Binary Search Tree Joke Lab:

Due Fri, Apr 11 (150 pts)

We're coding an Unbalanced Binary Search Tree.

Work with a partner, or work alone. Both must turn in Project

Uses:

For anything in which we want to add, remove, and find relatively efficiently

E.g.,

- **Store Inventory** – to keep track of what has come in, what has been sold, how much is left, etc.
- **Phone Contacts** - Can have a tree that is sorted by phone numbers to find names, or (usually) stored by names to find phone numbers
- **3D game engines** - To determine which objects should be rendered in a 3D world (we store the "layer" the image is on – if it's a lower layer, it isn't rendered. If it's a top layer, it will be rendered)
- **Computer File systems** – there's a tree structure for how files are stored on you computer – on a PC it's more obvious than on a MAC.
- **Etc**.

Time Analysis:

WHEN BALANCED: Add, Remove, and Find can be done in **O(log n)**

Unbalanced: Add, Remove, and Find can end up being **O(n)**

NOTE:

This is one of two challenging labs. Please start early on this.

Instructions:

There are 4 classes and 1 main function, along with 2 text files of jokes. I placed the text files in my cmake-build-debug folder.

To Turn In:

A zipped file with:

- Main.cpp
- BSTJokes.cpp
- BSTJokes.h
- JokeArchive.cpp
- JokeArchive.h
- Person.cpp
- Person.h
- TNode.cpp
- TNode.h
- A text file with your output
- A link to a video showing your code running

/***/

PART 1 (37 pts total)

1) Main: don't touch.
2) JokeArchive.cpp and JokeArchive.h – don't need to touch , but:
   a. The constructor is where the test cases for remove are called. Comment them out until you write them.
   b. In ReadInFile(), the tree's add() method is called. Comment that out at first to make sure the ReadInFile method is successfully reading in from the JokesSmall.txt file. Once you know that is working, comment that line back in.
3) Person.cpp and Person.h:
   a. I'm giving you Person.cpp.
   b. (3 pts) You must write Person.h
      i. Make sure you make the TNode class and the BSTJokes class friends with the Person class.
4) TNode.cpp and TNode.h
   a. I'm giving you TNode.h
   b. You must write TNode.cpp
      i. (3 pt) The empty constructor initializes everything to NULL and height to 0
      ii. (3 pt) The Constructor with (const string l, const string f, const string m, const string joke) makes a new person on the heap (l is last, f is first, m is mi (for middle initial) and j is joke) Set the height to 1
      iii. (3 pt) The printNode prints the height first and then calls person's printPerson() method
      iv. (3 pt) The destructor JUST deletes the person field (THAT'S IT!)
5) BSTJokes.cpp and BSTJokes.h:
   a. I'm giving you BSTJokes.h
   b. You're writing many of the methods in BSTJokes.cpp. This is the heart of this project.
   c. Methods:
      i. Constructors: I'm giving you
      ii. (8 pts) Add() – you write:
         1. This creates and adds a new node to the tree.
         2. It alphabetizes by the last name, then (if last names are the same) the first name, then (if first name is the same) by the middle name.
         3. DON'T GO TO A NULL NODE.
            a. In other words, if the new node belongs to the left of the current node, and the current node's left pointer points to a NULL node, add the new node to the left of the current node. Don't loop to the left and then try to add the new node.
      iii. PrintTreeIO() and (4 pts) PrintTreeIO(TNode *tmp):
         1. I'm giving you PrintTreeIO(). This method calls PrintTreeIO(TNode *tmp) with the root nood.
         2. You're writing PrintTreeIO(TNode *tmp). It is an in-order traversal of the tree. Use the printNode method associated with TNode class to print a node

/**/

/* TESTING Part 1 (correct output – 10 pts) */

/**/

Once you've got the add() method and the printTreeIO() methods working, test to see if your code is working so far. Note that all the heights should be 1 so far.

I've included the output for this below:

/***/

PART 2 (18 pts total)

(Still editing BSTJokes.cpp)

1) (8 pts) Write setHeight(TNode *tmp)
   a. This node takes as input a node and sets its height. Remember from lecture that the height of a node with no children is 1, The height of every other node is the the maximum height of the left child and the right child, then add 1. So if the left child has a height of 3 and the right child has a height of 6, the height of the node will be 7 (6+1)
   b. Also note that if you insert a node, THE ONLY nodes whose height might change are direct ancestors (parent, grandparent, great-grandparent... root). NOTHING ELSE will change height
2) Once you have the setHeight method written, you must call it from the add function every time you add a node to the tree.
3) For this, you don't need to modify JokeArchive's constructor. The output will automatically be updated because the add method is calling the setHeights method.

