

University of Waterloo
CS240 Winter 2025
Assignment 4 Post-Mortem

Question 1 [3+3+3+3+1=13 marks]

- This question was generally well done.
- For part b, some students did not count leaf nodes even though $\Theta(m)$ space is still required to store these nodes.
- For part c, some students incorrectly provided n or $n + 1$ as their final answer.
- For part d, some students did not account for the space required to store strings at leaf nodes.

Question 2 [2+2+3+3=10 marks]

- This question was well done.
- For part a, some students incorrectly provided slots 3 and 9 in the incorrect order.
- For part d, some students inserted keys into the wrong hash table. To resolve collisions with cuckoo hashing, the key previously occupying the hash table slot should be getting evicted.

Question 3 [1+2+1+3=7 marks]

- This question was well done.

Question 4 [6 marks]

- Many students had a mostly correct solution that returned the final i value off by one.
- Some students provided a solution that would only work for arrays without negative integers.
- Some students provided a solution that filled out the entire prefix sum hash table first before querying it afterwards. In principle this is fine as it is possible to solve in two passes within the required time efficiency. However, this led to some students violating the restriction that $i \leq j$ and providing an incorrect answer.

Question 5 [4+4=8 marks]

- This question was generally well done
- For part a, some students provided a plane partition diagram instead of a Quadtree.
- For part b, some students incorrectly provided 100 as the largest possible height and 1 as the smallest possible height for the modified Quadtree.

Question 6 [4+4+(2+2+2)=14 marks]

- This question was well done.
- Some students used $p1.x$ or $(7, 8)$ as the root which incorrectly assigned $\lceil n/2 \rceil$ points to the left subtree and $\lfloor n/2 \rfloor$ points to the right subtree.
- Some students drew a kd-tree with points stored at internal nodes. Similar to Quadtrees, points are only ever stored as leaves in kd-trees.