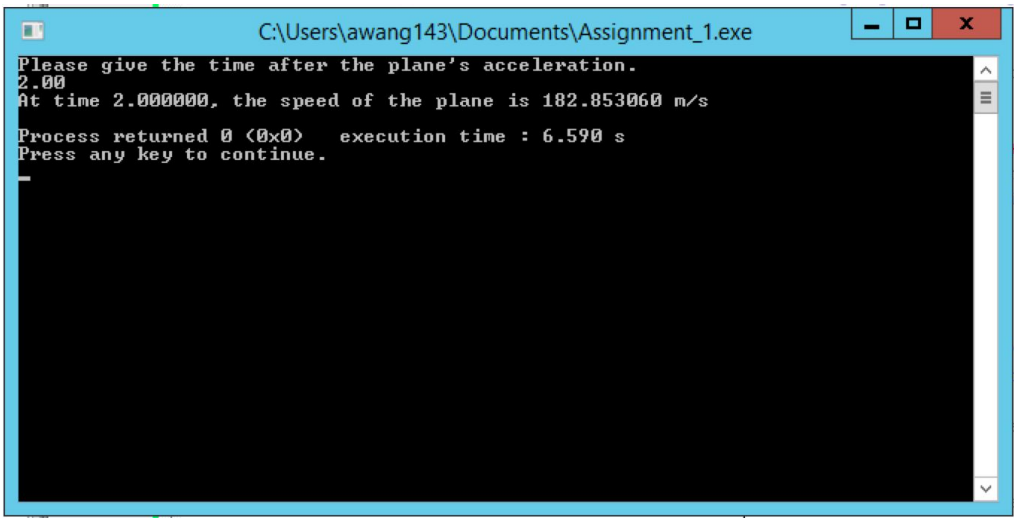
```
#include <stdio.h>
#include <math.h> // Use this header file to allow the program to complete basic
mathematic operations

double calculateSpeed(double t)
    /* Double function called calculateSpeed and has the double variable t in the
parameters to identify the arguments used in the equation */
{
    double v; // Declares a double variable named v
    v = 0.00001*(pow(t,3)) - 0.00488*(pow(t,2)) + 0.75795*(pow(t,1)) + 181.3566;
        /* Pow function used to raise the variable t to an exponent and the
calculation is stored
into v */
    return v; // Used to return the calculated value of v into the main function
}

int main() // Main function returns as an integer value
{
    double v, t; // Declares double variables named v and t
    printf("Please give the time after the plane's acceleration.\n");// Prompts the
user for the plane's time
    scanf("%lf", &t); // Uses the double conversion specifier, %lf, to print out a
double and put it into the variable t
    v = calculateSpeed (t);
        /* Calls the function calculateSpeed from the above function and allows that
value to be used in the printf.
        It has the variable t in the parameters to identify any other
variables/arguments used in the statement */
    printf("At time %lf, the speed of the plane is %lf m/s\n", t, v);