/***/
/* TESTING Part 2 (10 pts for getting correct output */
/***/

You should get the following output:

Printing In Order:

1:   Baynard, Mandy, D: "An electron is speeding down the highway when a police officer pulls him over. The officer walks up to the car and asks, ""do you know how fast you were going."" The electron replies, ""Yeah, but now I'm lost."""

2:   Campbell, John, P: How do you get a tissue to dance? > Put a little boogie in it

4:   Dove, Kacey, J: Why couldn't the sailor learn the alphabet? Because he always got lost at 'C.'

1:   Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"

3:   Jose, Angel, A: how do robots eat pizza?..... one byte at a time

1:   Patel, Haiya, X: "The broom swept them off their feet, but it was the invention of the fan that really blew them away. The vacuum cleaner sucked though"

2:   Smith, Cole, T: What concert costs 45 cents? 50 Cent featuring Nickleback.

5:   Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

1:   Smith, Mary, P: "An opinion without pi is just an onion"

2:   Vanyi, James, T: What do elves learn in school? The elphabet

1:   Walia, Nihaal, S: What do you call a magician who has lost his magic? Ian.

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/******************************************************************************/
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PART 3 (16 pts total)

(Still editing BSTJokes.cpp- this part will be short)

4) PrintTreePre() and (4 pts) PrintTreePre(TNode *tmp):
   a. I'm giving you PrintTreePre(). It calls PrintTreePre(TNode *tmp) with the root node
   b. This should be a pre-order traversal using the printNode method
5) PrintTreePost() and (4 pts) PrintTreePost(TNode *tmp):
   a. I'm giving you PrintTreePost(). It calls PrintTreePost(TNode *tmp) with the root node
   b. This should be a post-order traversal using the printNode method
6) In JokeArchive.cpp modify the constructor by commenting in Part 3

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/****************************************/
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/* TESTING Part 3 (8 pts for correct output */

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/****************************************/
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You should get the following output:

Printing PreOrder:

5:   Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

4:   Dove, Kacey, J: Why couldn't the sailor learn the alphabet? Because he always got lost at 'C.'

2:   Campbell, John, P: How do you get a tissue to dance? > Put a little boogie in it

1:   Baynard, Mandy, D: "An electron is speeding down the highway when a police officer pulls him over. The officer walks up to the car and asks, ""do you know how fast you were going."" The electron replies, ""Yeah, but now I'm lost."""

3:   Jose, Angel, A: how do robots eat pizza?..... one byte at a time

1:   Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"

2:   Smith, Cole, T: What concert costs 45 cents? 50 Cent featuring Nickleback.

1:   Patel, Haiya, X: "The broom swept them off their feet, but it was the invention of the fan that really blew them away. The vacuum cleaner sucked though"

2:   Vanyi, James, T: What do elves learn in school? The elphabet

1:   Smith, Mary, P: "An opinion without pi is just an onion"

1:   Walia, Nihaal, S: What do you call a magician who has lost his magic? Ian.

Printing Post Order:

1:   Baynard, Mandy, D: "An electron is speeding down the highway when a police officer pulls him over. The officer walks up to the car and asks, ""do you know how fast you were going."" The electron replies, ""Yeah, but now I'm lost."""

2:   Campbell, John, P: How do you get a tissue to dance? > Put a little boogie in it

1:   Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"

1:   Patel, Haiya, X: "The broom swept them off their feet, but it was the invention of the fan that really blew them away. The vacuum cleaner sucked though"

2:   Smith, Cole, T: What concert costs 45 cents? 50 Cent featuring Nickleback.

3:   Jose, Angel, A: how do robots eat pizza?..... one byte at a time

4:   Dove, Kacey, J: Why couldn't the sailor learn the alphabet? Because he always got lost at 'C.'

1:   Smith, Mary, P: "An opinion without pi is just an onion"

1:   Walia, Nihaal, S: What do you call a magician who has lost his magic? Ian.

2:   Vanyi, James, T: What do elves learn in school? The elphabet

5:   Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

/***/

PART 4 (11 pts total)

(Still editing BSTJokes.cpp)

1) (5 pts) Write the method Find(string l, string f, string m)
   This method should be similar to Add(). It takes the last ,first, and middle initial and finds the associated node in the tree.

   It should return the found node, and NULL if the node is not in the tree.

2) In JokeArchive.cpp modify the constructor by commenting in Part 2

/***/

/***/

You should get the following output:

****

Testing Find

1:   Smith, Mary, P: "An opinion without pi is just an onion"

5:   Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

/***/

PART 5 (23 pts total)

(Still editing BSTJokes.cpp)

3) (5 pts) Write void Remove(string l, string f, string m)). This method finds the node holding l, f, m (which is why you wrote find in step 4) and then determines whether the node to be removed has 0 kids, one kid, or two kids. For now, only call the RemoveNoKids method (if the node to be removed has 0 kids or call the RemoveOneKid method if the node to be removed has 1 kid. The RemoveTwoKids method will be part6, so you can't test it yet.

