

GNG 1106

**FUNDAMENTALS OF ENGINEERING
COMPUTATION**

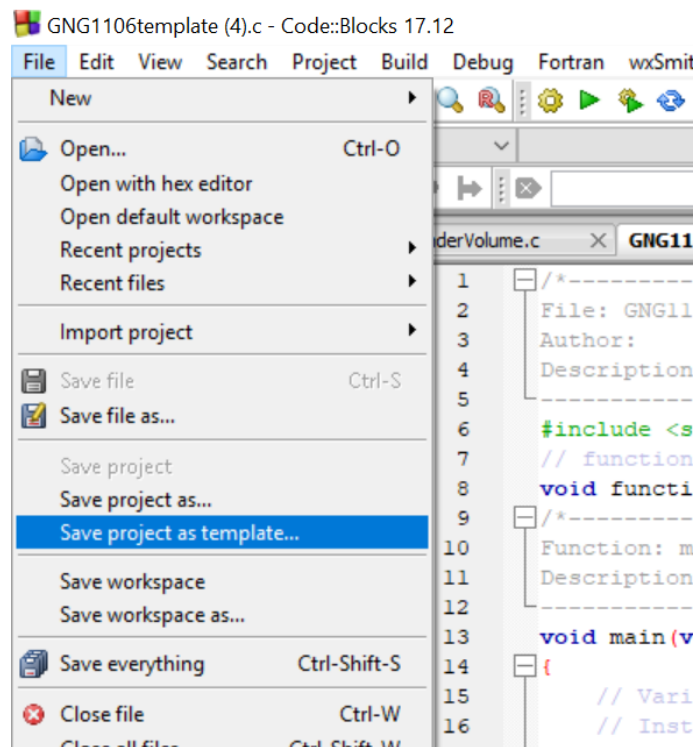
LAB2 – FALL 2018

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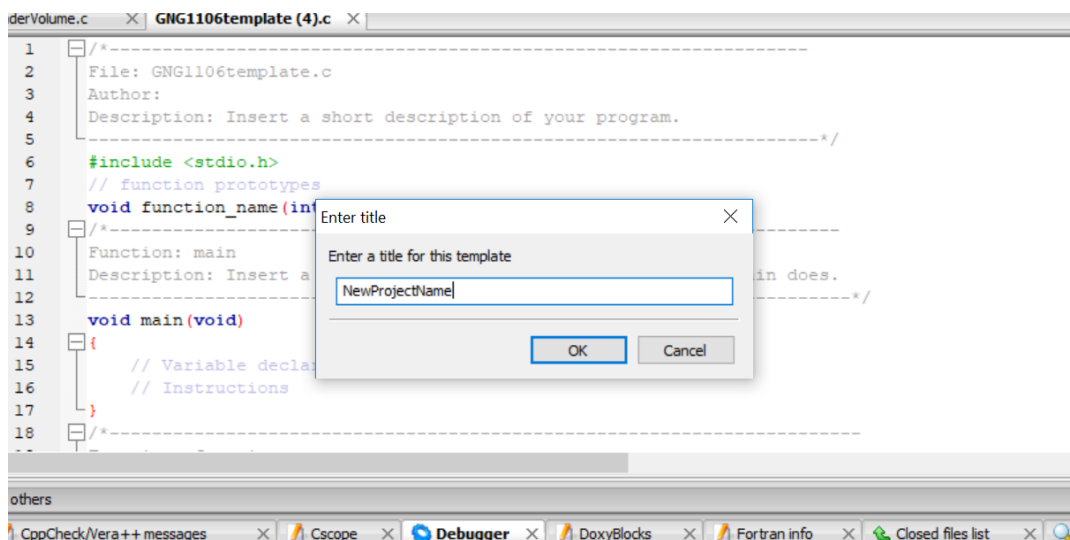
Student Number: 300093056

A. Creating a C Project (5 points)

I created a new project and deleted it. There are three ways of renaming a template. First of all, by going to the file where the template is saved and renaming it. Secondly, we could save a project as a template ...

