CSci 1113: Introduction to C/C++
Programming for Scientists and Engineers
Homework 9
Spring 2018

Due Date: Thursday, April 26, 2018 before 11:55pm.

Instructions: This is an individual homework assignment. There are two problems worth 20 points each. Solve each problem below by yourself (unlike the labs, where you work collaboratively), and submit each solution as a separate C++ source code file.

Because all homework assignments are submitted and tested electronically, the following are important:
- You follow any naming conventions mentioned in the homework instructions.
- You submit the correct file(s) through Moodle by the due deadline.
- You follow the example input and output formats given in each problem description.
- Regardless of how or where you develop your solutions, your programs compile
   and execute on cselabs computers running the Linux operating system.

Problem A: Family tree (20 points)
For this part, you are building a family tree starting at you (the "base") and going to past generations. You should start yourself out without a predefined name (just say "Unknown" if no name has been given yet). From here you should repeatedly give the user the following options until they choose to quit:

- 'g' = give a name to the current person in the family tree. (You may assume names will be single words.) If they already have a name, it should replace the old one.
- 'm' = change the current person to the mother currently displayed
- 'd' = change the current person to the father currently displayed
- 'b' = go back to "you", the starting person of the tree (or the "base").
- 'q' = quit the program (without crashing or leaking memory).

Your code must contain the following:
1. A "person" class with:
    ○ A constructor
    ○ A destructor
    ○ Contains a person pointer to the mother
    ○ Contains a person pointer to the father
    ○ A string to hold the person's name
2. A "person" pointer to keep track of the current pointer

I strongly recommend you initialize your pointers to NULL, and use this to check and see if the pointer actually contain content. You should make the parents (both mother and father) of the current person when 'g' is selected to give a name. However, choosing 'g' should not erase your current parents if they already exist.   If a pointer does not actually point to a person, show their name as "???".

If you choose 'm' or 'd' to change to your mother or father, you should only change if the mother or father actually exists. If the pointer is not pointing to an object, you should stay at the current person.

You must ensure that all dynamic memory is properly deleted at the end of your program.

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Example 1 (user input is underlined):
You are currently at: Unknown
Your mom is: ???
Your dad is: ???
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
m
You are currently at: Unknown
Your mom is: ???
Your dad is: ???
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
g
What name (single word)?
Alice
You are currently at: Alice
Your mom is: Unknown
Your dad is: Unknown
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
m
You are currently at: Unknown
Your mom is: ???
Your dad is: ???
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
g
What name (single word)?
Betty
You are currently at: Betty
Your mom is: Unknown
Your dad is: Unknown
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
d
You are currently at: Unknown
Your mom is: ???
Your dad is: ???
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
b
You are currently at: Alice
Your mom is: Betty
Your dad is: Unknown
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
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to starting person, or (q)uit?
m
You are currently at: Betty
Your mom is: Unknown
Your dad is: Unknown
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
q
What name (single word)?
Charlotte
You are currently at: Charlotte
Your mom is: Unknown
Your dad is: Unknown
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
b
You are currently at: Alice
Your mom is: Charlotte
Your dad is: Unknown
Do you want to (g)ive a name, goto the (m)om, goto the (d)ad, (b)ack
to starting person, or (q)uit?
q
```

When you are done, name the source code file <username>_9A.cpp. Here you replace <username> with your U of M email address; for example, if your email address is smithx1234@umn.edu, your file should be named smithx1234_9A.cpp. Then submit your program using the Homework_9A submission link in Moodle. It is important that you follow the file naming conventions very carefully. For example, note your username should be all in lowercase, you should not include "@umn.edu", the file name should contain an underscore (not a dash), the 'A' in the "9A" part is upper case, the extension is .cpp, etc. Following rigorous naming conventions is something computer programmers often must do in "real life" programming, and so submitting your program with the correct name is part of doing this assignment correctly.

Problem B: Siblings (5 points **extra credit**)
Add siblings to your submission from part A. You can assume that there will be no more than 10 siblings. Assume the siblings share the same mother and father, so if you change a name for the mother of one sibling, it should reflect across all siblings (in fact, the family tree upwards should be identical for all siblings).

For this part, you need to add two more options to the list from part A:
- 'a' = add a sibling
- 'c' = to change to a different sibling by name. (You may assume all siblings/people will have unique names in the program.)

Otherwise, the menu contains all options from part A. Unlike part A, ask for the name of the current person before giving other options (this simplifies things). Again, your code cannot contain memory leaks. You should also be careful so that you do not crash or hang when the user presses 'q' to quit. (Hint: be careful of recursion.)

```
Example 1 (user input is underlined):
What name (single word)?
A
You are currently at: A
Your mom is: Unknown
Your dad is: Unknown
Your siblings are:
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
a
What name (single word)?
B
You are currently at: A
Your mom is: Unknown
Your dad is: Unknown
Your siblings are: B,
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
a
What name (single word)?
C
You are currently at: A
Your mom is: Unknown
Your dad is: Unknown
Your siblings are: B, C,
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
c
What name (single word)?
C
You are currently at: C
Your mom is: Unknown
Your dad is: Unknown
Your siblings are: A, B,
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
m
You are currently at: Unknown
Your mom is: ???
Your dad is: ???
Your siblings are:
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
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goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
g
What name (single word)?
Mommy
You are currently at: Mommy
Your mom is: Unknown
Your dad is: Unknown
Your siblings are:
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
b
You are currently at: A
Your mom is: Mommy
Your dad is: Unknown
Your siblings are: B, C,
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
m
You are currently at: Mommy
Your mom is: Unknown
Your dad is: Unknown
Your siblings are:
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
g
What name (single word)?
Mums
You are currently at: Mums
Your mom is: Unknown
Your dad is: Unknown
Your siblings are:
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
b
You are currently at: A
Your mom is: Mums
Your dad is: Unknown
Your siblings are: B, C,
Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
c
What name (single word)?
B
You are currently at: B
Your mom is: Mums
Your dad is: Unknown
Your siblings are: A, C,

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Do you want to (a)dd a sibling, (c)hange to a sibling, (g)ive a name,
goto the (m)om, goto the (d)ad, (b)ack to starting person, or (q)uit?
q
```

When you are done, name the source code file <username>_9B.cpp. Here you replace <username> with your U of M email address; for example, if your email address is smithx1234@umn.edu, your file should be named smithx1234_9B.cpp. Then submit your program using the Homework_9B submission link in Moodle. It is important that you follow the file naming conventions very carefully. For example, note your username should be all in lowercase, you should not include "@umn.edu", the file name should contain an underscore (not a dash), the 'B' in the "9B" part is upper case, the extension is .cpp, etc. Following rigorous naming conventions is something computer programmers often must do in "real life" programming, and so submitting your program with the correct name is part of doing this assignment correctly.