4) (5 pts)Write void RemoveNoKids(TNode *tmp) method. It takes as input and removes a node with no children. Note that you must update the parent (and grandparent, etc.) of this node's height by calling setHeight.

5) (5 pts) Write void RemoveOneKid(TNode *tmp) method. It takes as input and removes a node with one child. Note that you must update the parent (and grandparent, etc.) of this node's height by calling setHeight.

6) Update JokeArchive.cpp's constructor by uncommenting part 5

/***/

/* TESTING Part 5 (8 pts correct output) */

/***/

You should get the following output:

****

Removing a node with no kids:

Deleting: Patel, Haiya, X: "The broom swept them off their feet, but it was the invention of the fan that really blew them away. The vacuum cleaner sucked though"

Printing In Order:

PART 6 (21 pts total)

(Still editing BSTJokes.cpp)

1) (8 pts) Write void RemoveTwoKids(TNode *tmp). This method removes a node with 2 kids by first finding the replacement node (calling findReplacement, to be written next)
   Note that this method is a bit complicated because there are gotchas
   - You must replace the data in the node to be removed with the replacement node's data. BUT. You will be deleting that replacement node. So you need to make sure you copy over the data before you delete it.
     o The easiest way to do this is to create a new person (on the heap) with the data from the replacing node's person data.
     o Then delete person from the node to be removed
     o Replace that person with the one you just created
   - NOW
     o You must remove from the tree the replacement node.
     o That node has either 0 or one child.
     o Call the appropriate remove method (this will delete that node)

   This isn't the only way to do this, but it is certainly one of the easier ways to do it.

2) (5 pts) Write TNode *findReplacement(TNode *tmp) method.
   It takes as input the node to be replaced and find the node whose date is closest to its data.

For our project, we're using the leftmost descendent of the right subtree.
Once you find that node, return it.
3) Modify Remove method to call the RemoveTwoKids method if the node to be removed has 2 kids.
4) Update JokeArchive.cpp's constructor by uncommenting part 6

/***/

/* TESTING Part 6 (8 pts for correct output) */

/***/

You should get the following output:

****

Deleting: Dove, Kacey, J: Why couldn't the sailor learn the alphabet? Because he always got lost at 'C.'

In R2Kids: Data moving up (Not really being deleted): Removing a node with no kids:

Deleting: Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"

Printing In Order:

1: Baynard, Mandy, D: "An electron is speeding down the highway when a police officer pulls him over. The officer walks up to the car and asks, ""do you know how fast you were going."" The electron replies, ""Yeah, but now I'm lost."""

3: Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"

2: Jose, Angel, A: how do robots eat pizza?..... one byte at a time

1: Smith, Cole, T: What concert costs 45 cents? 50 Cent featuring Nickleback.

4: Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

1: Smith, Mary, P: "An opinion without pi is just an onion"

2: Vanyi, James, T: What do elves learn in school? The elphabet

1: Walia, Nihaal, S: What do you call a magician who has lost his magic? Ian.

/***/

PART 7 (24 pts total)

(Still editing BSTJokes.cpp – last step!)

5) I'm giving you the BSTJokes Destructor. BUT
6) (4 pts) It calls a clearTree(TNode *tmp) method. ClearTree does a post order traversal, but instead of printing, it deletes the nodes from the tree.
7) Once you have this working, comment out Part 7. For this you'll be deleting the small tree and reading in the full Jokes2.txt file.
8) Now you should get a menu.
   a. Find yourself.
   b. Remove yourself
   c. Print the tree in order
   d. Add yourself back
   e. Print the tree in order.
   For testing purposes, I found, removed, and added Mary M Smith. Below is the output from this:

/***/

/* TESTING Part 7 (20 pts for getting correct output) */

/**/

You should get the following output:

****

Deleting: Baynard, Mandy, D: "An electron is speeding down the highway when a police officer pulls him over. The officer walks up to the car and asks, ""do you know how fast you were going."" The electron replies, ""Yeah, but now I'm lost." ""Deleting: Smith, Cole, T: What concert costs 45 cents? 50 Cent featuring Nickleback.
Deleting: Jose, Angel, A: how do robots eat pizza?..... one byte at a time
Deleting: Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"
Deleting: Smith, Mary, P: "An opinion without pi is just an onion"
Deleting: Walia, Nihaal, S: What do you call a magician who has lost his magic? Ian.
Deleting: Vanyi, James, T: What do elves learn in school? The elphabet
Deleting: Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