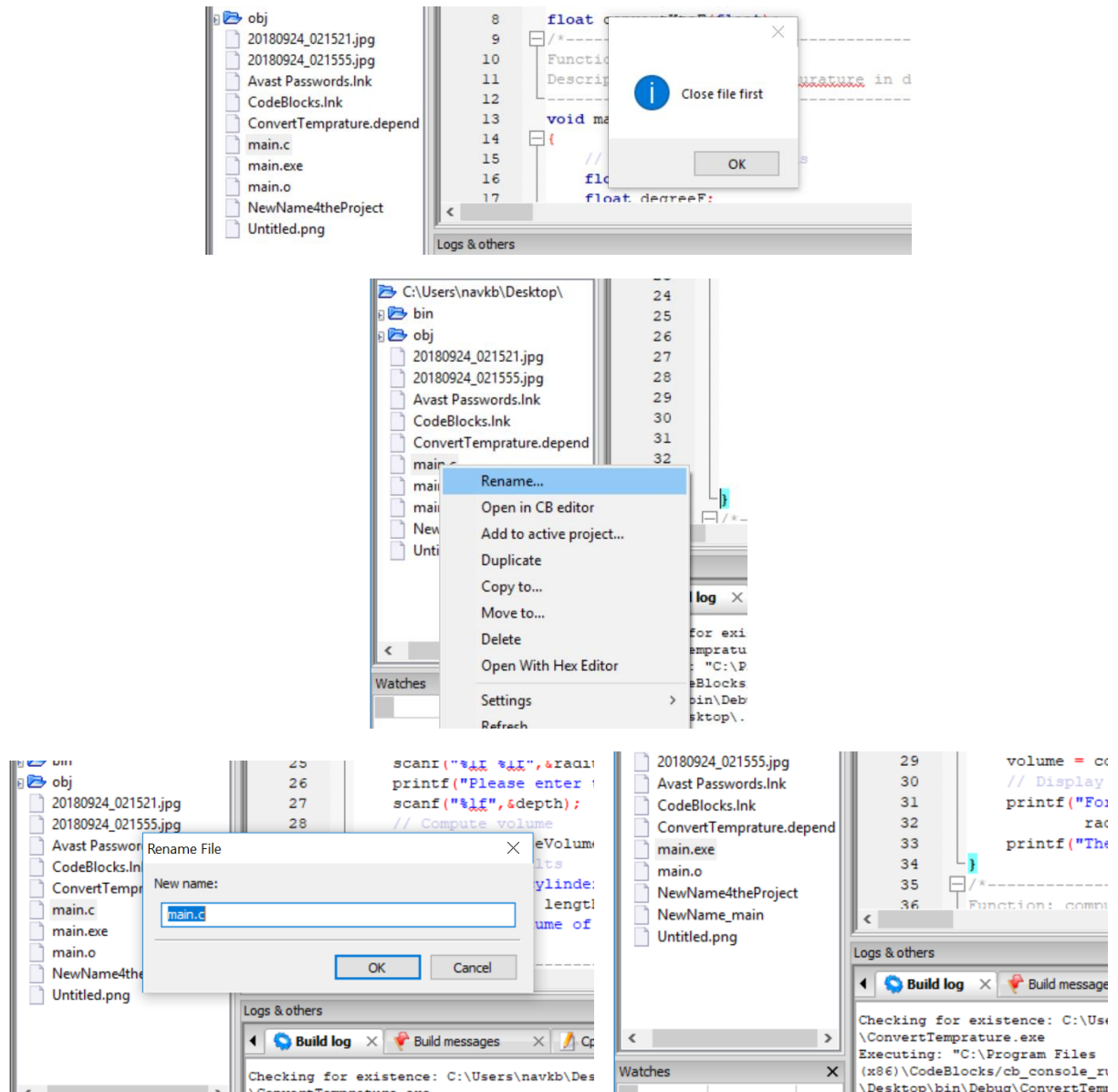


and this will pop up:

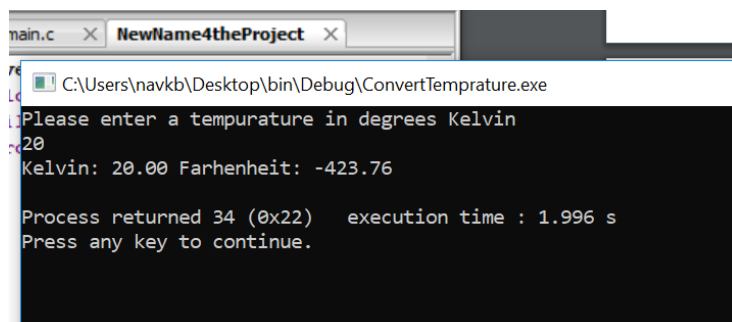


Lastly, a much better way of renaming a template is by doing the following steps:

Right-click> rename (but I first have to close the file itself)

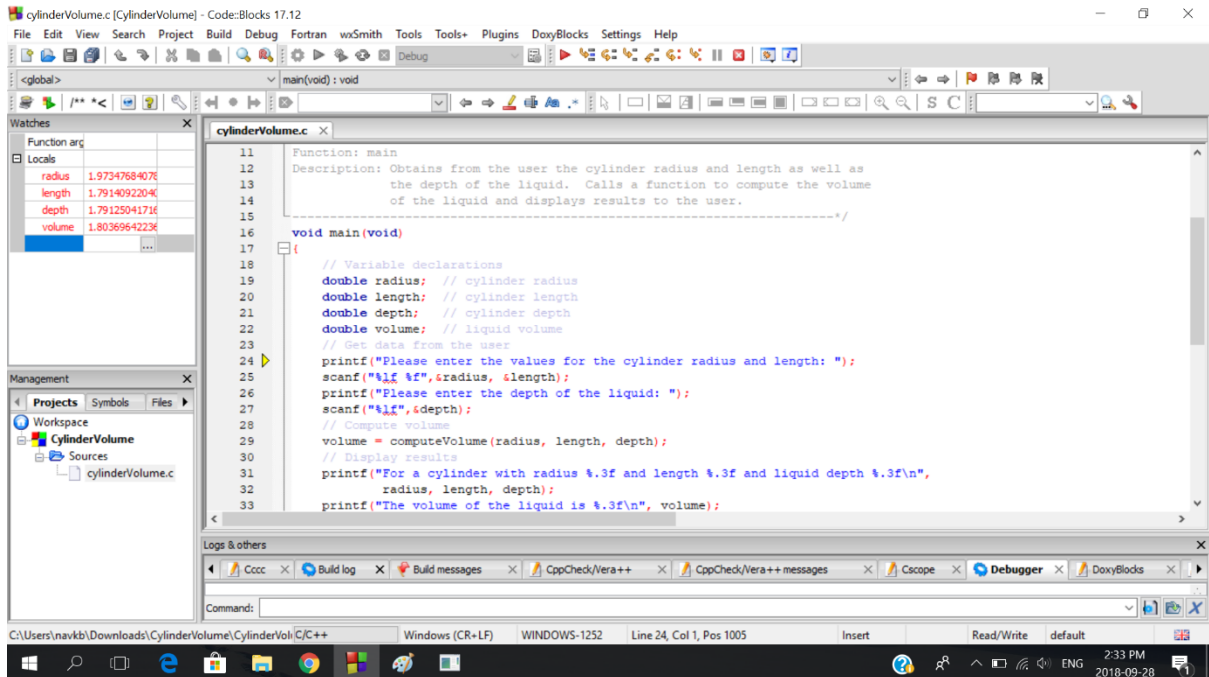


Finally, the project runs:



B. Exercise: Debugging a program (5 points)

“Watches” is necessary for debugging. The computer picks random variables (look at Watches table).



