

CSE-016 Programming Lab Assignment № 2

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Document structure is detailed in the second page.

Solutions begin from the third page.

1 Problems

1.1 Problem (1)

John is responsible for planting the street with trees; he can give you the length of the street in meters, the distance between each two trees in a meter, and the cost of planting each tree in dollars. Write a program that should read this information and then print the number of trees needed and the total cost.

1.2 Problem (2)

Write a program that calculates the squares, cubes, square root, and exponent (e^x) of the numbers from 0 to 5 and uses tabs to print the following table of values:

| Number | Square | Cube | Root | Exponent |
|--------|--------|------|------|----------|
| 0 | 0 | 0 | 0.0 | 1.0 |
| .. | .. | .. | .. | .. |
| .. | .. | .. | .. | .. |

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2 Solutions

2.1 Solution to Problem (1)

2.1.1 Source Code

Program's main.c File – console input/output-oriented application to solve the problem

```
1  #include <math.h>
2  #include <stdio.h>
3
4  int main() {
5      // Runtime variable declarations
6      float streetlen, treedist, treecost, totalcost;
7      int treenum;
8
9      // Input prompts
10     printf("Hello, John! Let's help you fill the street with trees.\n\n");
11     printf("Please enter the length of the street (m): ");
12     scanf("%f", &streetlen);
13     printf("Now enter the distance you want between each tree (m): ");
14     scanf("%f", &treedist);
15     printf("Great! Finally, enter the cost of planting one tree ($): ");
16     scanf("%f", &treecost);
17     printf("\n"); // To separate input from results
18
19     // Calculations
20     treenum = 1 + floor(streetlen / treedist);
21     totalcost = (float) treecost * treenum;
22
23     // Outputting the results
24     printf("You will have to plant %d tree(s)\n", treenum);
25     printf("The total price you'll pay will be $%.2f\n", totalcost);
26
27     return 0;
28 }
```

2.1.2 Outcome

Test Input Samples

| # | Street Length | Distance Btn. Trees | Cost/ Tree |
|-----|---------------|---------------------|------------|
| (1) | 100 | 10 | 12 |
| (2) | 987 | 10 | 13.98 |

| | # | Number of Trees | Total Cost |
|-------------------------|-----|-----------------|------------|
| Obtained Results | (1) | 11 | 132.00 |
| | (2) | 99 | 1384.02 |

The obtained results match the expected results.

Console Output

Program's output to console in plaintext – using inputs from test sample (1)

Hello, John! Let's help you fill the street with trees.

Please enter the length of the street (m): 100

Now enter the distance you want between each tree (m): 10

Great! Finally, enter the cost of planting one tree (\$): 12

You will have to plant 11 tree(s)

The total price you'll pay will be \$132.00

Turn over the page for the solution to problem (2)

2.2 Solution to Problem (2)

2.2.1 Source Code

Program's main.c File – console application to output the full table as described in the problem

```
1 #include <math.h>
2 #include <stdio.h>
3
4 int main() {
5     printf("Number\tSquare\tCube\tRoot\tExponent\n");
6     printf("0\t%d\t%d\t%.1f\t%.1f\n", ((int)pow(0,2)), ((int)pow(0,3)), sqrt(0), exp(0));
7     printf("1\t%d\t%d\t%.1f\t%.1f\n", ((int)pow(1,2)), ((int)pow(1,3)), sqrt(1), exp(1));
8     printf("2\t%d\t%d\t%.1f\t%.1f\n", ((int)pow(2,2)), ((int)pow(2,3)), sqrt(2), exp(2));
9     printf("3\t%d\t%d\t%.1f\t%.1f\n", ((int)pow(3,2)), ((int)pow(3,3)), sqrt(3), exp(3));
10    printf("4\t%d\t%d\t%.1f\t%.1f\n", ((int)pow(4,2)), ((int)pow(4,3)), sqrt(4), exp(4));
11    printf("5\t%d\t%d\t%.1f\t%.1f\n", ((int)pow(5,2)), ((int)pow(5,3)), sqrt(5), exp(5));
12    return 0;
13 }
```

Please note that the line numbers are purely for readability purposes and are not part of the code.

Please also note that on lines where there is no new line number, there is **NO** actual line break in the code and that this is meant to be read as one single line.

2.2.2 Outcome

Console Output

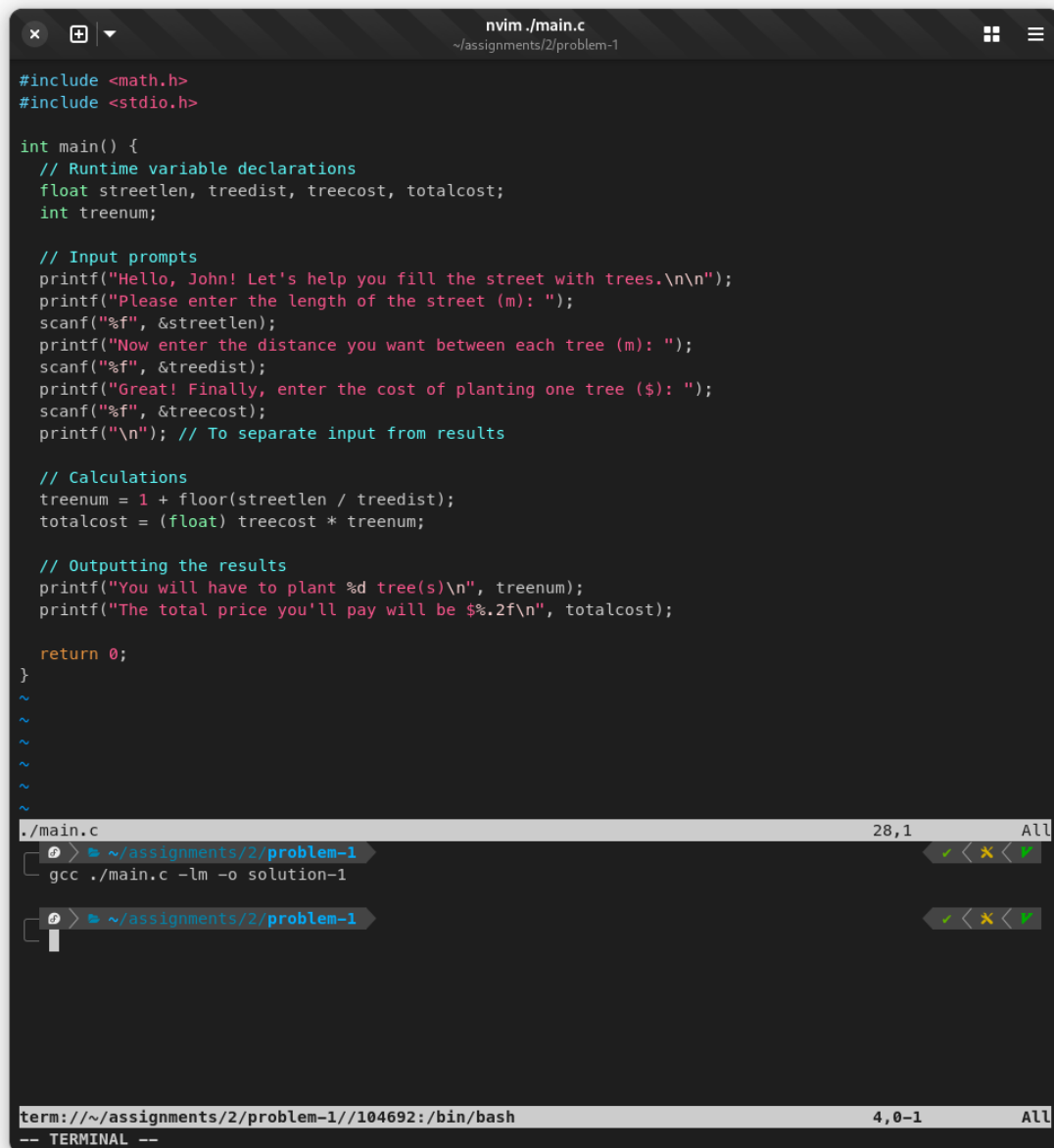
Program's output to console in plaintext

| Number | Square | Cube | Root | Exponent |
|--------|--------|------|------|----------|
| 0 | 0 | 0 | 0.0 | 1.0 |
| 1 | 1 | 1 | 1.0 | 2.7 |
| 2 | 4 | 8 | 1.4 | 7.4 |
| 3 | 9 | 27 | 1.7 | 20.1 |
| 4 | 16 | 64 | 2.0 | 54.6 |
| 5 | 25 | 125 | 2.2 | 148.4 |

2.3 Evidence of Work (Screenshots)

2.3.1 Problem (1) Screenshots

Close Up Source-code Screenshot



The screenshot shows a code editor window titled "nvim ./main.c" with the file path "~/.assignments/2/problem-1". The code is a C program that calculates the number of trees to plant and the total cost based on user input. The code is as follows:

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

int main() {
    // Runtime variable declarations
    float streetlen, treedist, treecost, totalcost;
    int treenum;

    // Input prompts
    printf("Hello, John! Let's help you fill the street with trees.\n\n");
    printf("Please enter the length of the street (m): ");
    scanf("%f", &streetlen);
    printf("Now enter the distance you want between each tree (m): ");
    scanf("%f", &treedist);
    printf("Great! Finally, enter the cost of planting one tree ($): ");
    scanf("%f", &treecost);
    printf("\n"); // To separate input from results

    // Calculations
    treenum = 1 + floor(streetlen / treedist);
    totalcost = (float) treecost * treenum;

    // Outputting the results
    printf("You will have to plant %d tree(s)\n", treenum);
    printf("The total price you'll pay will be $%.2f\n", totalcost);

    return 0;
}
~
~
~
~
~
```

Below the code editor, there is a terminal window showing the compilation command:

```
./main.c 28,1 All
~/.assignments/2/problem-1
gcc ./main.c -lm -o solution-1
~/.assignments/2/problem-1
```

The terminal window also shows the prompt "term://~/.assignments/2/problem-1/104692:/bin/bash" and "4,0-1 All".

Close Up Output Console Screenshot

```
youssef@silverblue:~/assignments/2/problem-1
~/assignments/2/problem-1

youssef@silverblue:~/assignments/2/problem-1$ ./solution-1
Hello, John! Let's help you fill the street with trees.

Please enter the length of the street (m): 100
Now enter the distance you want between each tree (m): 10
Great! Finally, enter the cost of planting one tree ($): 12

You will have to plant 11 tree(s)
The total price you'll pay will be $132.00
youssef@silverblue:~/assignments/2/problem-1$
```

Linux Desktop Screenshot

The screenshot shows a Linux desktop environment with three windows open:

- Code Editor (nvim):** Displays the C program `main.c` for "problem-1". The code includes `math.h` and `stdio.h`, and implements a program that calculates the number of trees and total cost based on user input. The code is as follows:

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

int main() {
    // Runtime variable declarations
    float streetlen, treedist, treecost, totalcost;
    int treenum;

    // Input prompts
    printf("Hello, John! Let's help you fill the street with trees.\n\n");
    printf("Please enter the length of the street (m): ");
    scanf("%f", &streetlen);
    printf("Now enter the distance you want between each tree (m): ");
    scanf("%f", &treedist);
    printf("Great! Finally, enter the cost of planting one tree ($): ");
    scanf("%f", &treecost);
    printf("\n"); // To separate input from results

    // Calculations
    treenum = 1 + floor(streetlen / treedist);
    totalcost = (float) treecost * treenum;

    // Outputting the results
    printf("You will have to plant %d tree(s)\n", treenum);
    printf("The total price you'll pay will be %.2f\n", totalcost);

    return 0;
}
```

The terminal output shows the program being compiled and executed, with the same results as the close-up screenshot:

```
gcc ./main.c -lm -o solution-1
./solution-1
Hello, John! Let's help you fill the street with trees.
Please enter the length of the street (m): 100
Now enter the distance you want between each tree (m): 10
Great! Finally, enter the cost of planting one tree ($): 12
You will have to plant 11 tree(s)
The total price you'll pay will be $132.00
```
- Terminal:** Shows the execution of the program and the compilation command: `gcc ./main.c -lm -o solution-1`.
- PDF Document (Lab 2 - Spring 2023.pdf):** Displays the assignment details and questions.

Assignment Details:

- Alexandria University
Faculty of Engineering
Specialized Scientific Programs
- Computer and Communication
CSE016 Computers & Programming

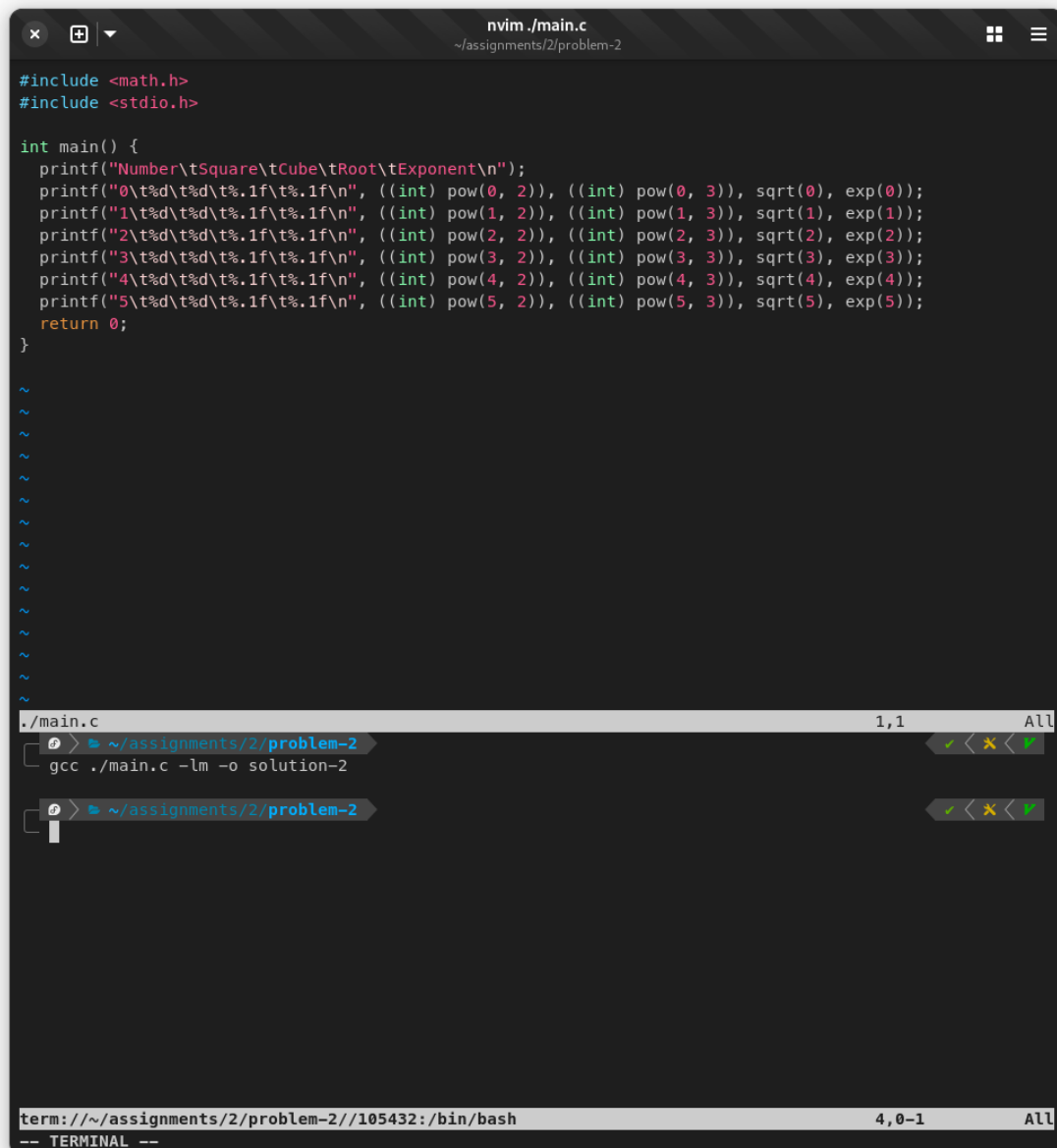
Take home Assignments:

- John is responsible for planting the street with trees; he can give you the **length** of the street in meters, the **distance** between each two trees in a meter, and the **cost** of planting each tree in dollars. Write a program that should read this information and then print the **number** of trees needed and the **total cost**.
- Write a program that calculates the **squares**, **cubes**, **square root**, and **exponent** (e^x) of the numbers from 0 to 5 and uses tabs to print the following table of values:

| Number | Square | Cube | Root | Exponent |
|--------|--------|------|------|----------|
| 0 | 0 | 0 | 0.0 | 1.0 |
| .. | .. | .. | .. | .. |
| .. | .. | .. | .. | .. |

2.3.2 Problem (2) Screenshots

Close Up Source-code Screenshot



The screenshot shows the nvim editor interface. The main window displays the source code for `./main.c`, which includes `math.h` and `stdio.h`. The `main` function prints a table of mathematical values for exponents 0 through 5. Below the code, there are two terminal windows. The first terminal window shows the command `gcc ./main.c -lm -o solution-2` being executed. The second terminal window shows the command `term://~/assignments/2/problem-2/105432:/bin/bash` being executed. The terminal output shows the command prompt `-- TERMINAL --`.

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

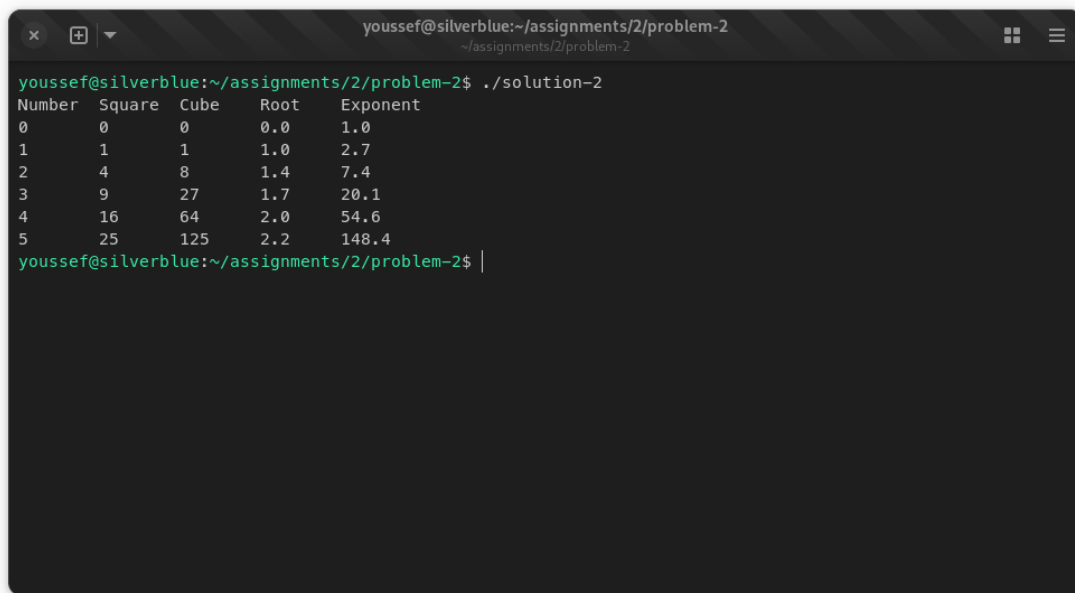
int main() {
    printf("Number\tSquare\tCube\tRoot\tExponent\n");
    printf("0\t%d\t%d\t%.1f\t%.1f\n", ((int) pow(0, 2)), ((int) pow(0, 3)), sqrt(0), exp(0));
    printf("1\t%d\t%d\t%.1f\t%.1f\n", ((int) pow(1, 2)), ((int) pow(1, 3)), sqrt(1), exp(1));
    printf("2\t%d\t%d\t%.1f\t%.1f\n", ((int) pow(2, 2)), ((int) pow(2, 3)), sqrt(2), exp(2));
    printf("3\t%d\t%d\t%.1f\t%.1f\n", ((int) pow(3, 2)), ((int) pow(3, 3)), sqrt(3), exp(3));
    printf("4\t%d\t%d\t%.1f\t%.1f\n", ((int) pow(4, 2)), ((int) pow(4, 3)), sqrt(4), exp(4));
    printf("5\t%d\t%d\t%.1f\t%.1f\n", ((int) pow(5, 2)), ((int) pow(5, 3)), sqrt(5), exp(5));
    return 0;
}
```