_____
__   Tree Deleted   __
_____

Printing In Order:
5:   Abu_Hawzah, Alaa, A: Grandma's house is like the Bermuda Triangle û things just disappear in there
1:   Almaymony, Abdulrahman, M: Why did the old man fall in the well? Because he couldnÆt see that well :)
2:   Anderson, Darrin, W: Why can't you hear a pterodactyl going to the bathroom? Because the P is silent.
3:   Arpaia, Justin, A: Two goldfish are in a tank. One says to the other ôDo you know how to drive this thing?ö
1:   Bajoria, Aditya, X: Why did the scarecrow win an award? -- Because he was outstanding in his field! ????
2:   Baker, Jacob, A: Why did the chicken cross the road? To get to the other side.
1:   Bao, Mianmian, X: Why did the coffee file a police report? It got mugged!
4:   Bartolotta, Michelle, J: "My ex wife still misses me, but her aim is getting better"
6:   Baynard, Mandy, D: "An electron is speeding down the highway when a police officer pulls him over. The officer walks up to the car and asks, ""do you know how fast you were going."" The electron replies, ""Yeah, but now I'm lost.""
1:   Black, Nathaniel, C: Why did the scarecrow win an award? Because he was outstanding in his field!
2:   Blume, Owen, M: What kind of fish does a knight like? A swordfish
3:   Boomer, Jermaine, E: "Knock, Knock; Who's there; Interrupting cow; Interrupt-; MOOOOO"
1:   Bourgeon, Gabriel, T: Why shouldn't you use a broken pencil? Because it's point-less.
2:   Bregvadze, Alexander, X: "Sherlock Holmes and his sidekick Watson decide to go camping one night, right? So they make a camp-fire, have a bottle of wine, roast some marshmallows. The usual. Then they bed down for the night. Later that night, Holmes wakes up and wakes up Watson. 'Watson, he says, 'look up at the sky and tell me what you see.' And Watson says, 'I can see the stars.' 'And what does that tell you?' Holmes asks. And Watson starts listing things, like that there are millions of stars, and how a clear sky means good weather for the next day, and how the majesty of the cosmos is proof of a powerful God. When he's done, he turns to Holmes and says 'What does the night sky tell you, Holmes?' And Holmes says, 'That some bastard has stolen our tent!'"""
8:   Broskey, Jules, N: "a girl with a gluten allergy arrives at her favorite sandwich shop. As she puts the car in park, what does she say to her family? Lettuce roll"
2:   Burchell, Paige, C: How can you tell the average weather on top of a mountain? You climate!
1:   Campbell, John, P: How do you get a tissue to dance? > Put a little boogie in it
6:   Carrillo, Soto, Julio: C
2:   Castle, Lucas, R: What has four wheels and flies? A GARBAGE TRUCK
1:   Castro, Nathan, A: Why can't you hear a pterodactyl in the bathroom? Because it has a silent pee.
4:   Casuga, Cedrick, L: "What do you call a can opener that cant open anything, a canÆt opener"
3:   Chacko, Jacob, A: Why did the math book look sad? Because it had too many problems
2:   Chen, Zijun, X: Why did the scarecrow win an award? Because he was outstanding in his field!
1:   Chioma, Courtney, U: Why is the flower so friendly? Because it always buds into conversations!
5:   Chowdhury, Salsavil, X: I keep telling Grandma to get a hearing aid. But she won't listen :(
1:   Christianson, Colin, H: Why did the scarecrow win an award? Because he was outstanding in his field!
2:   Clarke, Olivia, M: Why did the golfer bring an extra pair of pants? In case he got a hole in one!
3:   Conway, Austin, R: What runs but never goes anywhere? A refrigerator.
7:   Croce, Jake, A: "A Spanish magician says he will disappear on the count of 3. He says ""uno, dos..."" poof. He disappeared without a tres."
12:   Daluz, Raphael, M: Why is 6 afraid of 7? Because 7 8 9.
2:   Das, Sanjna, X: What does a telephone give its girlfriend? A ringggggggg
1:   Devine, Patricia, J: why did grandma put wheels on her rocking chair? because she wanted to rock and roll
3:   Dokus, Gabriel, P: What do you call a cow with no legs? Ground beef.
4:   Dortu, Avery, C: What did the janitor say when he jumped out of the closet? Supplies!
1:   Dove, Kacey, J: Why couldn't the sailor learn the alphabet? Because he always got lost at 'C.'
3:   Effiong, Miracle, V: What do grandmaÆs teeth and the stars have in common? They both come out at night.

