Exercise 1

1. Max: $2^{h+1}-1$

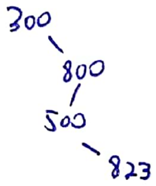
   Min 2^h

2. $O(n\log n)$ $O(n\log n)$

3. At the leaves.

Exercise 2 BST

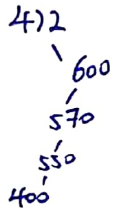
a) cannot



– 823 is in the left child tree of 800 but 823 > 800. hence violate the rule of BST: left subtree of a node contains only nodes with keys less than node's key.

b). Can The nodes donot violate the conditions.

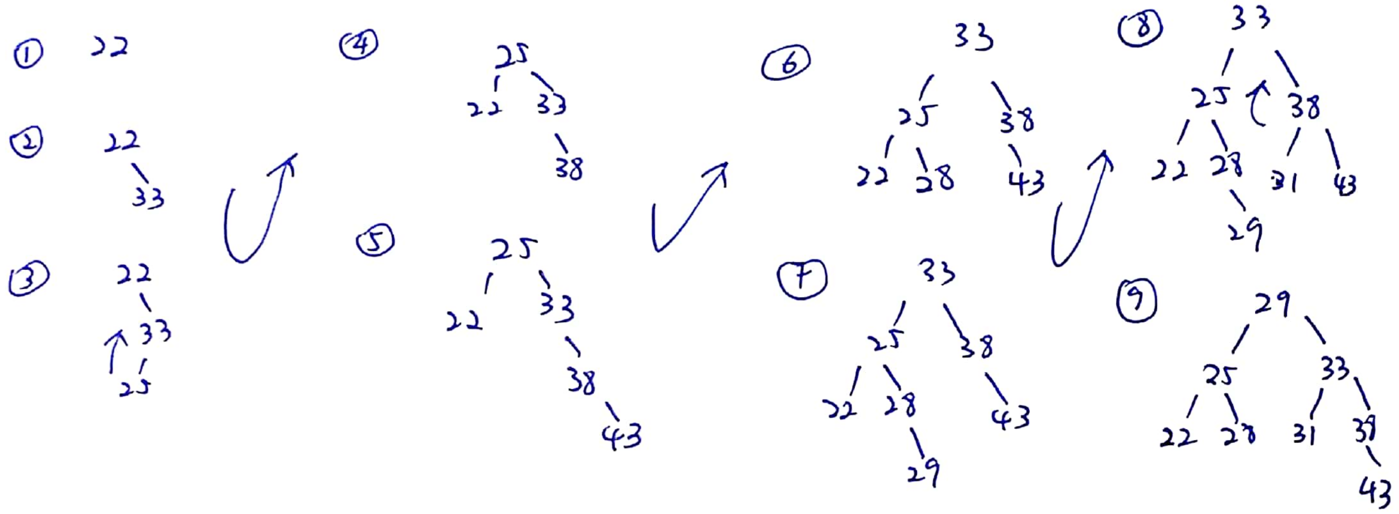
c). Cannot



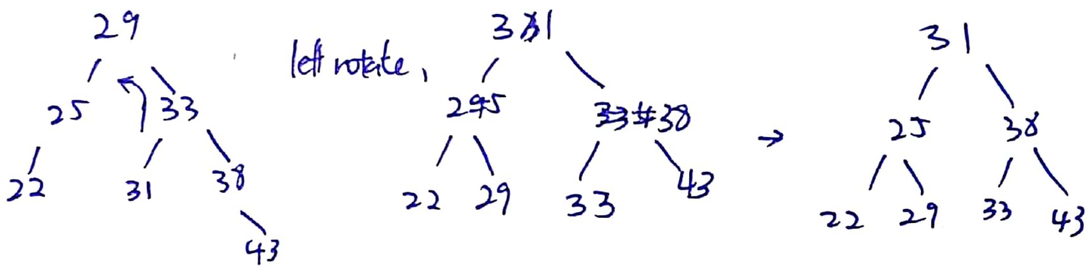
400 is in the right subtree of 412 but 400 < 412 hence violate: right subtree of a node should only contains with keys less than the node's key.

d). Can. The nodes donot violate the conditions.

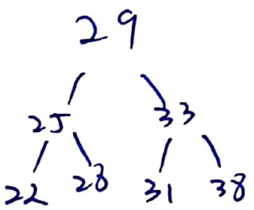
Exercise 3.



Delete 28.



Delete 43



unchase. as it still is an AVL.

Q4. Sorting.

1. It will work properly ~~but the~~, ~~this line will cause the~~ the same element, will appear in reverse order in the sorted array.

2. Integers in the range of 0 to k, → [a...b] in O(1)

By using parts of Counting-sort, to build an array C. which contains the number of elements less than or equal to i, then we use C[b] − C[a-1] to ~~ar~~ get the number of integers in the range [a....b].

Exercise 5 Hashing

According to the search scheme. the initial probed location is 0. $(i_0=0)$

$j=[h'(K)]$ 并 T

The next probed will be 1 $(i_1=1)$ $j_1 = (T[h'(k)] + j_1)\% m = (j_0+1)\% m$

The third probed will be 2 $(i_2=2)$

$j_2 = (j_1+i_2)\% m = (j_0+1+2)\% m$ as $j_1=(j_0+i_1)=(j_0+1)$

$i_2 = i_1+1$ 而

The fourth probed will be $j_3 \% m = (j_2+i_3)\% m$

$$= (j_2+i_2+1)\% m$$

$$= (j_1+i_2+i_1+2)\% m$$

$$= (j_0+1+2+3)\% m$$

$$h(K,i) = (T[h'(k)] + 1+2 \cdots + i)\% m$$

$$= \left(T[h'(k)] + \frac{i(i+1)}{2}\right)\% m \qquad C_1=\frac{1}{2} \quad C_2=\frac{1}{2}$$

$$= \left(T[h'(k)] + \frac{1}{2}i + \frac{1}{2}i^2\right)\% m$$

$$= ((T[h'(K)]) + C_1 i + C_2 i^2)\% m$$

$\therefore$ it is an instance of general quadratic probing scheme.

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