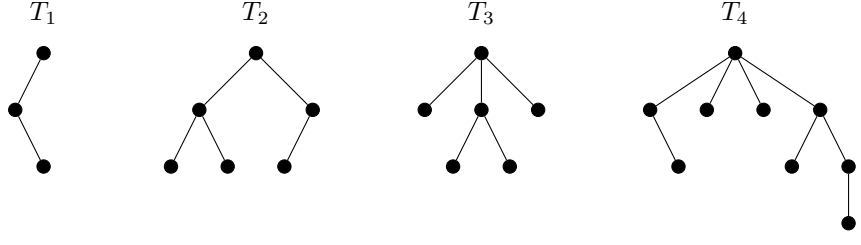
Diameter of a Tree

We define the *diameter* of a tree as the length of the longest path between two nodes.



In the examples above, T_1 has a diameter of 2, T_2 a diameter of 4, and T_3 a diameter of 3.

(a) What is the diameter of T_4?

In the next subproblems, we limit ourselves to *binary* trees. If v is a node, then:

- v.`left` the left child of v
- v.`right` the right child of v

(b) Will the longest path in a binary tree always go through the root node? Justify your answer.

(c) Write a procedure that finds the diameter of a given *binary tree*.

```
Input: The root node v of a binary tree
Output: Returns the diameter of the tree
1 Procedure Diameter(v)
  |   // ···
```

A lower run-time complexity gives a higher score.

(d) State the runtime complexity of your algorithm for a binary tree with n nodes.