

DS_A4 Answer Key

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Question 1.d

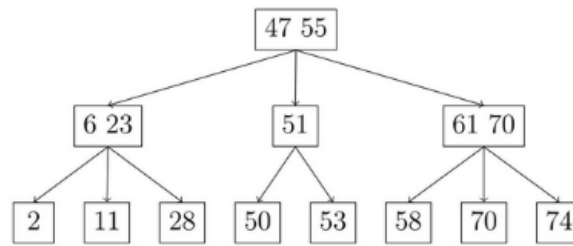
- 3 Points for the algorithm - Optimal method is traversing the new structure once and for every node, fill every level of **pointers** by checking divisibility of the index against 2 to **m**. Dock a point if they've done a separate traversal for every level of **m**. Dock points if the algorithm isn't explained, is incomplete, or is inefficient.
- 3 Points for correctly stating total number of link reassignments as $\sum_{x=2}^m \frac{n}{x}$
- 4 Points for the complexity - Full points for correctly argued $O(m \times n)$, deduct if less efficient or incorrect or incomplete reasoning.

Question 2.c

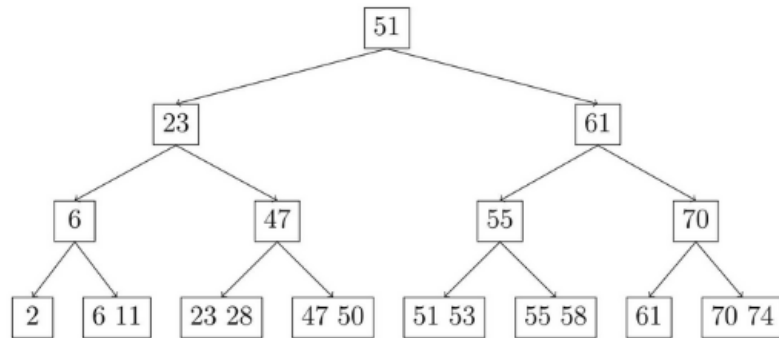
- 5 points: If they've made the assumption that an LR rotation counts as one rotation, any strictly ascending or descending sequence will do. If they've made the assumption that an LR rotation counts twice, any sequence alternating between large and small numbers will do.
- 2 points for correcting stating $O(\log n)$ for a single insertion. 3 points for correctly explaining why. 0 for incorrect bounds, -1 or -2 for insufficient explanation.

Question 3

B Tree:



B+ Tree:



(the bottom most level is a singly linked list)

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- 1 point each for stating $O(\log n)$. 1.5 points each for correct explanation about maximum splits deriving from degree and height.
- 5 points each. Dock points for incorrect order of steps, missing a step, or not mentioning each instance of possible shifting and splitting.