



## Why

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### Definition

An undirected graph is a *tree* if it is connected and acyclic. An undirected graph is a *forest* if it is acyclic. Each connected component of a forest is a tree, motivating the definition.

### Properties

**Proposition 1.** *There is a unique path between any two vertices of a tree.*

*Proof.* Such a path exists because the tree is connected. Such a path is unique because the existence of two separate paths would create a cycle.  $\square$

### Distance

The *distance* between two vertices  $v$  and  $w$  in a tree is the length of the unique path connecting  $v$  and  $w$ . Recall that the length of a path is the number of edges, or one fewer than the number of vertices. If  $v$  and  $w$  are adjacent in the tree, then their distance is 1.

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<sup>1</sup>Future editions will include.



