

Figure 3: B+ Tree of order $d = 4$ and height $h = 3$.

(a) min num of pointers to satisfy query Q
 $Q \in (11, 27)$

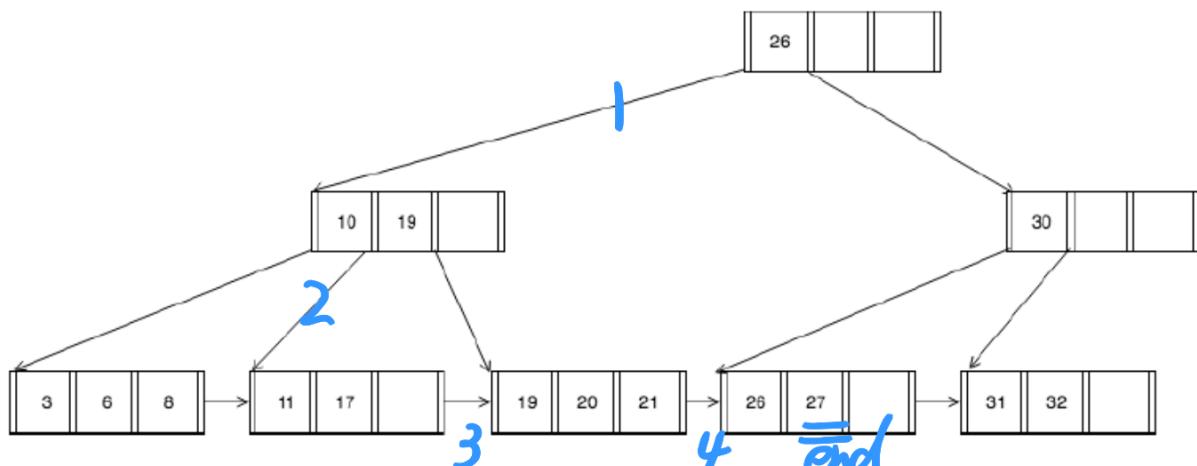
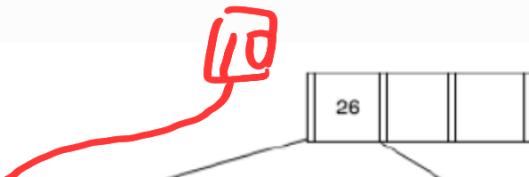


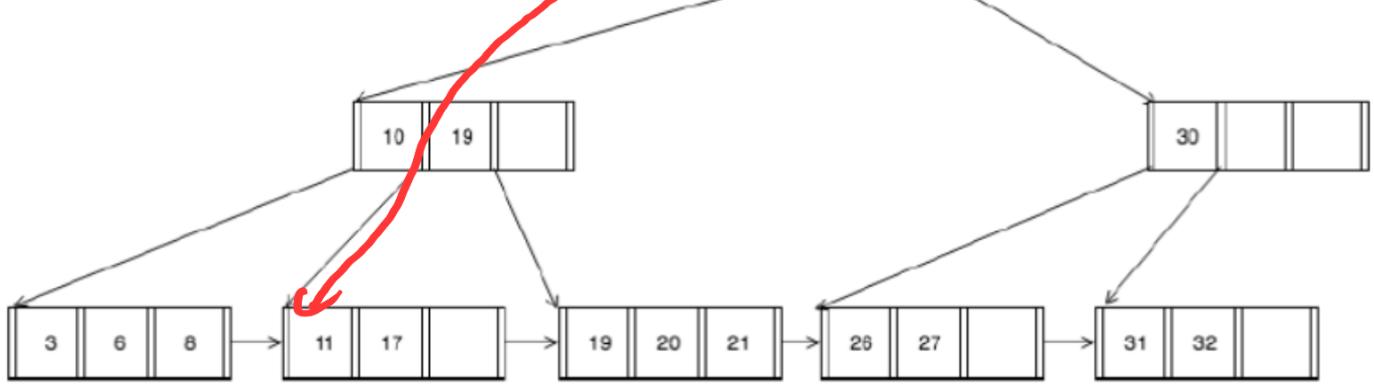
Figure 3: B+ Tree of order $d = 4$ and height $h = 3$.

