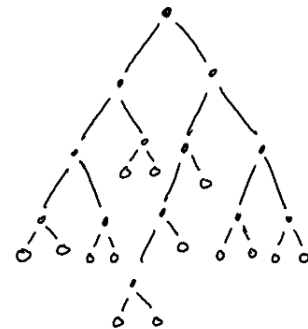
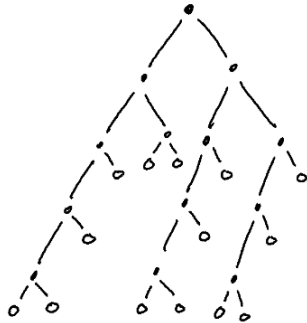
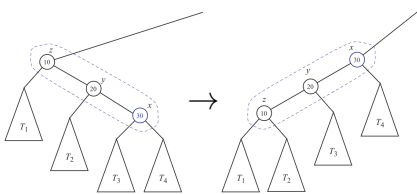


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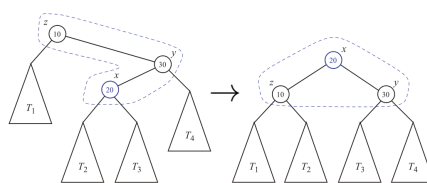
1. **Warm up 1:** Why are trees better than lists?
2. **Warm up 2:** In the diagrams below, internal nodes are filled circles \bullet and external nodes are not filled \circ .
 - (a) How many nodes of the following tree are unbalanced?
 - (b) How many rotations have been done to get from the previous tree to this one?



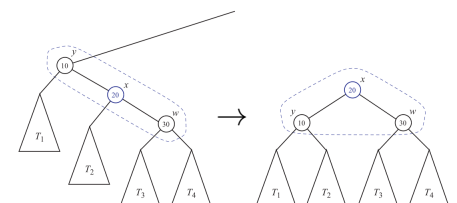
3. Recall the insertion sort, merge sort, quick sort algorithms.
 - (a) If an input list is already sorted, which algorithm will be fastest? Slowest?
 - (b) If an input list is sorted in reverse, which algorithm will be fastest? Slowest?
4. This question is about **splaying**. If x is a node in a tree T with parent y and grandparent z , to *splay* x means to make x the root node of T by sequences of the following actions (and their symmetrical analogues).



zig-zig



zig-zag



zig

- (a) How many steps does it take to splay 23 in the tree T below? Draw T at each step.

