ESS 201 Programming II
Java
Test 1b
5 Sept 2020

*Each question is worth **5 marks for a total of 15 marks**. Please upload the solutions to DomJudge. The submissions will be evaluated for correctness based on DomJudge scoring, as well as review of the code.*
For each question, you are provided a source file with skeleton code. Complete the code in these files (marked with …). Do not modify the main methods except where marked. The source files are at the following links:
Tree.java:
WordProcessor.java:
BagOfWords.java

1. [File WordProcessor.java]
   Implement a class `WordProcessor` with a method `process` that takes in a sentence as a String, and returns a list of strings each of which contains one word of the input sentence, with the following conditions:
   a. the words are output in reverse order
   b. only words that are longer than 4 characters are returned
   c. For these words, at most 8 characters are returned.

   Do not change the main. Implement the method `process` in WordProcessor, as well as any other methods you might need. You can assume that the input string does not have any punctuations and the words are separated by a single blank space.

   Sample input:
   We see daily news stories that herald new breakthroughs in facial recognition technology self driving cars or computers

   Expected output:
   computer
   driving
   technolo
   recognit
   facial
   breakthr
   herald
   stories

daily

2. [File BagOfWords.java]
   Implement a class BagOfWords that has the following methods:
   a. `void add(String word)` - adds to the bag if `word` is not in the bag. That is, words in the bag are unique and there are no duplicates
   b. `void remove(String word)` - removes `word` from the bag if it exists
   c. `String get(int i)` - returns the word in the ith position, and null if i is greater than the size of the bag. Words retain the order in which they were added
   d. int size() - returns the number of words in the bag.

   Implement this class using an ArrayList of the correct type, and use the existing methods of ArrayList to achieve the functionality.

   Complete the code of class BagOfWord, and fill in the parts of main that are incomplete. **Do not modify other parts of main.**

Sample input:

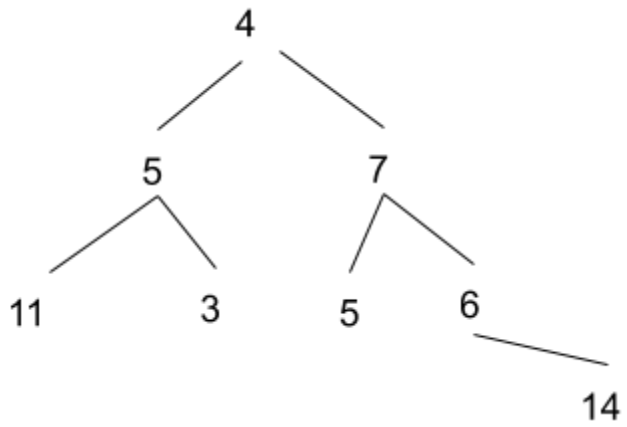
Internet communication is unsafe and hence the sender and the organisation hold no liability in case the mail

Expected output:

Internet
communication
is
unsafe
and
hence
the
sender
organisation
hold
no
liability
in
case
mail
Internet
communication
is
unsafe
hence
sender
organisation
hold
no
liability
in
case
mail

3. [File Tree.java]
   A class Tree is recursively defined using nodes of type Tree, where a Tree node has an int value, and left and right children which are also of type Tree. Write a method of class Tree that finds the depth at which a given value is found in the tree. The root is at depth 0, its children are at depth 1, and so on. Assume that a given value occurs at most once in a given tree. If the search value is not found in the tree, return -1
   Implement the method `findDepth` in the file Tree.java. Do not modify the main method where a tree and a search sequence are hardwired.

   As an example, consider the tree below:



   If we search for the values 4, 14, 7, 3, 31, the expected output would be:

   0
   3
   1
   2
   -1