

ECE 71 – Engineering Computations in C
Test #2 – Professor Kriehn
Tuesday, November 26, 2013

'D' Problem – Homework #31

Write a program that prompts the user to enter a series of diameters and a height to calculate the volume of a parabolic cone. The equation for a parabolic cone is given by:

$$V = 2 \pi d^2 h / 15$$

where d is the diameter of the base, h is the height, and V is the volume of the parabolic cone.

Specifications:

Create a project called **HW31** in NetBeans and create a **hw31.c** source file. Make sure that the first line of **hw31.c** is: `/* homework 31 */`. Then prompt the user to enter the number of diameters that will be entered from the keyboard. Use the results to create two variable-length arrays: one for the diameter and a second for the volume. Then use a `for()` loop to scan in a diameter into the appropriate element of the diameter array. After prompting the user to enter a height, calculate the volume using another `for()` loop, store the result in the appropriate element of the volume array, and print the results in a table. Use the following variable names:

Variable and Array Names

int n – represents the number of diameters to be read in
float diameter[n] – stores the scanned diameters
float height – stores the scanned height
float volume[n] – stores the calculated volumes

Use **%6.2f** for the output specifier when printing out the diameters, height, and volumes. If you execute the program with the following underlined inputs, the results will be:

```
~> hw31.o
Enter the number of diameters: 3

Enter a cone diameter: 1
Enter a cone diameter: 2
Enter a cone diameter: 3

Enter a cone height: 4

Diameter Height Volume
1.00      4.00    1.68
2.00      4.00    6.70
3.00      4.00   15.08
```

When you have double-checked your work, show your code to the instructor before submitting your program to the grader program. Be sure to use the back page for your Algorithmic Development. This should include your I/O diagram and pseudocode used to solve the problem.

REMEMBER: You MUST use arrays to solve this problem!

'C' Problem – Homework #32

Highlight your code from **HW31**, and copy it using **Ctrl-C**. Then create a new project called **HW32**, and create a **hw32.c** source file. Then hit **Ctrl-V** to copy the old **hw31.c** code into **hw32.c**.

Edit the first line of **hw32.c** so that it is `/* homework 32 */`.

Specifications:

Change your program so that the calculations of the volumes occur within a function. Use the following function prototype:

```
void conversion(int n, float d[n], float h, float v[n]);
```

Function Prototype Parameters

int n – number of elements within the two arrays
float d[n] – stores the diameters
float h – stores the height
float v[n] – stores the volumes

The function should then use the input arguments to perform the volume calculations.

If you execute the program, the following information should be displayed:

```
~> hw32.o
Enter the number of diameters: 3

Enter a cone diameter: 1
Enter a cone diameter: 2
Enter a cone diameter: 3

Enter a cone height: 4

Diameter Height Volume
1.00      4.00    1.68
2.00      4.00    6.70
3.00      4.00   15.08
```

When you have double-checked your work, show your code to the instructor before submitting your program to the grader program. Be sure to use the back page for your Algorithmic Development. This should include your I/O diagram and pseudocode used to solve the problem.

REMEMBER: You MUST use a function to solve this test problem!

'B' Problem – Homework #33

Highlight your code from **HW32**, and copy it using **Ctrl-C**. Then create a new project called **HW33**, and create a **hw33.c** source file. Then hit **Ctrl-V** to copy the old **hw32.c** code into **hw33.c**.

Edit the first line of **hw33.c** so that it is `/* homework 33 */`.

Specifications:

Change your function so that it uses pointers as parameters instead of arrays. Use the following function prototype:

```
void conversion(int n, float *d, float *h, float *v);
```

Function Prototype Parameters

int n – number of elements within the two arrays
float *d – points to the start of the diameter array
float *h – points to the height
float *v – points to the start of the volume array

The function should then use the pointers **d**, **h**, and **v** to perform the volume calculations. Also, in the main function, define three new pointers:

Pointers in main function

float *dia – points to the start of the diameter array
float *hei – points to the height
float *vol – points to the start of the volume array

Use the pointers **dia**, **hei**, and **vol** in the main function to help scan in the values from the keyboard, as arguments to your **conversion()** function, and to help print your results to the screen. If you execute the program, the following information should be displayed:

```
~> hw33.o
Enter the number of diameters: 3

Enter a cone diameter: 1
Enter a cone diameter: 2
Enter a cone diameter: 3

Enter a cone height: 4

Diameter Height Volume
1.00 4.00 1.68
2.00 4.00 6.70
3.00 4.00 15.08
```

When you have double-checked your work, show your code to the instructor before submitting your program to the grader program. Be sure to use the back page for you Algorithmic Development. This should include your I/O diagram and pseudocode used to solve the problem.

REMEMBER: You MUST use pointers to solve this test problem!

'A' Problem – Homework #34

Highlight your code from **HW33**, and copy it using **Ctrl-C**. Then create a new project called **HW34**, and create a **hw34.c** source file. Then hit **Ctrl-V** to copy the old **hw33.c** code into **hw34.c**.

Edit the first line of **hw34.c** so that it is `/* homework 34 */`.

Specifications:

Change the program so that you print the results to a file called `"cone_volumes.txt"`. Define a constant called **FILENAME** that stores the string literal for the name of the file.

If you execute the program, the following information should be displayed:

```
~> hw33.o
Enter the number of diameters: 3

Enter a cone diameter: 1
Enter a cone diameter: 2
Enter a cone diameter: 3

Enter a cone height: 4

Printing results to file "cone_volumes.txt"

~> more cone_volumes.txt
Diameter Height Volume
  1.00    4.00    1.68
  2.00    4.00    6.70
  3.00    4.00   15.08
~>
```

When you have double-checked your work, show your code to the instructor before submitting your program to the grader program. Be sure to use the back page for you Algorithmic Development. This should include your I/O diagram and pseudocode used to solve the problem.

REMEMBER: You MUST use files to solve this test problem!