```
~/main.c 1,1 All
> ~/assignments/2/problem-2
gcc ./main.c -lm -o solution-2

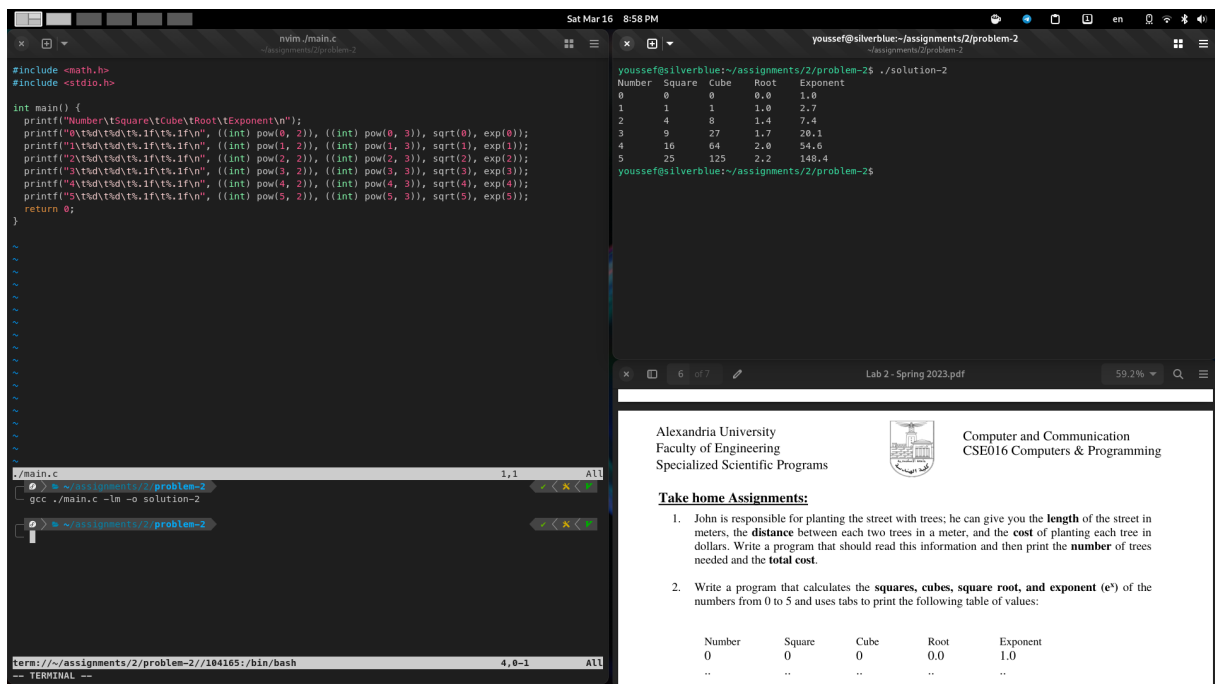
> ~/assignments/2/problem-2

term://~/assignments/2/problem-2/105432:/bin/bash 4,0-1 All
-- TERMINAL --
```


Close Up Output Console Screenshot



Linux Desktop Screenshot



2.4 Specifications

- **Libraries:**
 - `stdio.h`
 - `math.h`
- **Compiler:** GNU C Compiler (gcc) version 13.2.1 20231205 (Red Hat 13.2.1-6)
- **Supported Platforms:** OS: (any), architecture: (any)
- **Tested On:**
 - Compiled on Fedora 39 Workstation Linux
 - Ran on Fedora 39 Silverblue Workstation Linux

3 Licenses & Warranty

The software & source code included are licensed under the BSD 3-Clause Open Source License: <https://opensource.org/license/bsd-3-clause>.

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