2:   Elioff, Louis, W: "When you look really closely, all mirrors look like eyeballs"
1:   Ellis, Isaac, C: Why don't skeletons like to fight? They don't have any guts!
10:   England, Daniel, H: "A man walks into a bar. A second man walks into a bar. A third bar walks into a man. The man, unsure of what has happened looks up to see another man."
4:   Fadadu, Nova, V: "Some one exclaims, "look a flock of cows!" The person next to them corrects them, "Herd of cows". They respond, "Yeah, I have, there's a flock of them over there.""
1:   Fang, Yuang, Y: Why did the scarecrow win an award? Because he was outstanding in his field!
2:   Farraj, Nicholas, J: Why did the C++ programmer break up with his girlfriend? He couldn't handle the arguments!
3:   Foster, Jillian, M: Where do you store bad jokes? The bad-da base.
9:   Garcia, Izabelle, G: "A Spanish magician told everyone he would disappear. He said, "Uno, dos...." Then disappeared without a tres."
3:   Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"
1:   Guy, Ian, C: "Yo mama so nasty, she gave my computer a virus."
2:   Hayward, Nathan, R: Why was 6 scared of 7? Because 7 8 9. This is a horrible joke and not funny at all but it's the first thing I thought of.
4:   Infantes, Luis, J: "If a King sleeps on a king mattress, and a Queen sleeps on a queen mattress, what does a Prince sleep on? An heir mattress"
5:   Jacovetti, Steven, A: How do you make a tissue dance? You put a little boogie in it!
6:   Jose, Angel, A: how do robots eat pizza?..... one byte at a time
4:   Joshi, Aarna, X: How does a penguin build a house? It glues the house together (like igloo get it haha)
2:   Karve, Kiera, E: Want to hear a joke about the roof? The first one is on the house.
1:   Krupiarz, David, P: Why was 6 afraid of 7? Because 789
3:   Lawson, George, W: My ex-wife still misses me... BUT HER AIM IS GETTIN BETTER!
2:   Le, Tom, M: What did 50 Cent do when he was hungry? 58!
1:   Manzari, Gabi, X: "When does a joke become a ""dad"" joke? When it becomes apparent"
7:   Mazabras, Matthew, S: How did the crab cross the road? It sidewalked
3:   McCormack, Matthew, T: "When an inuit goes fishing, he doesn't look for the fish, he looks for the blue heron."
1:   Mekhai, Waples, D: Why was the office of cantaloupes so glum? Because they were melon-colleagues.
2:   Meredith, Benjamin, A: Why do Java developers wear glasses? Because they can't C!
1:   Mose, Ethan, E: "Why was cinderella so bad at soccer, She kept running away from the ball"
4:   Movva, Rishi, X: I love college
8:   Nair, Shreyas, H: GOT NONE
1:   Natale, Ava, N: What is a computer virus? A terminal illness
11:   Nguyen, Tien, L: """"are you serious?"""
1:   Nittoly, Anthony, J: I tried to catch fog yesterday. I mist.
2:   OBrien, Aidan, P: How do you comfort a bug in your code? You console it
7:   Pastino, Giovanni, N: Do you guys ever accidentally put your kids in the oven and drive the turkey to school?
1:   Patel, Haiya, X: "The broom swept them off their feet, but it was the invention of the fan that really blew them away. The vacuum cleaner sucked though"
3:   Patel, Romir, M: "I told my grandma I felt invisible. She patted my hand and said, ""Nonsense, dear... I've been ignoring you just fine!"""
2:   Peleg, Tamar, X: "This is a nerdy one.... The larger the sample size, the better the average..... or the N justifies the means"
1:   Pie, Colin, A: What is brown and sticky? A STICK! (haha)
4:   Pillay, Tiyaan, X: How does the ocean say hello? It waves!
6:   Pizzurro, Victoria, X: How do you get a tissue to dance? You put a lil boogie in it!
2:   Romeo, Stephen, M: Why did the scarecrow win an award? Because he was outstanding in his field!
1:   Roze, Onoriode, O: If someone says they're alright, say, "no you're all left".
3:   Schmidt, Ryan, P: Why did the monkey fall out of the tree? Because it was dead!
4:   Scrimenti, Brandon, R: Where does a polar bear keep his money? A Snow Bank!
5:   Seidel, Kristopher, R: "What did the big flower say to the little flower? - ""Hey Bud!"" i -"
8:   Sieglen, Brennan, P: "A Pope, a chair, and a water bottle walk into a bar. The Pope says ""I'll have the water!"""