The screenshot shows the Code::Blocks IDE with a C program for calculating the volume of a cylinder. The program is named 'cylinderVolume.c' and is located in the workspace 'CylinderVolume'. The code is as follows:

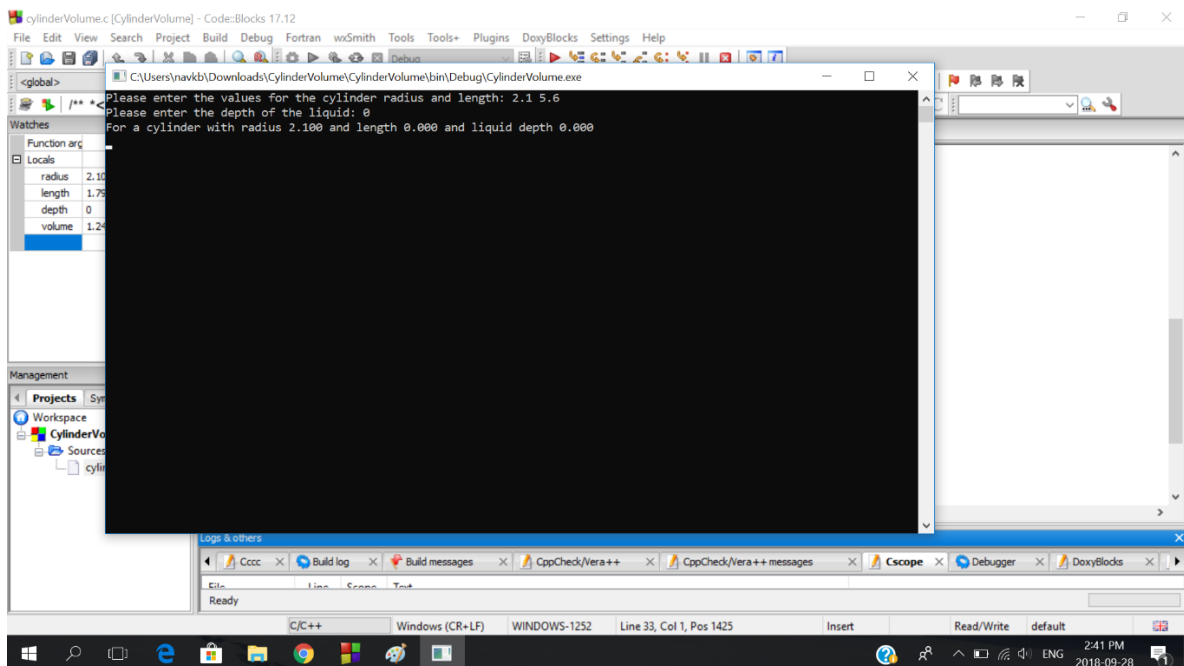
```
11 Function: main
12 Description: Obtains from the user the cylinder radius and length as well as
13 the depth of the liquid. Calls a function to compute the volume
14 of the liquid and displays results to the user.
15 -----*/
16 void main(void)
17 {
18     // Variable declarations
19     double radius; // cylinder radius
20     double length; // cylinder length
21     double depth; // cylinder depth
22     double volume; // liquid volume
23     // Get data from the user
24     printf("Please enter the values for the cylinder radius and length: ");
25     scanf("%lf %lf", &radius, &length);
26     printf("Please enter the depth of the liquid: ");
27     scanf("%lf", &depth);
28     // Compute volume
29     volume = computeVolume(radius, length, depth);
30     // Display results
31     printf("For a cylinder with radius %.3f and length %.3f and liquid depth %.3f\n",
32           radius, length, depth);
33     printf("The volume of the liquid is %.3f\n", volume);

