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1  #include <iostream>
2  #include <fstream>
3  #include <string>
4
5  using namespace std;
6
7  struct TreeNode {
8      string value;
9      TreeNode *left; //yes
10     TreeNode *right; //no
11     TreeNode(string val) {
12         value = val;
13         left = nullptr;
14         right = nullptr;
15     }
16     TreeNode() {
17         left = nullptr;
18         right = nullptr;
19     }
20 };
21
22 void makeCityTree(TreeNode* &current, ifstream &f) {
23     string text;
24     getline(f, text);
25     current = new TreeNode(text.substr(1));
26
27     if(text[0] == 'Q') {
28         makeCityTree(current->left, f);
29         makeCityTree(current->right, f);
30     }
31 }
32
33 void saveFile(TreeNode* current, ofstream &f) {
34     if(current->right == nullptr && current->left == nullptr) {
35         f << "A"+current->value << endl;
36     }
37     else {
38         f << "Q"+current->value << endl;
39         saveFile(current->left, f);
40         saveFile(current->right, f);
41     }
42 }
43
44 void endGame(TreeNode* root) {
45     cout << "Do you want to save the current city information to a file
46     ? ";
47     string answer;
48     getline(cin, answer);
49     if(answer == "y"){
```

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50     string filename;
51     cout << "Enter name of file (duplicate files will be overwritten
52 ): ";
53     getline(cin, filename);
54     ofstream fout(filename);
55     fout.clear();
56     saveFile(root, fout);
57 }
58
59 void makeNewCity(TreeNode* root) {
60     string city, question, answer;
61     cout << endl << "Darn. What was your city? ";
62     getline(cin, city);
63     cout << "Please enter a question that would distinguish between " <<
64 root->value << " and " << city << "." << endl;
65     cout << "Enter question: ";
66     getline(cin, question);
67     cout << "If you were thinking of " << city << " what would the answer
68 to your question be? ";
69     getline(cin, answer);
70
71     string ogcity = root->value;
72
73     root->value = question;
74     if(answer == "y") {
75         root->left = new TreeNode(city);
76         root->right = new TreeNode(ogcity);
77     }
78     else {
79         root->left = new TreeNode(ogcity);
80         root->right = new TreeNode(city);
81     }
82 }
83 void newGame(TreeNode* root){
84     cout << endl << "Think of a city. Please press return when you are
85 ready to begin..." << endl;
86     string input;
87     getline(cin, input);
88
89     TreeNode* temp = root;
90     while(!(temp->left == nullptr && temp->right == nullptr)) {
91         cout << temp->value << " ";
92         string answer;
93         getline(cin, answer);
94         if(answer == "y")
95             temp = temp->left;
96         else
```

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96         temp = temp->right;
97     }
98     cout << "Is it " << temp->value << "? ";
99     string answer;
100    getline(cin, answer);
101
102    if(answer == "y")
103        cout << "Yes! I guessed your city correctly! " << endl;
104    else {
105        makeNewCity(temp);
106    }
107
108    cout << endl << "Do you want to play again? ";
109    getline(cin, answer);
110    if(answer == "y")
111        newGame(root);
112    else
113        endGame(root);
114
115 }
116
117 int main() {
118     cout << "City Guessing Game" << endl << endl;
119     cout << "Welcome to the city City Guessing Game!" << endl;
120     string filename;
121     cout << "Enter the name of the data file: ";
122     getline(cin, filename);
123     TreeNode* root = nullptr;
124     ifstream fin(filename);
125
126     makeCityTree(root, fin);
127     newGame(root);
128
129     cout << "Good bye!" << endl;
130
131     return 0;
132 }
```