

# **Assignment 4**

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CS 3305 – Section 01

Description: This assignment implements 2 programming projects part 1 and 2. The first part prints out section numbers of a prefix value by recursively calling itself (Assignment4a.cpp).

The second part prints out a \* pattern based on the values provided by recursively calling itself twice (Assignment4b.cpp).

## Assignment 4a (Part 1) - Source Code:

```
// Assignment 4 - Part 1
// by: Kevin Nolan
//
// This program implements part 1 of assignment 4. It takes a prefix string value
// and uses recursion to print out "section" numbers to the end of each string.

#include <iostream>
#include <string>

void numbers(std::ostream& outs, const std::string& prefix, unsigned int levels);

int main()
{
    std::cout << "Testing out the levels function!!! \n \n";
    std::ostream& os = std::cout;

    numbers(os, "joke", 2);
}

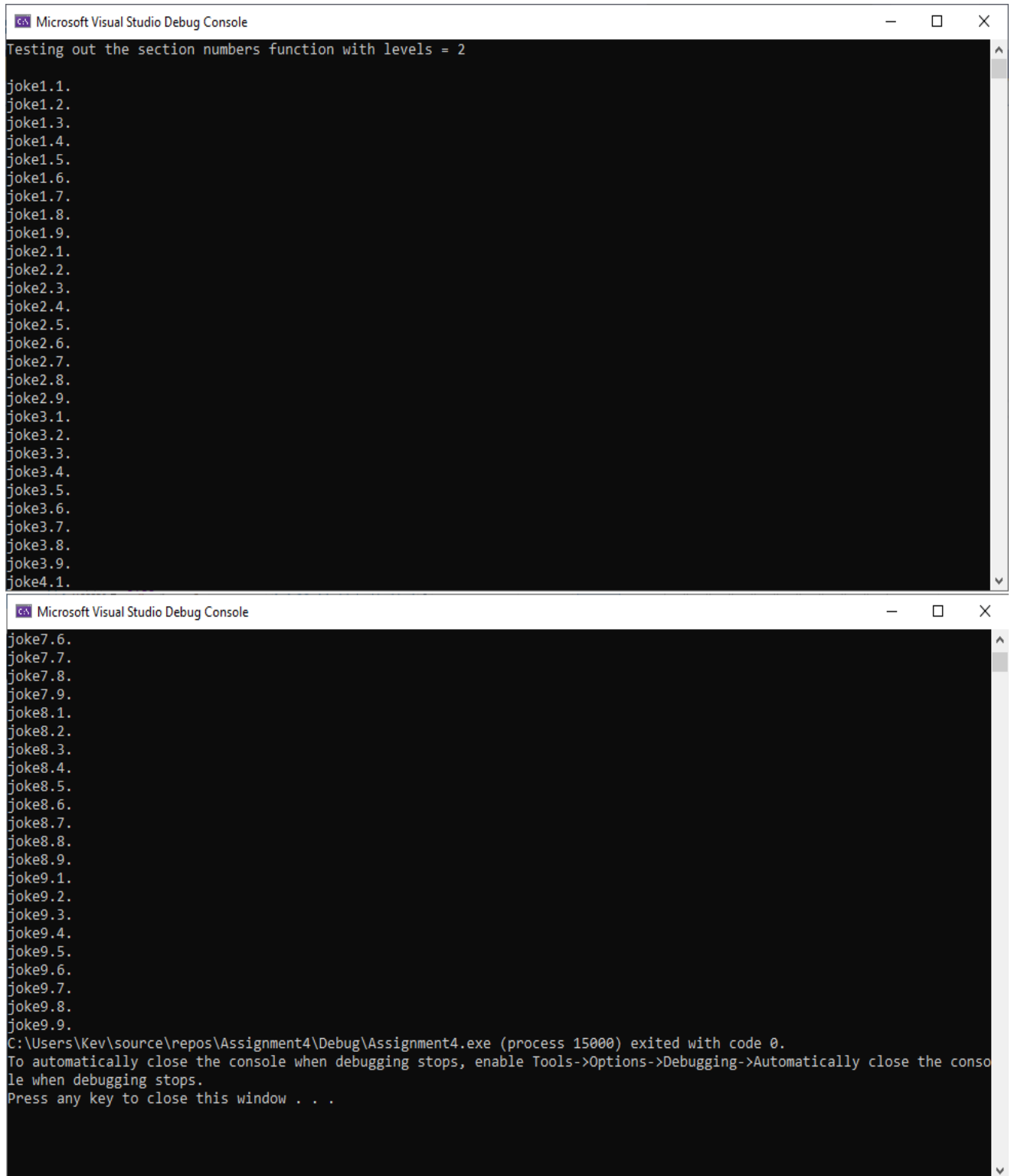
//Function to print out section numbers of prefix value
void numbers(std::ostream& outs, const std::string& prefix, unsigned int levels)
{
    std::string newString = prefix;

    if (levels == 0)
        outs << prefix;
    else
    {
        for (int j = 49; j < 58; j++) //uses char ascii values for 1-9
        {
            numbers(outs, newString + (char)j + '.' , levels - 1);

            if(j != 57 ) //Prints out new line unless it's reached the end!
                std::cout << "\n";
        }
    }
}
```