```

The Watches table shows the following values:

Function arg	Value
radius	1.97347684076
length	1.79140922046
depth	1.79125041716
volume	1.80369642236

But throughout the process of running and building the program some errors occurred just like the following:



The screenshot shows the Code::Blocks IDE with the same C program as above. The program is running, and the output is displayed in the console window. The output is as follows:

```
Please enter the values for the cylinder radius and length: 2.1 5.6
Please enter the depth of the liquid: 0
For a cylinder with radius 2.100 and length 0.000 and liquid depth 0.000
```

The Watches table shows the following values:

Function arg	Value
radius	2.100000
length	1.791409
depth	0.000000
volume	1.240000

But, by keeping the errors in mind I was able to track down the mistakes so I corrected them. I tried the debugger and checked the test cases.

Specifically:

Line 25: Instead of %f we need %lf

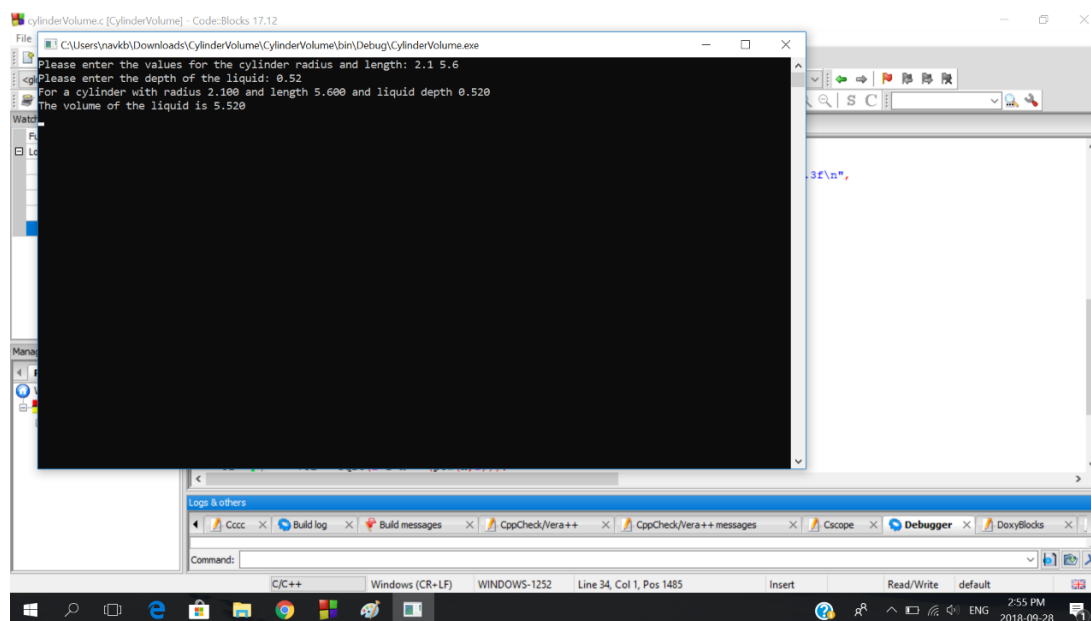
```
20     double length; // cylinder length
21     double depth; // cylinder depth
22     double volume; // liquid volume
23     // Get data from the user
24     printf("Please enter the values for the cylinder radius and
25     scanf("%lf %f",&radius, &length);
26     printf("Please enter the depth of the liquid: ");
27     scanf("%lf",&depth);
28     // Compute volume
29     volume = computeVolume(radius, length, depth);
30     // Display results
```