2:   Silbaugh, Atticus, T: What did the banana say to his crush? I find you very a peeling
1:   Slonacher, Brendan, G: Why did the quark visit the psychiatrist? It had too many unresolved issues with its spin and could not determine its position in
3:   Smith, Cole, T: What concert costs 45 cents? 50 Cent featuring Nickleback.
2:   Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!
1:   Sohn, Alexander, I: Why did the chicken cross the road? To get to the golden arches
4:   Steeves, Joseph, A: How does the man on the moon cut his hair? Eclipse it.
7:   Syed, Aoun, A: How do you know if a vampire is unwell? They be coffin
3:   Szydlow, Emma, M: What do you call a pig that practices karate? A pork chop!
1:   Tabaco, Chloe-Erika, B: Why did the AI break up with its chatbot girlfriend? Because it felt like their conversations were too scripted!
2:   Tapel, Daryl, K: Why did scarecrow win an award? Because he was OUTSTANDING in his field!
6:   Taylor, William, H: How does a mathematician pick their nose? They work it out with a pencil.

1:   Tran, Ken, W: Why did Grandma sit on the clock? Because she wanted to be on time!
2:   Tymofyeyeva, Tatiana, E: Why do plants hate math? It gives them square roots.
3:   Vanyi, James, T: What do elves learn in school? The elphabet
1:   Walia, Nihaal, S: What do you call a magician who has lost his magic? Ian.
4:   Wang, Alexander, X: "My cat saw me knocked over the plant on the kitchen, to show my cat that law applies to every one, I have to spray myself with the watergun."
3:   Winters, Carson, R: Why can't you trust stairs? They're always up to something!
1:   Yang, Hanmin, X: Why was the plum sad? because it was feeling plum-glum.
2:   Yenugu, Shriya, X: Why do programmers prefer dark mode? Because the light attracts too many bugs!
5:   Zhang, Wenzhen, X: knock knock whoÆs there CMU CMU who? CMUDisJoke

_____
Choose Option:
 f   Find Student Info
 a   Add a student
 r   remove a student
 p   print tree
 q   quit

_____
f

Enter Last:
Smith

Enter First:
Mary

Enter Middle Initial:
M

2:   Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

_____
Choose Option:
 f   Find Student Info
 a   Add a student
 r   remove a student
 p   print tree
 q   quit

_____
r

Enter Last:
Smith

Enter First:
Mary

Enter Middle Initial:
M

Removing a node with one kid:
Deleting: Smith, Mary, M: What do you call 8 hobbits? A Hobbyte!

_____
Choose Option:
 f   Find Student Info
 a   Add a student
 r   remove a student
 p   print tree
 q   quit

_____
p

Choose a for pre, b for in, or c for post-orderb

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*********** Printing Tree In Order *************

