1 Convention of drawing of Trees

When drawing ordered trees, we adopt the convention that the child on the left most is the first child, the second left most is the second child and so on. Use this convention whenever you are asked to draw a tree.

2 Proof of Theorem 2.5

Theorem 1 Let $T$ be a tree with $n$ nodes, $c_v$ the number of children of node $v$.

$$\sum_{v \in T} c_v = n - 1.$$  

Proof Here is an explanation with more details. Basically, we want to argue the left hand side counts the number of some objects, which could be counted by another view that leads to the right hand side. The objects here could be parent-child relationships. Let $v \rightarrow u$ denote such a relationship in which $v$ is the parent and $u$ is a child. We want to count the number of such relationships.

The left hand side takes the following view. It first groups all $v \rightarrow u_1, v \rightarrow u_2, \cdots$ with the same parent and counts the number within each group. It is easy to see that group with parent $v$ is of size $c_v$. And then the left hand side sums over all possible $v$, which refers to the number of all parent-child relationships.

One can take another view. If we group according to the child $u$, except being root, each $u$ has one and only one parent and thus each group has size 1. The number of groups is $n - 1$. Therefore, the total number is $n - 1$. $\blacksquare$