Line 51: It should be pow(h,2) and

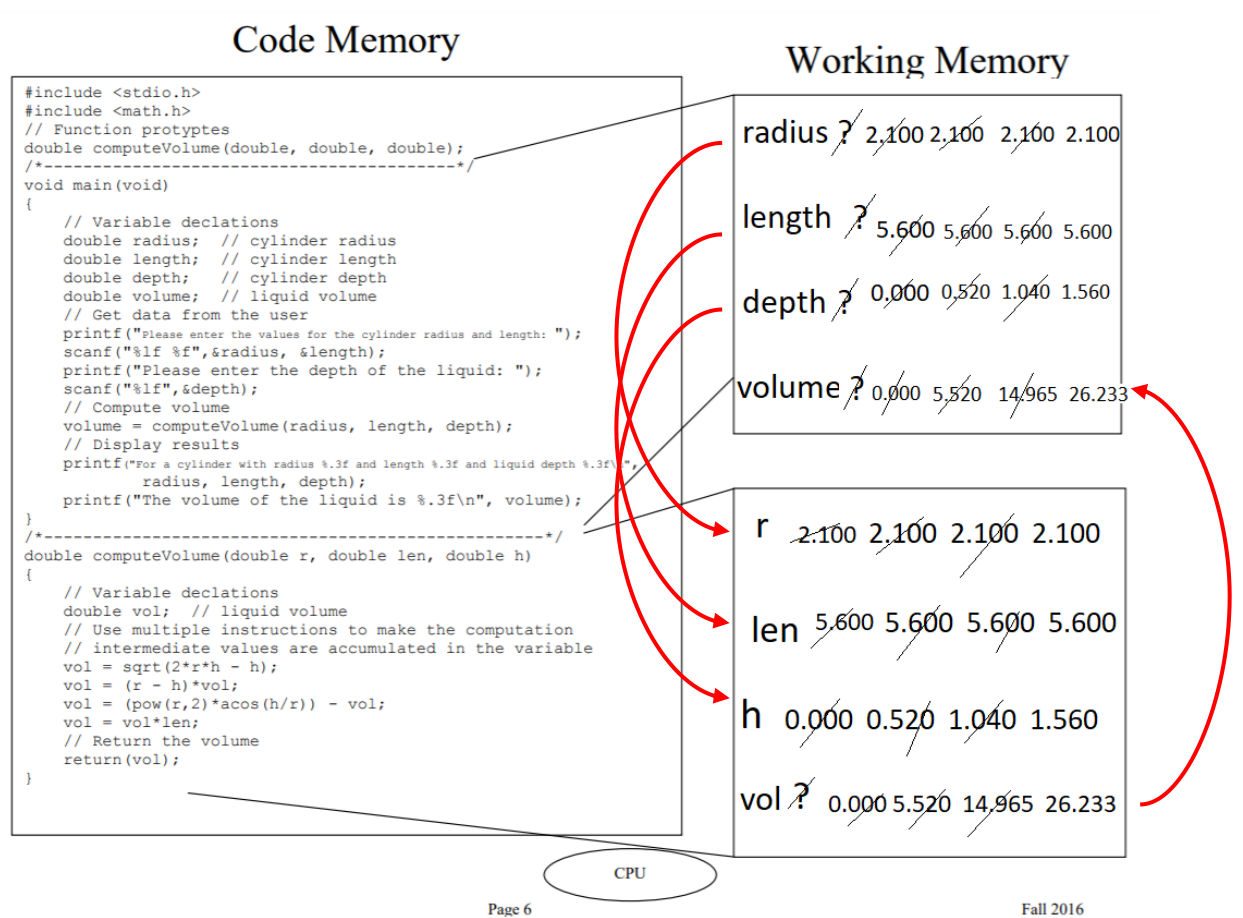
Line 53: It should be (r-h/r)

```
44     -----*/
45     double computeVolume(double r, double len, double h)
46     {
47         // Variable declarations
48         double vol; // liquid volume
49         // Use multiple instructions to make the computation
50         // intermediate values are accumulated in the variable
51         vol = sqrt(2*r*h - h);
52         vol = (r - h)*vol;
53         vol = (pow(r,2)*acos(h/r)) - vol;
54         vol = vol*len;
55         // Return the volume
56         return(vol);
57     }
```