Answer : 4

(b) 左子树 $<$, 右子树 \geq

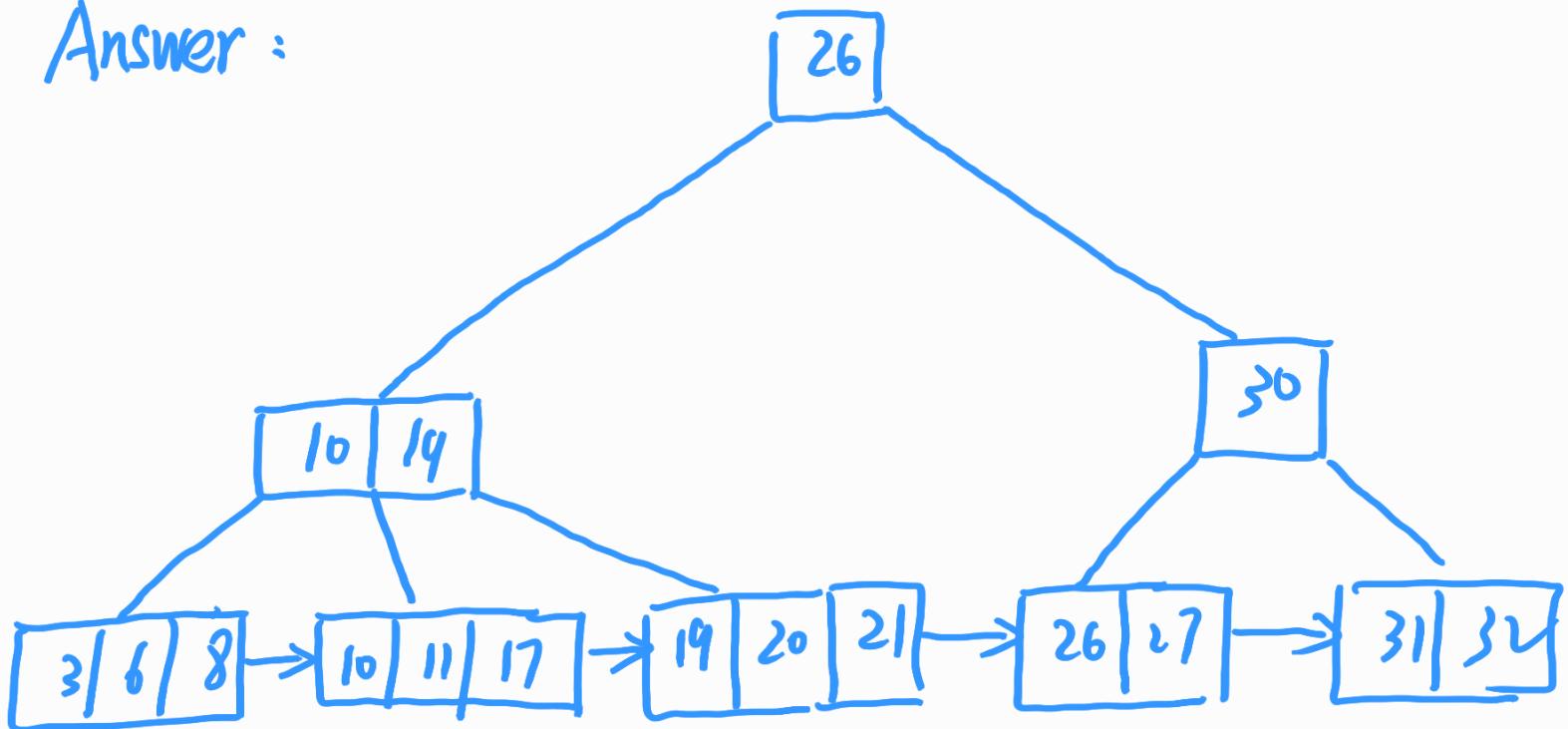
(i) insert 10





