

**SEN-107 Fundamental Data Structures**  
**Assessment Activity SEN-107:00020**  
**Understanding and Using Recursion**  
*Last update: 16 January 2024*

## Assignment Instructions

Write a program that solves the problem described below. Test your program thoroughly, not only with the sample files provided but with other examples.

Follow the coding standards. If you violate the coding standards, this will lower your assessment score.

Submit your **C source code** only. Your source code must be a plain text file named ***descendants.c***. Do not submit code as a doc file, pdf file, IDE project, or anything else. I must be able to compile and run your code on my computer, without any warnings or errors.

## Finding and Printing Descendants

To do this assessment, you should start with Lab 3 (***matrilineal.c***). In that lab, you created a tree of mother-daughter relationships. The program had the following options:

### Matrilineal options:

- 1 - Add a woman to the tree
- 2 - Print the name of a woman's mother
- 3 - Print the names of all of a woman's daughters
- 4 - Print the names of all of a woman's sisters

For this assessment, first copy your code to a file called ***descendants.c***. Then add the following additional options:

- 5 - Find and print the longest chain of descendants
- 6 - Print all the descendants of some woman in the tree

(Change the option number of the exit option to 7, or 0.)

Given the input in the Lab 3 instructions, option 5 output would look like this:

**Longest chain of descendants: Julie -> Maria -> Jane**

Option 6 might look like this:

**Print whose descendants? Maria**  
**Maria's descendants are: Jane, Helen**

**Print whose descendants? Julie**  
**Maria's descendants are: Ann, Maria, Jane, Helen, Ruth**

For option 5, if there are multiple chains of descendants that have the same (maximum) length, you only need to print one of them. (However, if you can print all of them, that is even more impressive!)

On the next page you will find a sample tree that you can use for your testing. Build the tree step by step using option 1 repeatedly. At each step, try options 5 and 6.

This tree has a single longest chain of descendants: *Emma* → *Martha* → *Patty* → *Eliza* → *Vanessa* → *Dora*

However, if you build the tree except for Dora, there will be three longest chains of equal length. The second will be: *Emma* → *Jane* → *Jenny* → *Tina* → *Nancy*. The third will be: *Emma* → *Jane* → *Jenny* → *Tina* → *Kate*.

