Mandatory Exercise: Level Ancestor

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1 Path Sums Let T be a rooted tree with n nodes. Each edges is assigned a *weight*. The weight of a path in T is the sum of weight of edges on the path. We are interested in a data structure that supports the following operation on T. Given leaves ℓ_1 and ℓ_2 and integers k_1 and k_2 define

- path$-$sum$(\ell_1, \ell_2, k_1, k_2)$: return the weight of the path between the k_1-ancestor of ℓ_1 and the k_2-ancestor of ℓ_2.

Give a compact data structure that supports fast queries.