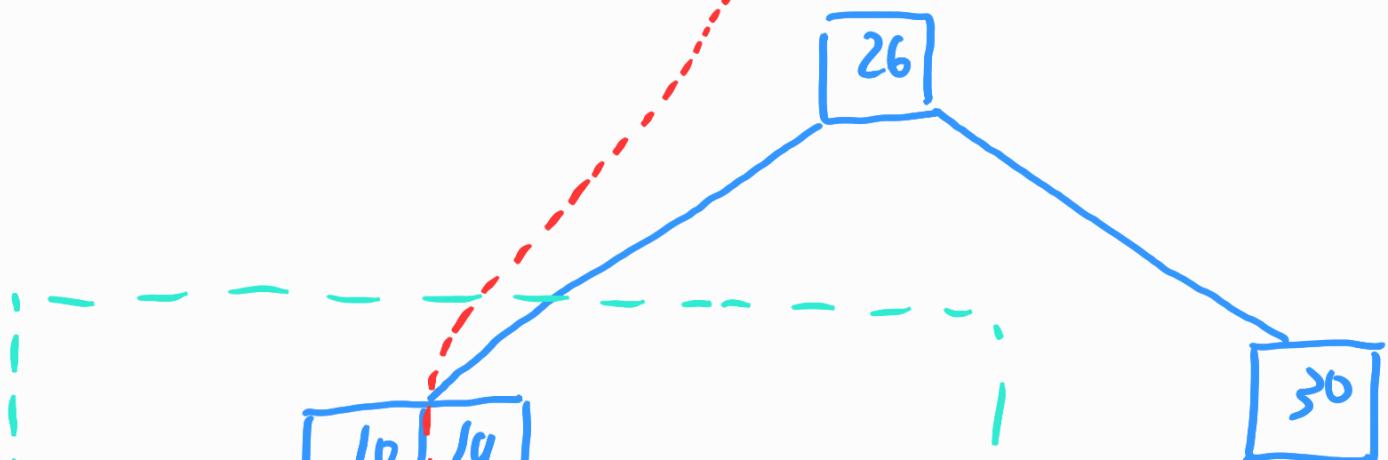
$d=4 \Rightarrow$ 结点内 key 数 ≤ 3

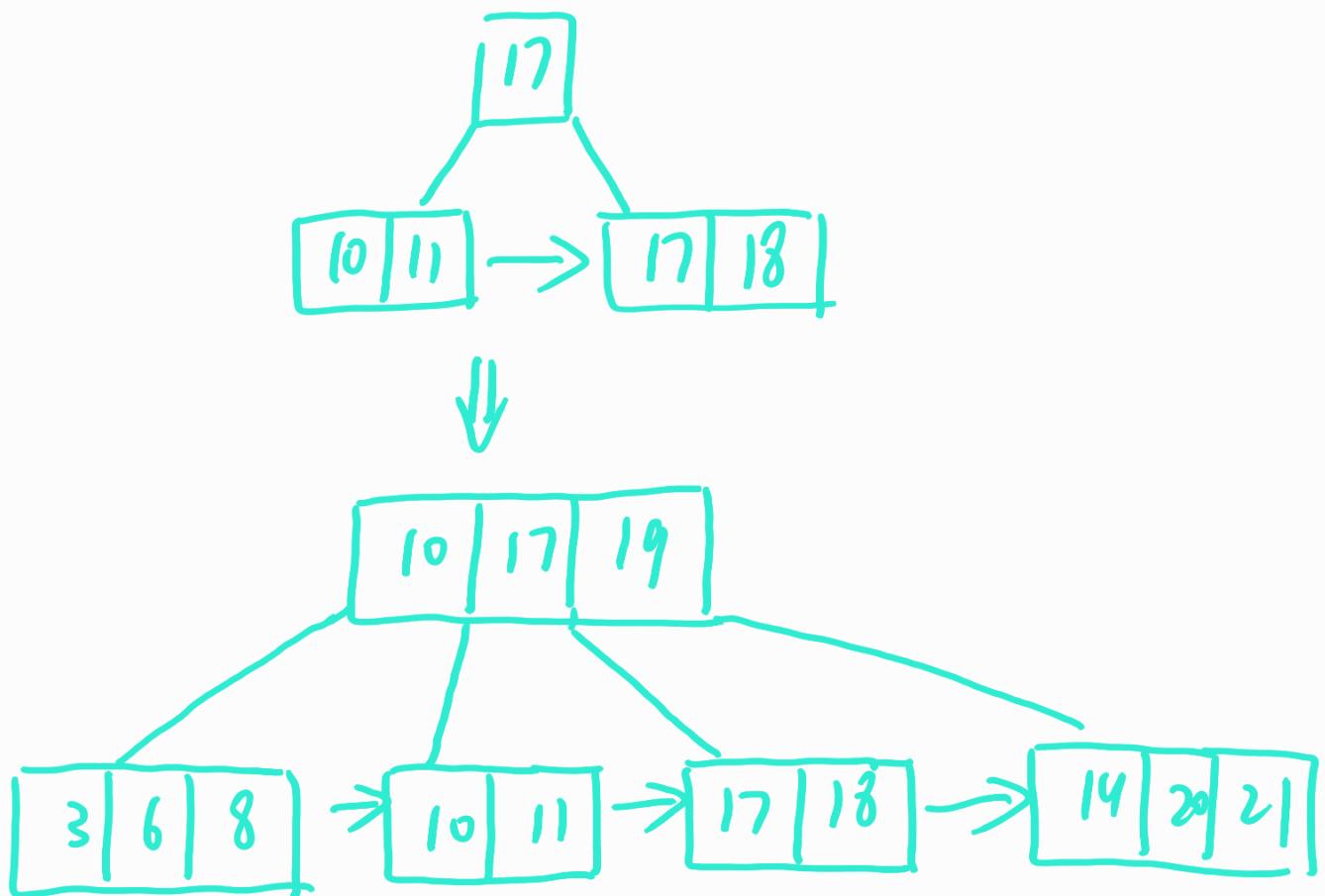