        /* Prints final statement using printf and the %lf is a double conversion
specifier that inputs the stored values of t and v */
    return 0; // Used to terminate the function
}
```

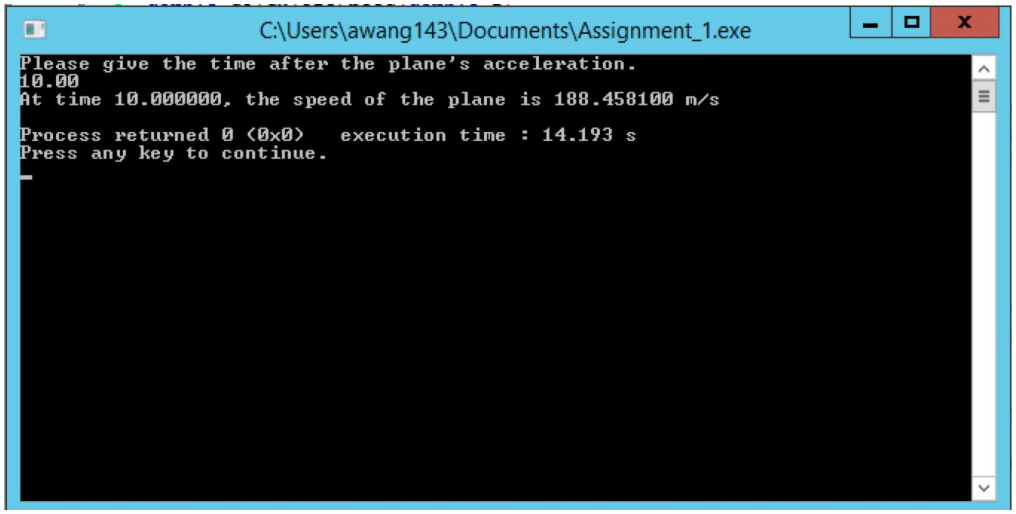
Start here | Assignment_1.c

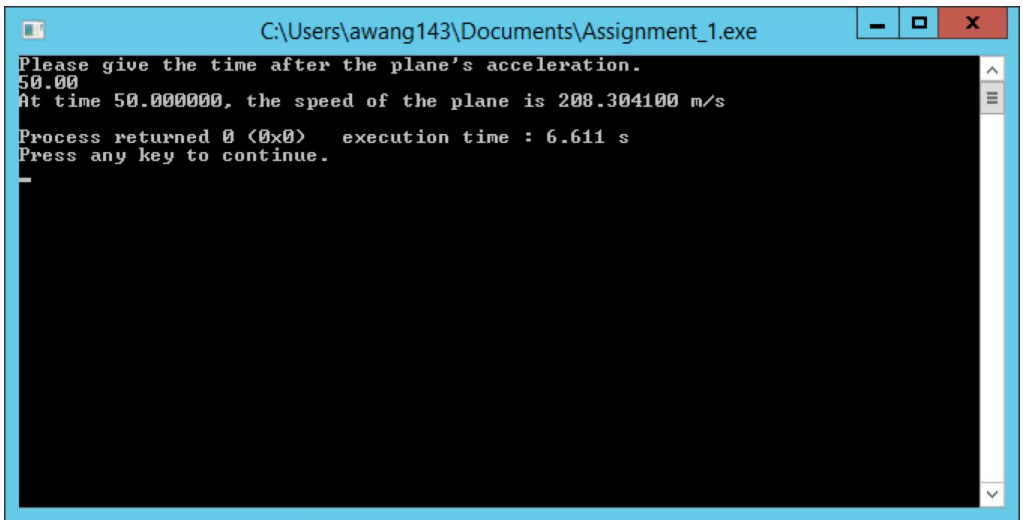
```c
#include <stdio.h>
#include <math.h> // Use this header file to allow the program to complete basic mathematic operations

double calculateSpeed(double t)
    /* Double function called calculateSpeed and has the double variable t in the parameters to identify the arguments used in the equation */
{
    double v; // Declares a double variable named v
    v = 0.00001*(pow(t,3)) - 0.00488*(pow(t,2)) + 0.75795*(pow(t,1)) + 181.3566;
        /* Pow function used to raise the variable t to an exponent and the calculation is stored into v */
    return v; // Used to return the calculated value of v into the main function
}

int main() // Main function returns as an integer value
{
    double v, t; // Declares double variables named v and t
    printf("Please give the time after the plane's acceleration.\n");// Prompts the user for the plane's time
    scanf("%lf", &t); // Uses the double conversion specifier, %lf, to print out a double and put it into the variable t
    v = calculateSpeed (t);
        /* Calls the function calculateSpeed from the above function and allows that value to be used in the printf.
