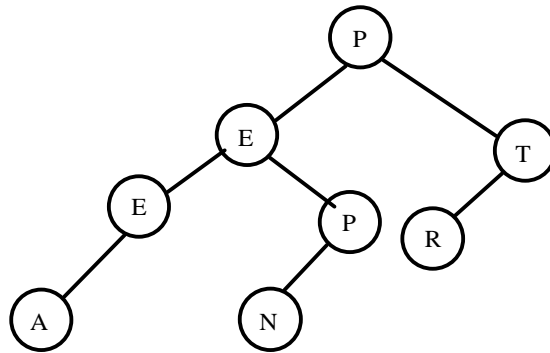


Senior Division

ACSL TREES

PROBLEM: Given a list of letters, construct a binary search tree. Once the tree is constructed calculate the depth of the tree, the number of leaf nodes, the number of external nodes, the internal path length and the external path length. The depth of the tree is defined as the number of node levels below the root node. A leaf node is a node with no children. An external node is a place where a new node could be attached. The internal path length is the sum of the depths of all nodes. The external path length is the sum of the depths of all external nodes.



As an example, given the letters PETERPAN, the above binary search tree would be constructed. The depth of the tree is 3. P is the root node. It has a depth of 0. The E and T have a depth of 1. E, P and R have a depth of 2. A and N have a depth of 3. There are 3 leaf nodes: A, N and R. There are 9 external nodes: 1 from E, 2 from A, 1 from P, 2 from N, 1 from T and 2 from R. The internal path length is $1 + 1 + 2 + 2 + 2 + 3 + 3 = 14$. The external path length is $2 + 3 + 3 + 3 + 3 + 3 + 4 + 4 + 4 = 30$.

INPUT: There will be just 1 line of input. The line will consist of a string containing upper case letters.

OUTPUT: Print the depth of the binary search tree, the number of leaf nodes, the number of external nodes, the internal path length and the external path length. Label each answer printed.

SAMPLE INPUT

1. PENNSYLVANIA

SAMPLE OUTPUT

1. Depth = 5
2. Leaf nodes = 4
3. External nodes = 13
4. Internal path length = 31
5. External path length = 55