

EECS3101 (Section E) Summer 2026
Tutorial 4
Cases of Rotations in Self-Balancing BSTs

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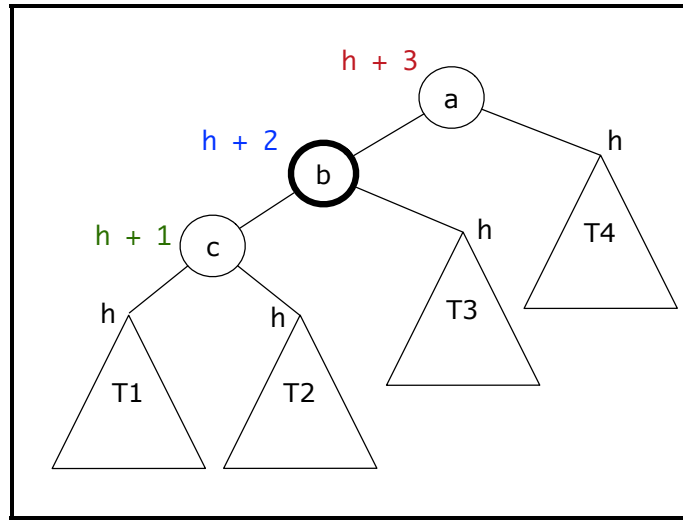
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1 Abstracting a Trinode Restructuring Step

Consider the following BST, where roots of subtrees are annotated with their *heights*:



- Is the *height-balance property* satisfied (assuming that BSTs $T1$, $T2$, $T3$, and $T4$ are balanced)?

If yes, justify.

If no, justify and then perform the necessary **trinode restructuring step(s)** on the appropriate node(s).

- Is the *height-balance property* re-established?

2 Performing Trinode Restructuring Steps after Deletions

Pre-Study. Review the algorithm of performing BST rotations after insertions [here](#).

Task 1.

- **Insert** the following sequence of nodes into an empty BST:

$\langle 44, 17, 78, 32, 50, 88, 48 \rangle$

Is the *height-balance property* satisfied?

- **Insert** 46 into the BST.

Is the *height-balance property* maintained?

- Perform the necessary **trinode restructuring step(s)** on the appropriate node(s).

Is the *height-balance property* re-established?

Task 2.

- **Insert** the following sequence of nodes into an empty BST:

$\langle 44, 17, 78, 32, 50, 88, 82, 95 \rangle$

Is the *height-balance property* satisfied?

- **Insert** 85 into the BST.

Is the *height-balance property* maintained?

- Perform the necessary **trinode restructuring step(s)** on the appropriate node(s).

Is the *height-balance property* re-established?

Task 3.

- **Insert** the following sequence of nodes into an empty BST:

$\langle 44, 17, 78, 32, 50, 88, 48, 62 \rangle$

Is the *height-balance property* satisfied?

- **Insert** 54 into the BST.

Is the *height-balance property* maintained?

- Perform the necessary **trinode restructuring step(s)** on the appropriate node(s).

Is the *height-balance property* re-established?

3 Performing Trinode Restructuring Steps after Deletions

Pre-Study 1. Review the algorithm of BST deletions [here](#).

Pre-Study 2. Review the algorithm of performing BST rotations after deletions [here](#).

Task 1.

- **Insert** the following sequence of nodes into an empty BST:

$\langle 44, 17, 62, 32, 50, 78, 48, 54, 88 \rangle$

Is the *height-balance property* satisfied?

- **Delete** 32 from the BST.

Is the *height-balance property* maintained?

- Perform the necessary **trinode restructuring step(s)** on the appropriate node(s).

Is the *height-balance property* re-established?

Task 2.

- **Insert** the following sequence of nodes into an empty BST:

$\langle 50, 25, 10, 30, 5, 15, 27, 1, 75, 60, 80, 55 \rangle$

Is the *height-balance property* satisfied?

- **Delete** 80 from the BST.

Is the *height-balance property* maintained?

- Perform the necessary **trinode restructuring step(s)** on the appropriate node(s).

Is the *height-balance property* re-established?