        It has the variable t in the parameters to identify any other variables/arguments used in the statement */
    printf("At time %lf, the speed of the plane is %lf m/s\n", t, v);
        /* Prints final statement using printf and the %lf is a double conversion specifier that inputs the stored values of t and v */
    return 0; // Used to terminate the function
}
```

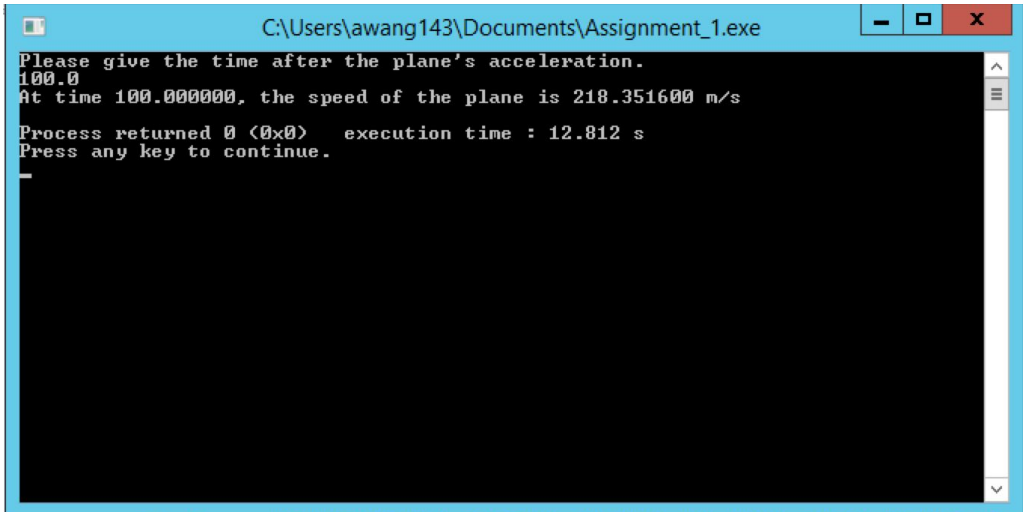
C:\Users\awang143\Documents\Assignment_1.exe

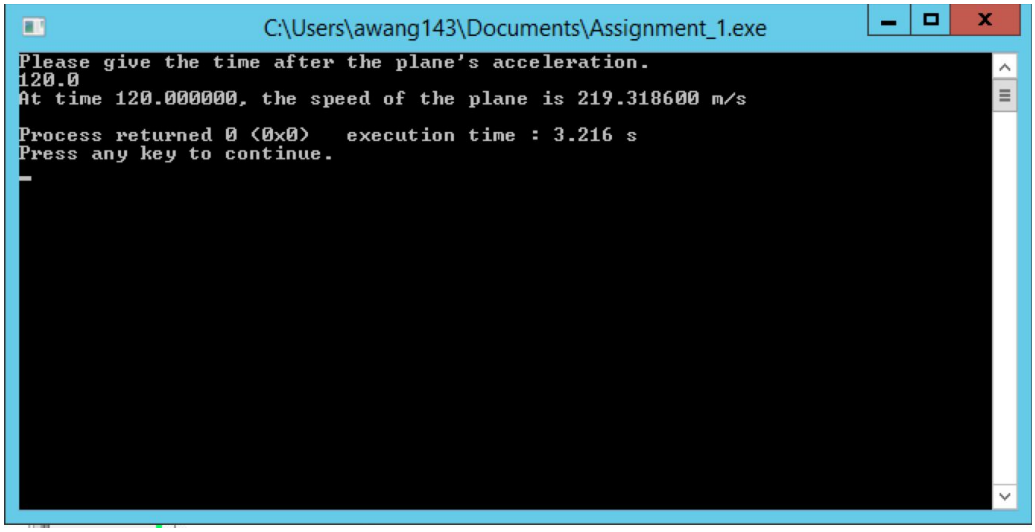
```
Please give the time after the plane's acceleration.
0.00
At time 0.000000, the speed of the plane is 181.356600 m/s

Process returned 0 (0x0)   execution time : 4.346 s
Press any key to continue.
```


C:\Users\awang143\Documents\Assignment_1.exe
Please give the time after the plane's acceleration.
2.00
At time 2.000000, the speed of the plane is 182.853060 m/s
Process returned 0 (0x0)   execution time : 6.590 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment_1.exe
Please give the time after the plane's acceleration.
10.00
At time 10.000000, the speed of the plane is 188.458100 m/s
Process returned 0 (0x0)   execution time : 14.193 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment_1.exe
Please give the time after the plane's acceleration.
50.00
At time 50.000000, the speed of the plane is 208.304100 m/s
Process returned 0 (0x0)   execution time : 6.611 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment_1.exe
Please give the time after the plane's acceleration.
