

Part A: contains()

Container/ Amount	Vector	List	Hash	Table
1000	0	$2.05 * 10^{-7}$	$1.22 * 10^{-4}$	$7.60 * 10^{-3}$
2000	$2.10 * 10^{-7}$	0	$8.42 * 10^{-5}$	$1.63 * 10^{-2}$
3000	0	0	$1.11 * 10^{-4}$	$1.63 * 10^{-2}$
4000	$2.05 * 10^{-7}$	$2.05 * 10^{-7}$	$1.49 * 10^{-4}$	$3.68 * 10^{-2}$

Part B: query (name & weight)

Container	Vector	List	Hash	Table
1000	$5.68 * 10^{-2}$	$5.75 * 10^{-2}$	$5.87 * 10^{-2}$	$5.58 * 10^{-2}$
2000	$9.85 * 10^{-2}$	$1.01 * 10^{-1}$	$1.02 * 10^{-1}$	$9.60 * 10^{-2}$
3000	$2.43 * 10^{-1}$	$2.47 * 10^{-1}$	$2.53 * 10^{-1}$	$2.50 * 10^{-1}$
4000	$6.06 * 10^{-1}$	$6.13 * 10^{-1}$	$6.25 * 10^{-1}$	$6.16 * 10^{-1}$

Container	Vector	List	Hash	Table
1000	$4.85 * 10^{-3}$	$7.89 * 10^{-3}$	$7.57 * 10^{-3}$	$6.05 * 10^{-3}$
2000	$7.47 * 10^{-3}$	$1.44 * 10^{-2}$	$1.43 * 10^{-2}$	$1.42 * 10^{-2}$
3000	$1.87 * 10^{-2}$	$3.21 * 10^{-2}$	$3.19 * 10^{-2}$	$2.40 * 10^{-2}$
4000	$3.35 * 10^{-2}$	$6.18 * 10^{-2}$	$6.43 * 10^{-2}$	$4.55 * 10^{-2}$

Analysis

My Tree-based query didn't pass the time requirement on Gradescope, so that will affect my response. I am surprised that the AVL tree has such long times, especially for the query. The fact that the Hash-based inventory performed similarly to the list for query. This shows me that the list is an inefficient data time to iterate and search through because Hash-based containers aren't made for searches to the value stored, instead it exceeds for lookups. The hash function also outperformed the query when based on name comparison, which is also a mark against a Tree-based inventory. Overall, I would pick a Hash-based inventory because overall it performs better than Tree-based. As noted in my first sentence, my choice could be changed if I was able to write my Tree-based query more efficiently.