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Printing In Order:
5:   Abu_Hawzah, Alaa, A: Grandma's house is like the Bermuda Triangle û things just disappear in there
1:   Almaymony, Abdulrahman, M: Why did the old man fall in the well? Because he couldnÆt see that well :)
2:   Anderson, Darrin, W: Why can't you hear a pterodactyl going to the bathroom? Because the P is silent.
3:   Arpaia, Justin, A: Two goldfish are in a tank. One says to the other ôDo you know how to drive this thing?ö
1:   Bajoria, Aditya, X: Why did the scarecrow win an award? -- Because he was outstanding in his field! ????
2:   Baker, Jacob, A: Why did the chicken cross the road? To get to the other side.
1:   Bao, Mianmian, X: Why did the coffee file a police report? It got mugged!
4:   Bartolotta, Michelle, J: "My ex wife still misses me, but her aim is getting better"
6:   Baynard, Mandy, D: "An electron is speeding down the highway when a police officer pulls him over. The officer wal
ks up to the car and asks, ""do you know how fast you were going."" The electron replies, ""Yeah, but now I'm lost."""
1:   Black, Nathaniel, C: Why did the scarecrow win an award? Because he was outstanding in his field!
2:   Blume, Owen, M: What kind of fish does a knight like? A swordfish
3:   Boomer, Jermaine, E: "Knock, Knock; Who's there; Interrupting cow; Interrupt-; MOOOOO"
1:   Bourgeon, Gabriel, T: Why shouldn't you use a broken pencil? Because it's point-less.
2:   Bregvadze, Alexander, X: "Sherlock Holmes and his sidekick Watson decide to go camping one night, right? So they m
ake a camp-fire, have a bottle of wine, roast some marshmallows. The usual. Then they bed down for the night. Later that
 night, Holmes wakes up and wakes up Watson. 'Watson, he says, 'look up at the sky and tell me what you see.' And Watson
 says, 'I can see the stars.' 'And what does that tell you?' Holmes asks. And Watson starts listing things, like that th
ere are millions of stars, and how a clear sky means good weather for the next day, and how the majesty of the cosmos is
 proof of a powerful God. When he's done, he turns to Holmes and says 'What does the night sky tell you, Holmes?' And Ho
lmes says, 'That some bastard has stolen our tent!'"""
8:   Broskey, Jules, N: "a girl with a gluten allergy arrives at her favorite sandwich shop. As she puts the car in par
k, what does she say to her family? Lettuce roll"
2:   Burchell, Paige, C: How can you tell the average weather on top of a mountain? You climate!
1:   Campbell, John, P: How do you get a tissue to dance? > Put a little boogie in it
6:   Carrillo, Soto, Julio: C
2:   Castle, Lucas, R: What has four wheels and flies? A GARBAGE TRUCK
1:   Castro, Nathan, A: Why can't you hear a pterodactyl in the bathroom? Because it has a silent pee.
4:   Casuga, Cedrick, L: "What do you call a can opener that cant open anything, a canÆt opener"
3:   Chacko, Jacob, A: Why did the math book look sad? Because it had too many problems
2:   Chen, Zijun, X: Why did the scarecrow win an award? Because he was outstanding in his field!
1:   Chioma, Courtney, U: Why is the flower so friendly? Because it always buds into conversations!
5:   Chowdhury, Salsavil, X: I keep telling Grandma to get a hearing aid. But she won't listen :(
1:   Christianson, Colin, H: Why did the scarecrow win an award? Because he was outstanding in his field!
2:   Clarke, Olivia, M: Why did the golfer bring an extra pair of pants? In case he got a hole in one!
3:   Conway, Austin, R: What runs but never goes anywhere? A refrigerator.
7:   Croce, Jake, A: "A Spanish magician says he will disappear on the count of 3. He says ""uno, dos…"" poof. He dis
appeared without a tres."
12:   Daluz, Raphael, M: Why is 6 afraid of 7? Because 7 8 9.
2:   Das, Sanjna, X: What does a telephone give its girlfriend? A ringgggggg
1:   Devine, Patricia, J: why did grandma put wheels on her rocking chair? because she wanted to rock and roll
3:   Dokus, Gabriel, P: What do you call a cow with no legs? Ground beef.
4:   Dortu, Avery, C: What did the janitor say when he jumped out of the closet? Supplies!
1:   Dove, Kacey, J: Why couldn't the sailor learn the alphabet? Because he always got lost at 'C.'
3:   Effiong, Miracle, V: What do grandmaÆs teeth and the stars have in common? They both come out at night.
2:   Elioff, Louis, W: "When you look really closely, all mirrors look like eyeballs"
1:   Ellis, Isaac, C: Why don't skeletons like to fight? They don't have any guts!
10:   England, Daniel, H: "A man walks into a bar. A second man walks into a bar. A third bar walks into a man. The man
, unsure of what has happened looks up to see another man."
4:   Fadadu, Nova, V: "Some one exclaims, "look a flock of cows!" The person next to them corrects them, "Herd of cows"
. They respond, "Yeah, I have, there's a flock of them over there.""
1:   Fang, Yuang, Y: Why did the scarecrow win an award? Because he was outstanding in his field!
2:   Farraj, Nicholas, J: Why did the C++ programmer break up with his girlfriend? He couldn't handle the arguments!
3:   Foster, Jillian, M: Where do you store bad jokes? The bad-da base.
9:   Garcia, Izabelle, G: "A Spanish magician told everyone he would disappear. He said, "Uno, dos…." Then disappeare

