1.25.2017

B-trees

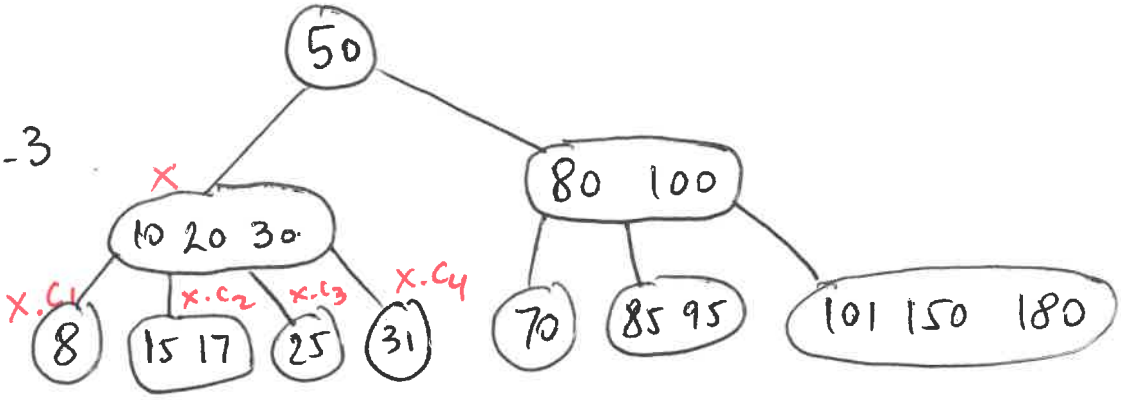
t - minimum degree

- a node x which is NOT the root
  - number of keys: $t-1 \dots 2t-1$
  - number of children: $t \dots 2t$
- root node:
  - number of keys: $1 \dots 2t-1$
  - number of children: $2 \dots 2t$

example

$t = 2$

no. keys: 1..3



$x.n = 3$

$x.key_1 = 10$

$x.key_2 = 20$

$x.key_3 = 30$

$x.leaf = false$

$$\log_3 n = \frac{\log_2 n}{\log_2 3} = \frac{\log_2 n}{1.58} = \Theta(\lg n)$$

$$\log_4 n = \frac{\log_2 n}{\log_2 4} = \frac{\log_2 n}{2} = \Theta(\lg n)$$

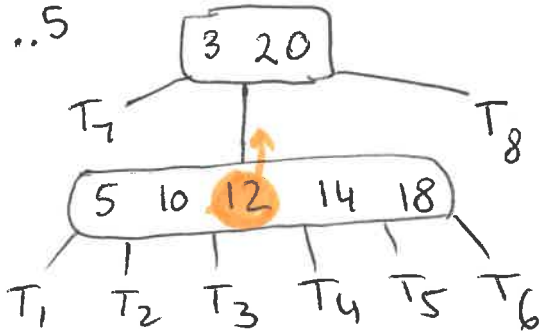
Insert operation

- split a full node around its median key
- a full node has $2t-1$ keys

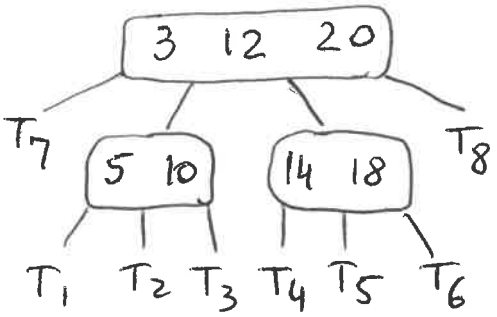
example (split)

$t=3$

Keys: 2..5



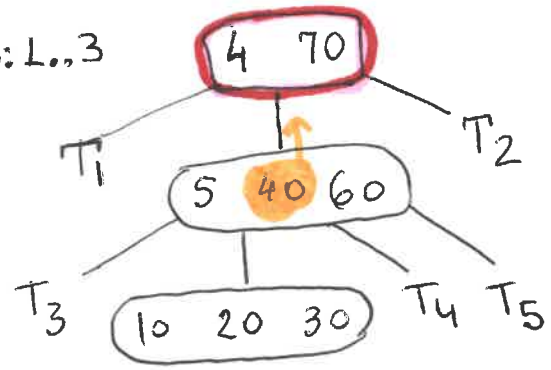
split →



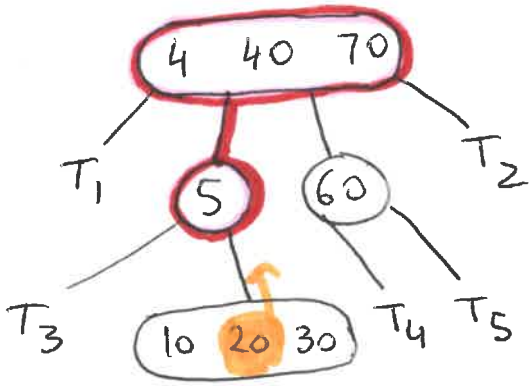
example: insert key 15

$t=2$

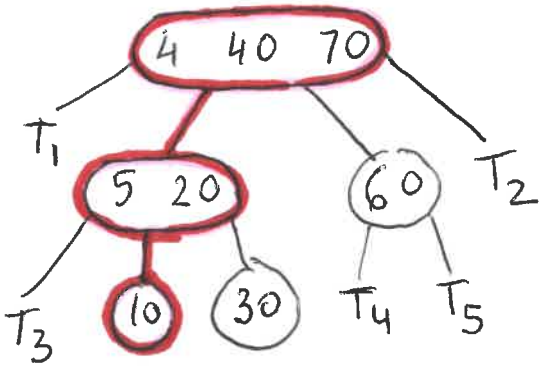
Keys: 1..3



split →



split →



insert 15 →