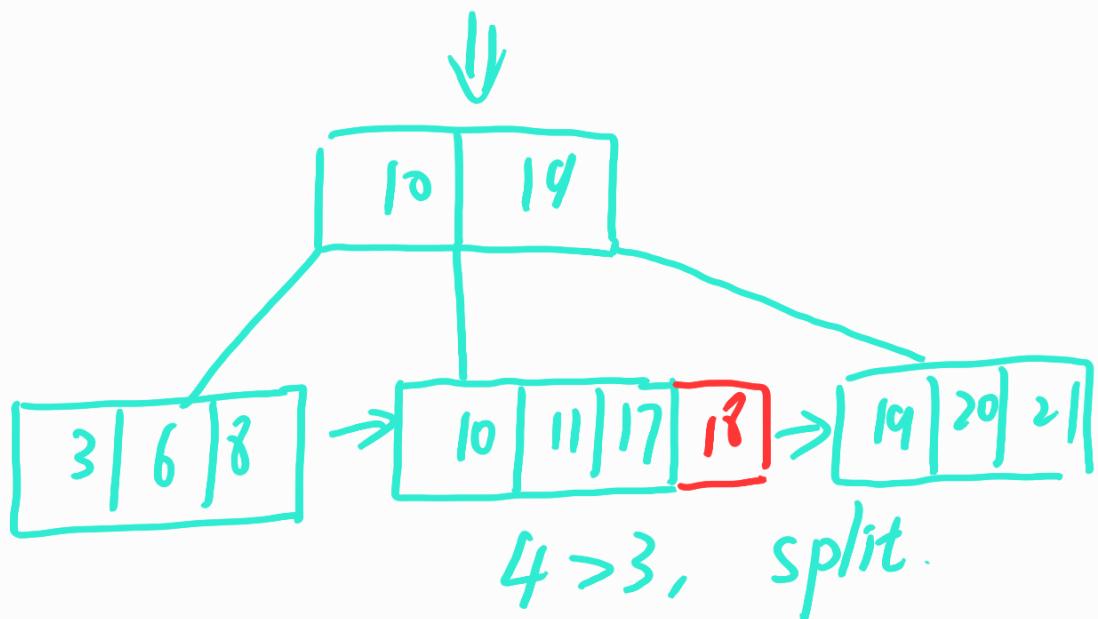
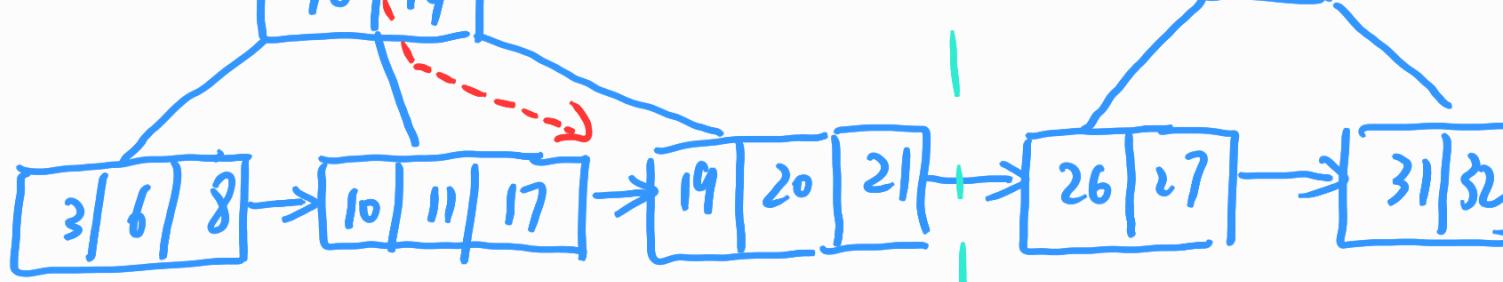
Answer :



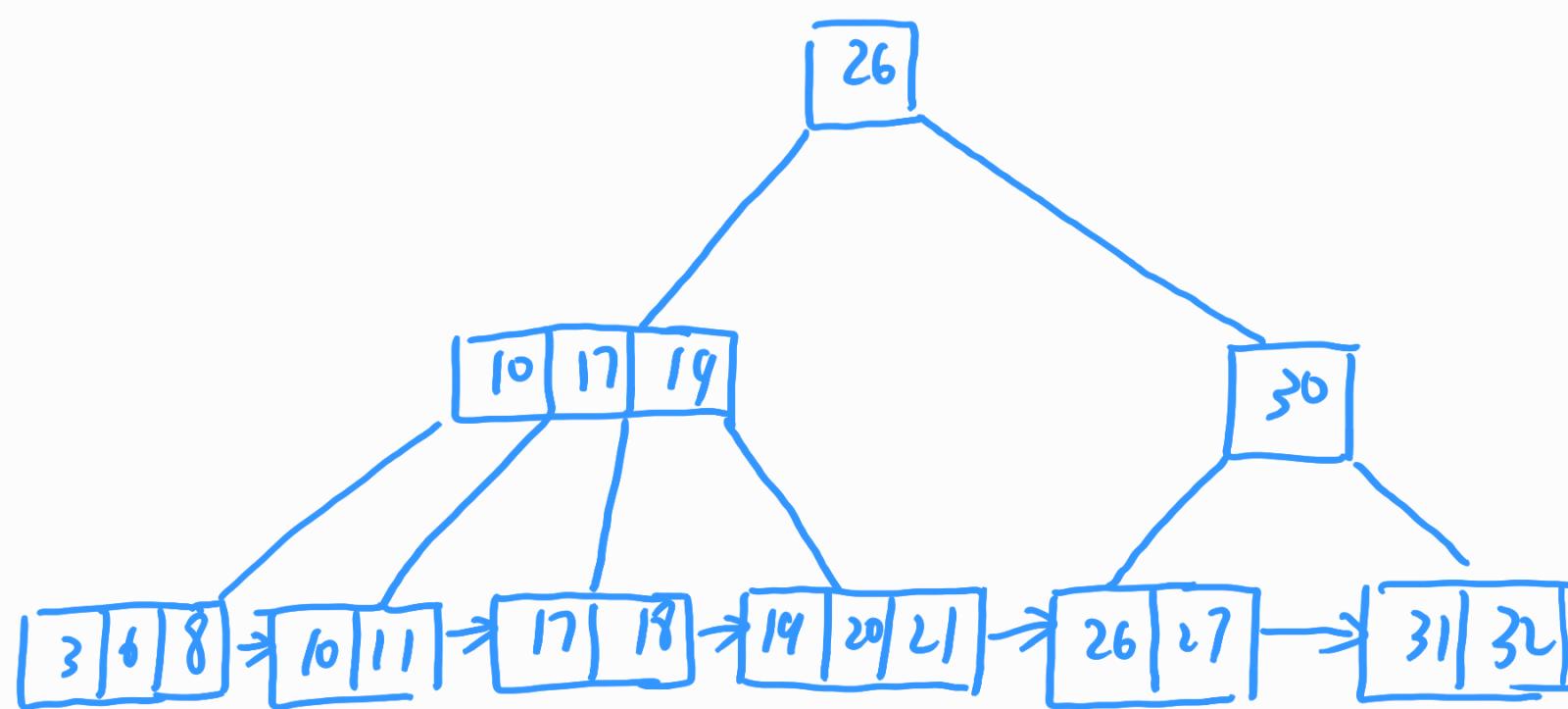
(ii) insert 10, 18 from original

\Rightarrow insert 18 in the below tree