d without a tres."
3:   Goldring, Ariel, M: "There are 10 types of people, those who understand binary, and those who don't"
1:   Guy, Ian, C: "Yo mama so nasty, she gave my computer a virus."
2:   Hayward, Nathan, R: Why was 6 scared of 7? Because 7 8 9. This is a horrible joke and not funny at all but it's the first thing I thought of.
4:   Infantes, Luis, J: "If a King sleeps on a king mattress, and a Queen sleeps on a queen mattress, what does a Prince sleep on? An heir mattress"
5:   Jacovetti, Steven, A: How do you make a tissue dance? You put a little boogie in it!
6:   Jose, Angel, A: how do robots eat pizza?..... one byte at a time
4:   Joshi, Aarna, X: How does a penguin build a house? It glues the house together (like igloo get it haha)
2:   Karve, Kiera, E: Want to hear a joke about the roof? The first one is on the house.
1:   Krupiarz, David, P: Why was 6 afraid of 7? Because 789
3:   Lawson, George, W: My ex-wife still misses me... BUT HER AIM IS GETTIN BETTER!
2:   Le, Tom, M: What did 50 Cent do when he was hungry? 58!
1:   Manzari, Gabi, X: "When does a joke become a ""dad"" joke? When it becomes apparent"
7:   Mazabras, Matthew, S: How did the crab cross the road? It sidewalked
3:   McCormack, Matthew, T: "When an inuit goes fishing, he doesn't look for the fish, he looks for the blue heron."
1:   Mekhai, Waples, D: Why was the office of cantaloupes so glum? Because they were melon-colleagues.
2:   Meredith, Benjamin, A: Why do Java developers wear glasses? Because they can't C!
1:   Mose, Ethan, E: "Why was cinderella so bad at soccer, She kept running away from the ball"
4:   Movva, Rishi, X: I love college
8:   Nair, Shreyas, H: GOT NONE
1:   Natale, Ava, N: What is a computer virus? A terminal illness
11:   Nguyen, Tien, L: """"are you serious?""""
1:   Nittoly, Anthony, J: I tried to catch fog yesterday. I mist.
2:   OBrien, Aidan, P: How do you comfort a bug in your code? You console it
7:   Pastino, Giovanni, N: Do you guys ever accidentally put your kids in the oven and drive the turkey to school?
1:   Patel, Haiya, X: "The broom swept them off their feet, but it was the invention of the fan that really blew them away. The vacuum cleaner sucked though"
3:   Patel, Romir, M: "I told my grandma I felt invisible. She patted my hand and said, ""Nonsense, dear... I've been ignoring you just fine!"""
2:   Peleg, Tamar, X: "This is a nerdy one.... The larger the sample size, the better the average..... or the N justifies the means"
1:   Pie, Colin, A: What is brown and sticky? A STICK! (haha)
4:   Pillay, Tiyaan, X: How does the ocean say hello? It waves!
6:   Pizzurro, Victoria, X: How do you get a tissue to dance? You put a lil boogie in it!
2:   Romeo, Stephen, M: Why did the scarecrow win an award? Because he was outstanding in his field!
1:   Roze, Onoriode, O: If someone says they're alright, say, "no you're all left".
3:   Schmidt, Ryan, P: Why did the monkey fall out of the tree? Because it was dead!
4:   Scrimenti, Brandon, R: Where does a polar bear keep his money? A Snow Bank!
5:   Seidel, Kristopher, R: "What did the big flower say to the little flower? - ""Hey Bud!"" i -"
8:   Sieglen, Brennan, P: "A Pope, a chair, and a water bottle walk into a bar. The Pope says ""I'll have the water!"""

2:   Silbaugh, Atticus, T: What did the banana say to his crush? I find you very a peeling
1:   Slonacher, Brendan, G: Why did the quark visit the psychiatrist? It had too many unresolved issues with its spin and could not determine its position in
3:   Smith, Cole, T: What concert costs 45 cents? 50 Cent featuring Nickleback.
1:   Sohn, Alexander, I: Why did the chicken cross the road? To get to the golden arches
4:   Steeves, Joseph, A: How does the man on the moon cut his hair? Eclipse it.
7:   Syed, Aoun, A: How do you know if a vampire is unwell? They be coffin
3:   Szydlow, Emma, M: What do you call a pig that practices karate? A pork chop!
1:   Tabaco, Chloe-Erika, B: Why did the AI break up with its chatbot girlfriend? Because it felt like their conversations were too scripted!
2:   Tapel, Daryl, K: Why did scarecrow win an award? Because he was OUTSTANDING in his field!
6:   Taylor, William, H: How does a mathematician pick their nose? They work it out with a pencil.
1:   Tran, Ken, W: Why did Grandma sit on the clock? Because she wanted to be on time!
2:   Tymofyeyeva, Tatiana, E: Why do plants hate math? It gives them square roots.
3:   Vanyi, James, T: What do elves learn in school? The elphabet
1:   Walia, Nihaal, S: What do you call a magician who has lost his magic? Ian.
4:   Wang, Alexander, X: "My cat saw me knocked over the plant on the kitchen, to show my cat that law applies to everyone, I have to spray myself with the watergun."
3:   Winters, Carson, R: Why can't you trust stairs? They're always up to something!
1:   Yang, Hanmin, X: Why was the plum sad? because it was feeling plum-glum.
2:   Yenugu, Shriya, X: Why do programmers prefer dark mode? Because the light attracts too many bugs!
5:   Zhang, Wenzhen, X: knock knock whoÆs there CMU CMU who? CMUDisJoke

_____
Choose Option:
 f   Find Student Info
 a   Add a student
 r   remove a student
 p   print tree
 q   quit

_____
a

Enter Last:
Smith

Enter First:
Mary

Enter Middle Initial
M

Enter your favorite joke:What did 0 say to 8? Nice belt!

Mary   Smith inserted successfully

_____
Choose Option:
 f   Find Student Info
 a   Add a student
 r   remove a student
 p   print tree
 q   quit

_____
f

Enter Last:
Smith

Enter First:
Mary

Enter Middle Initial:
M

1:   Smith, Mary, M: What did 0 say to 8? Nice belt!

_____
Choose Option:
 f   Find Student Info
 a   Add a student
 r   remove a student
 p   print tree
 q   quit

_____
q