By building and running the program once again we have the following results:



C. Programming Model (5 points)



D. Free Falling Parachutist (10 points)

```
#include <stdio.h>
#include <math.h>
#define G 9.8
#define c 12.5
double calculateVelocity(double, double, double);
void main()
{
    double weight, drag, time, velocity, mass;
    printf("Enter weight:\n");
    scanf("%lf", &weight);
    printf("Enter drag:\n");
    scanf("%lf", &drag);
    printf("Enter time:\n");
    scanf("%lf", &time);
    velocity=calculateVelocity(weight, drag, time);
    printf("At t = %f , the parachutist with weight %f kg and a
drag coefficient %f kg/s will have a velocity of %f m/s.", time,
weight, drag, velocity);
}

double calculateVelocity(double weight, double drag, double
time)
{
    double a, b, d;
    a=- (drag/weight) *time;
    b=(1-exp(a));
    d=G*weight*b/c;
    return (d);
}
```

Test cases

```
"C:\Users\navkb\Documents\lab2 gng 25.09.18.exe"
Enter weight:
68.1
Enter drag:
12.5
Enter time:
1.0
At t = 1.000000 , the parachutist with weight 68.100000 kg and a drag coefficient 12.500000 kg/s will have a velocity of 8.953182 m/s.
Process returned 134 (0x86)   execution time : 38.944 s
Press any key to continue.
```

```
"C:\Users\navkb\Documents\lab2 gng 25.09.18.exe"
Enter weight:
68.1
Enter drag:
12.5
Enter time:
2.0
At t = 2.000000 , the parachutist with weight 68.100000 kg and a drag coefficient 12.500000 kg/s will have a velocity of 16.404981 m/s.
Process returned 135 (0x87)   execution time : 8.423 s
Press any key to continue.
```

```
"C:\Users\navkb\Documents\lab2 gng 25.09.18.exe"
Enter weight:
68.1
Enter drag:
12.5
Enter time:
4.0
At t = 4.000000 , the parachutist with weight 68.100000 kg and a drag coefficient 12.500000 kg/s will have a velocity of 27.769291 m/s.
Process returned 135 (0x87)   execution time : 9.810 s
Press any key to continue.
```

```
"C:\Users\navkb\Documents\lab2 gng 25.09.18.exe"
Enter weight:
68.1
Enter drag:
12.5
Enter time:
6.0
At t = 6.000000 , the parachutist with weight 68.100000 kg and a drag coefficient 12.500000 kg/s will have a velocity of
35.641752 m/s.
Process returned 135 (0x87)   execution time : 9.553 s
Press any key to continue.
```

```
"C:\Users\navkb\Documents\lab2 gng 25.09.18.exe"
Enter weight:
68.1
Enter drag:
12.5
Enter time:
10.0
At t = 10.000000 , the parachutist with weight 68.100000 kg and a drag coefficient 12.500000 kg/s will have a velocity of 44.873138 m/s.
Process returned 136 (0x88)   execution time : 13.553 s
Press any key to continue.
```

```
Enter weight:
45.2
Enter drag:
12.5
Enter time:
10.0
At t = 10.000000 , the parachutist with weight 45.200000 kg and a drag coefficient 12.500000 kg/s will have a velocity of
33.206215 m/s.
Process returned 136 (0x88)   execution time : 17.200 s
Press any key to continue.
```

```
"C:\Users\navkb\Documents\lab2 gng 25.09.18.exe"
Enter weight:
45.2
Enter drag:
12.5
Enter time:
0.0
At t = 0.000000 , the parachutist with weight 45.200000 kg and a drag coefficient 12.500000 kg/s will have a velocity of
0.000000 m/s.
Process returned 134 (0x86)   execution time : 10.741 s
Press any key to continue.
```