## Program Output - Screenshot

**\*\*Assignment4a.cpp running with levels =2 (not all #s shown)\*\***



The image displays two screenshots of the Microsoft Visual Studio Debug Console. The top screenshot shows the output of the 'section numbers' function for levels = 2, listing jokes from 1.1 to 4.1. The bottom screenshot shows jokes from 7.6 to 9.9, followed by a message indicating the program has exited with code 0 and instructions to close the console.

```
Microsoft Visual Studio Debug Console
Testing out the section numbers function with levels = 2
joke1.1.
joke1.2.
joke1.3.
joke1.4.
joke1.5.
joke1.6.
joke1.7.
joke1.8.
joke1.9.
joke2.1.
joke2.2.
joke2.3.
joke2.4.
joke2.5.
joke2.6.
joke2.7.
joke2.8.
joke2.9.
joke3.1.
joke3.2.
joke3.3.
joke3.4.
joke3.5.
joke3.6.
joke3.7.
joke3.8.
joke3.9.
joke4.1.

Microsoft Visual Studio Debug Console
joke7.6.
joke7.7.
joke7.8.
joke7.9.
joke8.1.
joke8.2.
joke8.3.
joke8.4.
joke8.5.
joke8.6.
joke8.7.
joke8.8.
joke8.9.
joke9.1.
joke9.2.
joke9.3.
joke9.4.
joke9.5.
joke9.6.
joke9.7.
joke9.8.
joke9.9.
C:\Users\Kev\source\repos\Assignment4\Debug\Assignment4.exe (process 15000) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

## Assignment 4b (Part 2) - Source Code:

```
// Assignment 4 - Part 2
// by: Kevin Nolan
//
// This program implements part 2 of assignment 4. It takes a value of power of 2 and
// index i and prints the *** pattern based on the inputs given using recursion. In
// this case it uses 2 recursive calls in order to create the appropriate display.

#include <iostream>

using namespace std;

void pattern(ostream& outs, unsigned int n, unsigned int i);

int main()
{
    cout << "Testing out the fractal pattern!! \n \n" << "values of n = 8, i =0 \n" ;

    ostream& os = cout;

    pattern(os, 8, 0);
}

// Precondition: n is a power of 2 greater than zero.
// Postcondition: The longest line of the pattern has
//                  n stars beginning in column i of the output.
// Base Case: The recursion stops if n == 0
void pattern(ostream& outs, unsigned int n, unsigned int i)
{
    if (n != 0)
    {
        pattern(outs, n / 2, i); //1st call starts printing ** at i

        for (int j = 0; j < i; j++)
            outs << ' ';

        for (int k = 0; k < n; k++)
            outs << "* ";

        cout << endl;

        pattern(outs, n / 2, i + n / 2); //2nd call to make ** go out further
    }
    else
        return;
}
```

### Program Output - Screenshot

```
**Assignment4b.cpp running with n=8, i=0 **
```

```
Microsoft Visual Studio Debug Console
Testing out the fractal pattern!!

values of n = 8, i =0

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*
* *
*

C:\Users\Kev\source\repos\Assignment4b\Debug\Assignment4b.exe (process 21400) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

```
**Assignment4b.cpp running with n=16, i=0 **
```

```
Microsoft Visual Studio Debug Console
```

Testing out the fractal pattern!!

values of n = 16, i =0

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```

C:\Users\Kev\source\repos\Assignment4b\Debug\Assignment4b.exe (process 796) exited with code 0.  
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging st