ZIO Select Answers

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This document outlines my answers to some ZIO questions I found interesting or instructive. The solutions are written the way I solved them. In some cases, the solution is much better than the equivalent given in answer keys, in others, the answer key does the job better.

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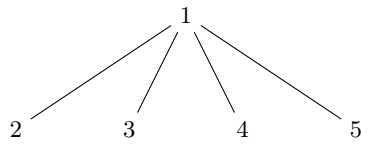
1.1 Org-Trees

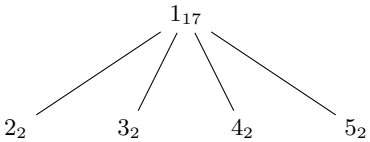
On first observation, the problem seems incredibly difficult to do because of the sheer number of combinations one can achieve in large org trees. The key insight, however, is that trees can (and should) be seen recursively bottom-up, a technique in dynamic programming.

Consider the simple tree (direction of arrows is omitted where hierarchies are obvious):

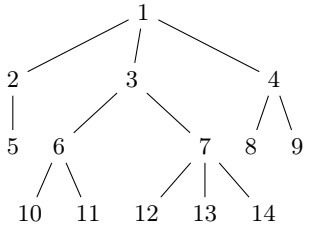


In how many ways can we delete a leaf level node? Obviously, only one way: just delete it. However, note that we always have the option of *not* deleting the node as well, giving us a total of 2 ways of dealing with leaves. Now, apply combinatorics. The total number of ways of deleting 1 (or below) will be the product of the ways of deleting its children, plus one for its own deletion.

Therefore, writing number of ways of deletion into the tree:



And the problem is solved. Solving the first subproblem as an example,



Solving bottom-up: