

BIL 102 – Computer Programming

HW 03

Last Submission Date: March 12, 2014 – 09:00

Notes:

1. Write only one C program for all parts of this homework. For each part write a separate function to perform the tasks of the part as explain below. In main function call these functions to test them.
2. Because your code may be tested automatically by using a test software, **strictly** obey defined I/O format in all inputs (from file or console) and file outputs and also tag declarations. You can (and should) inform user by console output in any reasonable format.

1. **(40 Pts)** In this part you will calculate the sinus of an angle using the Taylor expansion of the sinus function given below.

$$\sin(x) \approx x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \frac{x^{11}}{11!} + \dots$$

Note that, in the approximation above x must be given in radians, but your code will accept the angle value in degrees from the user. The more terms you used in the calculation above the more precision you get.

User Interface

In the given sequence, your program will:

- Take a letter from console which indicates the source of the future inputs:
 - ‘C’ or ‘c’ indicates console
 - ‘F’ or ‘f’ indicates a text file named “**Angle.txt**”
 - Anything else indicates an error and terminates the program
- Take the angle from the user defined source
- Take the number of terms to be used in the calculation from the user defined source
- Output the calculated sinus value both to
 - Console (in any format)
 - A text file named “**Sinus.txt**” (numeric value only in default precision, i.e. no output formatting)

Implementation Details

- Write a function with the following prototype to perform all operations (by calling other user defined functions) in this part.
int part1(void)
This function should return 0 normally and a non-zero value on errors (e.g. in the case user enters a negative value for number of terms)
- You are **not** allowed to:
 - Use math.h library
 - Use nested loops (one loop in another loop explicitly)
 - Make any calculations in part1() function
- Perform all I/O operations (from/to file or console) in part1() function, call other user defined functions for calculations.

2. **(60 Pts)** In this part you will write a function having the following prototype which draws a left-aligned tree (see Implementation Details part) with the following properties.

```
int drawTree(int numberOfTriangles, int truckHeight, int truckWidth, char ch)
```

numberOfTriangles: number of triangular shapes used in the tree

truckHeight: height of the truck part (in terms of characters)

truckWidht: width of the truck part (in terms of characters) and should be an odd number

ch: character used to draw the tree

This function should return number of 'ch' characters used in the tree normally and a negative error code on error.

Some sample calls are:

- `drawTree(3, 5, 3, 'x')` should return 44 and draw the following pattern

[illegible]

- `drawTree(2, 2, 1, 'O')` should return 15 and draw the following pattern

[illegible]

- `drawTree(-2, 5, 3, '*')` should return a negative error code
- `drawTree(3, 2, 2, '+')` should return a negative error code

Implementation Details

For this part you will write the function “drawTree” as described above. In the implementation of “drawTree” you will realize and use the following functions (you can define other functions as well), otherwise your code will not be graded:

- **int drawTriangleWithSpace(int height, int space, char ch)**

This function should draw an isosceles left-aligned triangle shifted right by space amount of characters and return the number of ch characters it prints normally and a negative error code on error.

height: height of the triangle

space: amount of shift

ch: character used to draw the shape

- `int drawRectangleWithSpace(int height, int width, int space, char ch)`

This function should draw a rectangle shifted right by space amount of characters and return the number of ch characters it prints.

height: height of the rectangle

width: width of the rectangle

space: amount of shift

ch: character used to draw the shape

Ex: following code should draw the following shape to console.

```
drawRectangleWithSpace(4, 2, 3, 'O');
```

```
drawTriangleWithSpace(3, 2, 'X');
```

[illegible]

When testing your code call `drawTree()` function from `main()`.

General:

1. Obey honor code principles.
2. **Read your homework carefully** and follow the directives about the I/O format (data file names, file formats, etc.) and submission format **strictly**. Violating any of these directives will be penalized.
3. Obey coding convention.
4. Do not forget to put the required **tags** in the main function.
5. Your submission should include the following file **and NOTHING MORE** (no data files, object files, etc):

HW03_<student_name>_<studentSirname>_<student number>.c

Do **NOT** compress the file you submit.

6. Do not use non-English characters in any part of your homework (in body, **file name**, etc.).
7. Deliver the printout of your work **until the last submission date**.