100.0
At time 100.000000, the speed of the plane is 218.351600 m/s
Process returned 0 (0x0)   execution time : 12.812 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment_1.exe
Please give the time after the plane's acceleration.
120.0
At time 120.000000, the speed of the plane is 219.318600 m/s
Process returned 0 (0x0)   execution time : 3.216 s
Press any key to continue.

QUESTION 2

```
#include <stdio.h>

double calculateRref()
    /* Identifies the function type as a double and calls the function calculateRref.
It is used to calculate the value of the reference resistance */

{
    double Rref, Rl, L; // Declares the double variables named Rref, Rl, and L
    printf("Enter the resistance value per unit length between 3.27e-3 ohms/m and 3.55
ohms/m.\n"); //Prompts the user to input the resistance value per unit length
    scanf("%lf", &Rl); // Reads the user's input and stores that given value into the
variable Rl
    printf("Enter the length of the conductor between 0.1 meters and 100 meters.\n");
//Prompts the user to input the value of the conductor
    scanf("%lf", &L); // Reads the user's input and stores it into the variable L
    Rref = Rl*L; //Multiplies the stored input values of Rl and L and then stores that
answer into the variable Rref
    return Rref; //Used to return the calculated value of Rref into the main function
}

double TValue() // Identifies the function type as a double and calls the function
TValue. It is used to calculate the final temperature.
{
    double T, Tref, Tfinal; // Declares the double variables T, Tref, and Tfinal
    Tref = 20; // Assigns the value 20 to Tref
    printf("Please enter the material's temperature in degrees celcius.\n"); //Prompts
the user to input the value of the temperature
    scanf("%lf", &T); // Reads the user's input and stores the value into the variable
T
    Tfinal = T-Tref; // Subtracts Tref from T using the stored values assigned to the
variables and then stores that value into Tfinal
    return Tfinal; //Used to return the calculated value of Tfinal into the main
function
}

double calculateResistance()
```

```
    /* Identifies the function type as a double and calls the function
calculateResistance. It is used to calculate the conductor's resistance */

{
    double R, Rref, Rl, L, Tref, Tfinal, T, M; //Declares the variables being used
    Rref = calculateRref(Rl, L); //Retrieves the value of Rref from the above function
called calculateRref
    Tfinal = TValue(T, Tref); //Retrieves the value of Tfinal from the above function
called TValue
    printf("If the material is aluminum, input the value 3.27e-3. If the material is
copper input the value 4.041e-3.\n");
        /* Prompts the user to identify the material being tested */
    scanf("%lf", &M); // Reads the user's input and stores the value into the variable
M
    R = Rref*(1+(M*Tfinal)); // Calculates the resistance by collecting the values
inputted and calculated in the other functions
    return R; // Used to return the calculated value of R into the main function
}

int main()
{
    float R; // Declares the variable R
    R = calculateResistance(); // Retrieves the value of R from the above function
called calculateResistance
    printf("The value of R is %f\n", R); //Prints out the final statement using %f to
input the value of R
    return 0; // Terminates the function
}
```

Start here | Assignment1_pt2.c

```c
#include <stdio.h>

double calculateRref()
    /* Identifies the function type as a double and calls the function calculateRref. It is used to calculate the value of the reference resistance */

{
    double Rref, Rl, L; // Declares the double variables named Rref, Rl, and L
    printf("Enter the resistance value per unit length between 3.27e-3 ohms/m and 3.55 ohms/m.\n");
        /*Prompts the user to input the resistance value per unit length */
    scanf("%lf", &Rl); // Reads the user's input and stores that given value into the variable Rl
    printf("Enter the length of the conductor between 0.1 meters and 100 meters.\n"); //Prompts the user to input the value of the conductor
    scanf("%lf", &L); // Reads the user's input and stores it into the variable L
    Rref = Rl*L; //Multiplies the stored input values of Rl and L and then stores that answer into the variable Rref
    return Rref; //Used to return the calculated value of Rref into the main function
}

double TValue() // Identifies the function type as a double and calls the function TValue. It is used to calculate the final temperature.
{
    double T, Tref, Tfinal; // Declares the double variables T, Tref, and Tfinal
    Tref = 20; // Assigns the value 20 to Tref
    printf("Please enter the material's temperature in degrees celcius.\n"); //Prompts the user to input the value of the temperature
    scanf("%lf", &T); // Reads the user's input and stores the value into the variable T
    Tfinal = T-Tref; // Subtracts Tref from T using the stored values assigned to the variables and then stores that value into Tfinal
    return Tfinal; //Used to return the calculated value of Tfinal into the main function
}

double calculateResistance()
    /* Identifies the function type as a double and calls the function calculateResistance. It is used to calculate the conductor's resistance */

{
    double R, Rref, Rl, L, Tref, Tfinal, T, M; //Declares the variables being used
    Rref = calculateRref(Rl, L); //Retrieves the value of Rref from the above function called calculateRref
    Tfinal = TValue(T, Tref); //Retrieves the value of Tfinal from the above function called TValue
    printf("If the material is aluminum, input the value 3.27e-3. If the material is copper input the value 4.041e-3.\n");
        /* Prompts the user to identify the material being tested */
    scanf("%lf", &M); // Reads the user's input and stores the value into the variable M
    R = Rref*(1+(M*Tfinal)); // Calculates the resistance by collecting the values inputted and calculated in the other functions
    return R; // Used to return the calculated value of R into the main function
}

int main()
{
    float R; // Declares the variable R
    R = calculateResistance(); // Retrieves the value of R from the above function called calculateResistance
    printf("The value of R is %f\n", R); //Prints out the final statement using %f to input the value of R
    return 0; // Terminates the function
}
```

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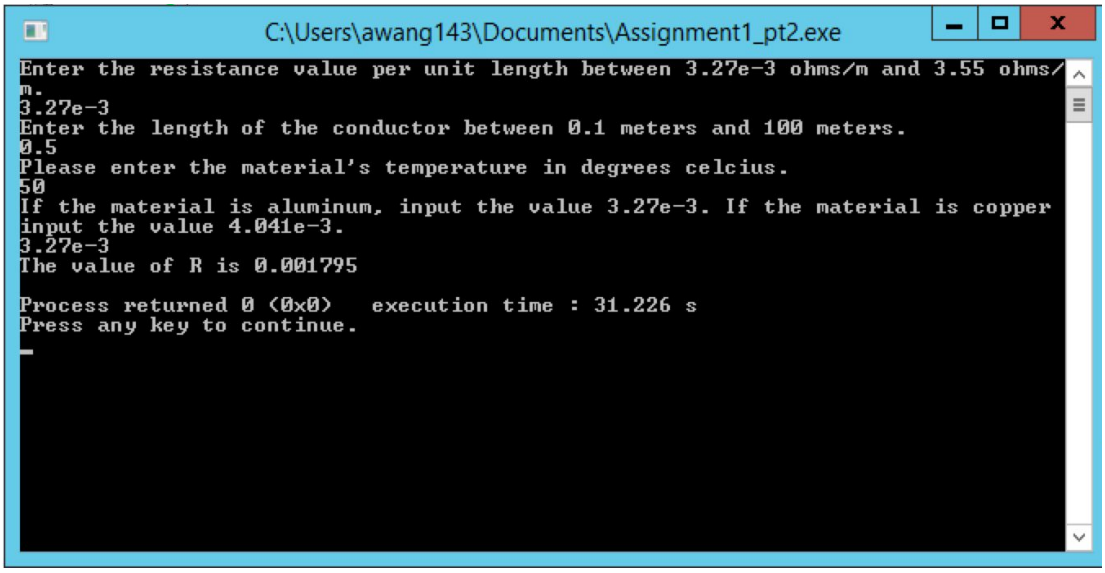
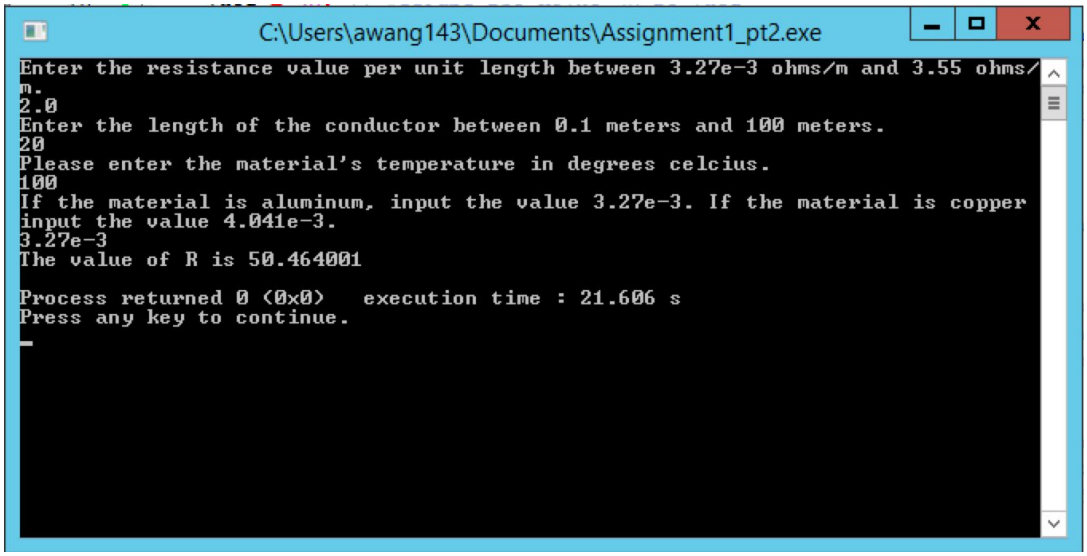
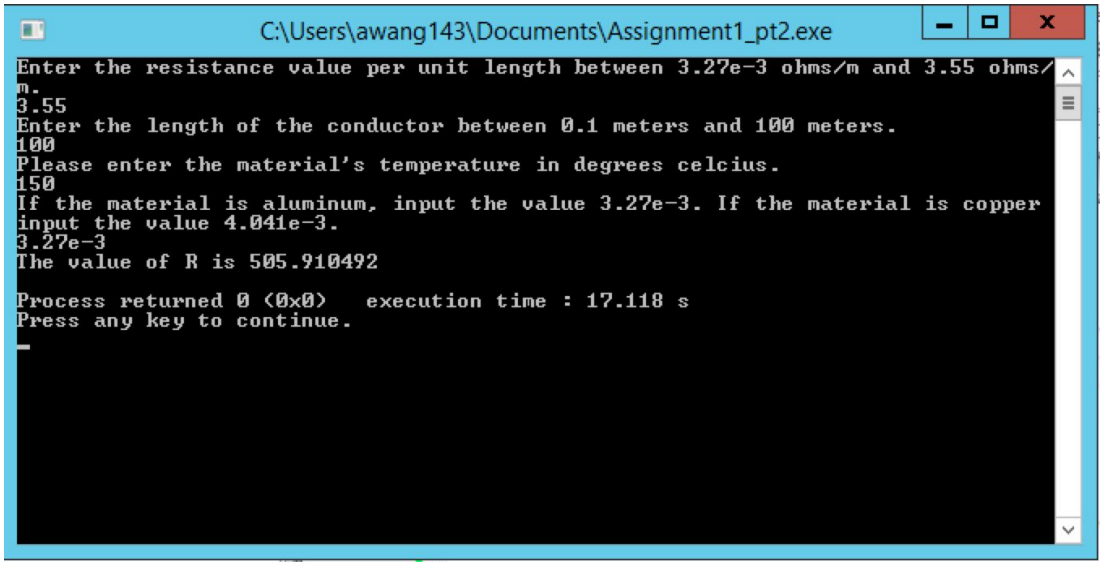
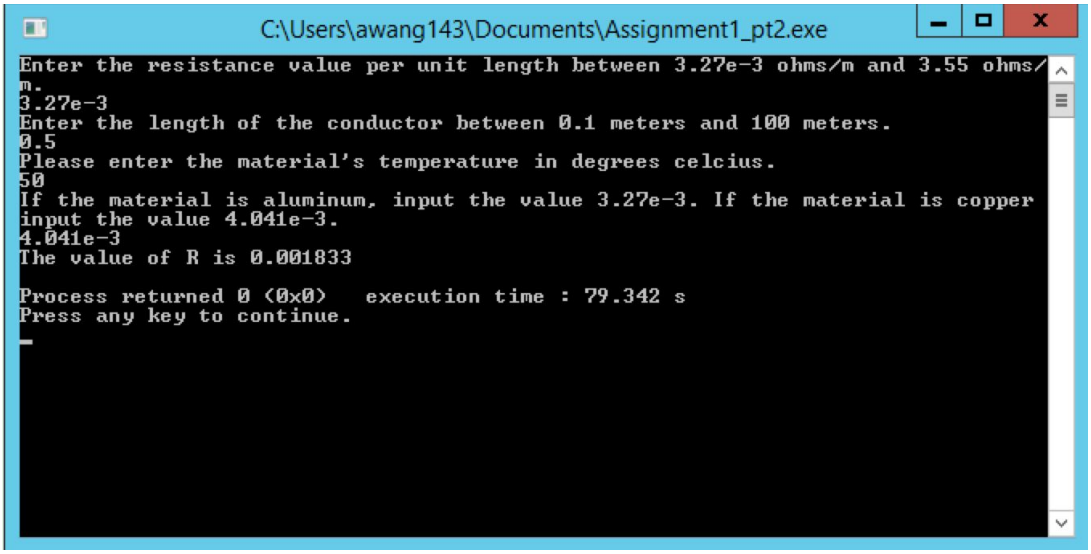
Test Cases

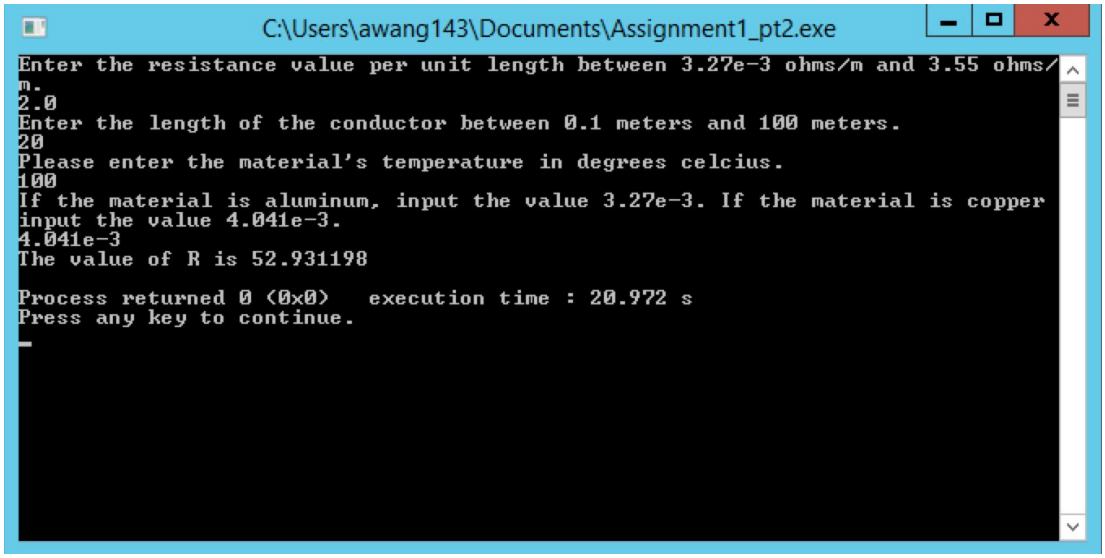
Resistance value per unit length (Rl)	Length of the conductor (L)	Temperature (T)	Material (Aluminum or Copper)	Resistance (R)
0.00327	0.5	50	0.00327	0.001795
2.0	20	100	0.00327	50.4640011
3.55	100	150	0.00327	505.910492
0.00327	0.5	50	0.004041	0.001833
2.0	20	100	0.004041	52.931198
3.55	100	150	0.004041	541.492126

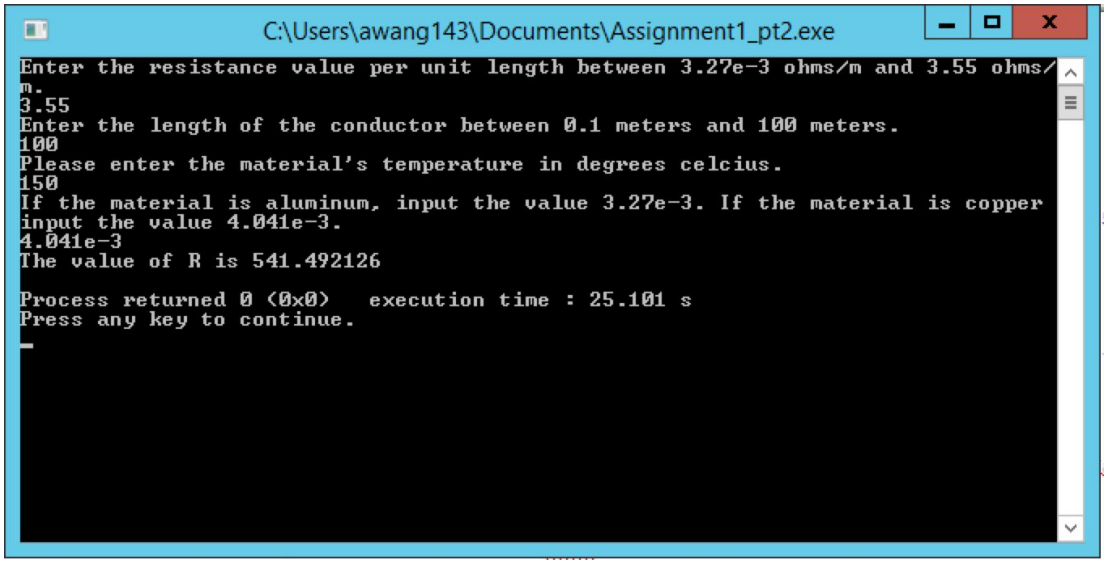



C:\Users\awang143\Documents\Assignment1_pt2.exe
Enter the resistance value per unit length between 3.27e-3 ohms/m and 3.55 ohms/m.
2.0
Enter the length of the conductor between 0.1 meters and 100 meters.
20
Please enter the material's temperature in degrees celcius.
100
If the material is aluminum, input the value 3.27e-3. If the material is copper input the value 4.041e-3.
3.27e-3
The value of R is 50.464001
Process returned 0 (0x0) execution time : 21.606 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment1_pt2.exe
Enter the resistance value per unit length between 3.27e-3 ohms/m and 3.55 ohms/m.
3.55
Enter the length of the conductor between 0.1 meters and 100 meters.
100
Please enter the material's temperature in degrees celcius.
150
If the material is aluminum, input the value 3.27e-3. If the material is copper input the value 4.041e-3.
3.27e-3
The value of R is 505.910492
Process returned 0 (0x0) execution time : 17.118 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment1_pt2.exe
Enter the resistance value per unit length between 3.27e-3 ohms/m and 3.55 ohms/m.
3.27e-3
Enter the length of the conductor between 0.1 meters and 100 meters.
0.5
Please enter the material's temperature in degrees celcius.
50
If the material is aluminum, input the value 3.27e-3. If the material is copper input the value 4.041e-3.
4.041e-3
The value of R is 0.001833
Process returned 0 (0x0) execution time : 79.342 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment1_pt2.exe
Enter the resistance value per unit length between 3.27e-3 ohms/m and 3.55 ohms/m.
2.0
Enter the length of the conductor between 0.1 meters and 100 meters.
20
Please enter the material's temperature in degrees celcius.
100
If the material is aluminum, input the value 3.27e-3. If the material is copper input the value 4.041e-3.
4.041e-3
The value of R is 52.931198
Process returned 0 (0x0) execution time : 20.972 s
Press any key to continue.


C:\Users\awang143\Documents\Assignment1_pt2.exe
Enter the resistance value per unit length between 3.27e-3 ohms/m and 3.55 ohms/m.
3.55
Enter the length of the conductor between 0.1 meters and 100 meters.
100
Please enter the material's temperature in degrees celcius.
150
If the material is aluminum, input the value 3.27e-3. If the material is copper input the value 4.041e-3.
4.041e-3
The value of R is 541.492126
Process returned 0 (0x0) execution time : 25.101 s
Press any key to continue.