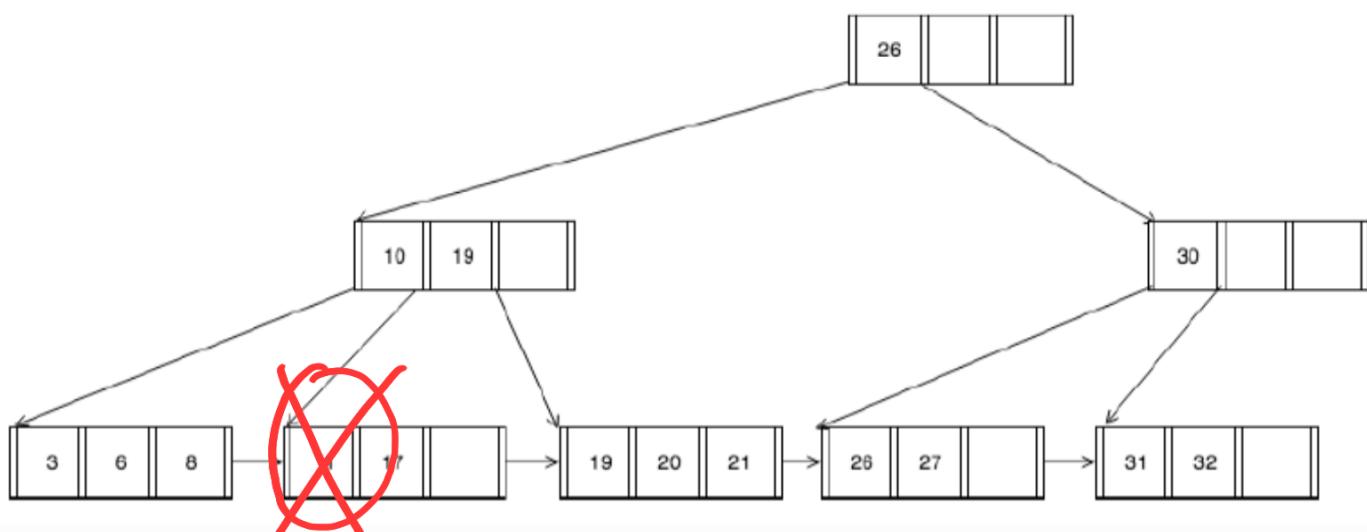


Answer :



(iii)

delete 11 from original B+ Tree



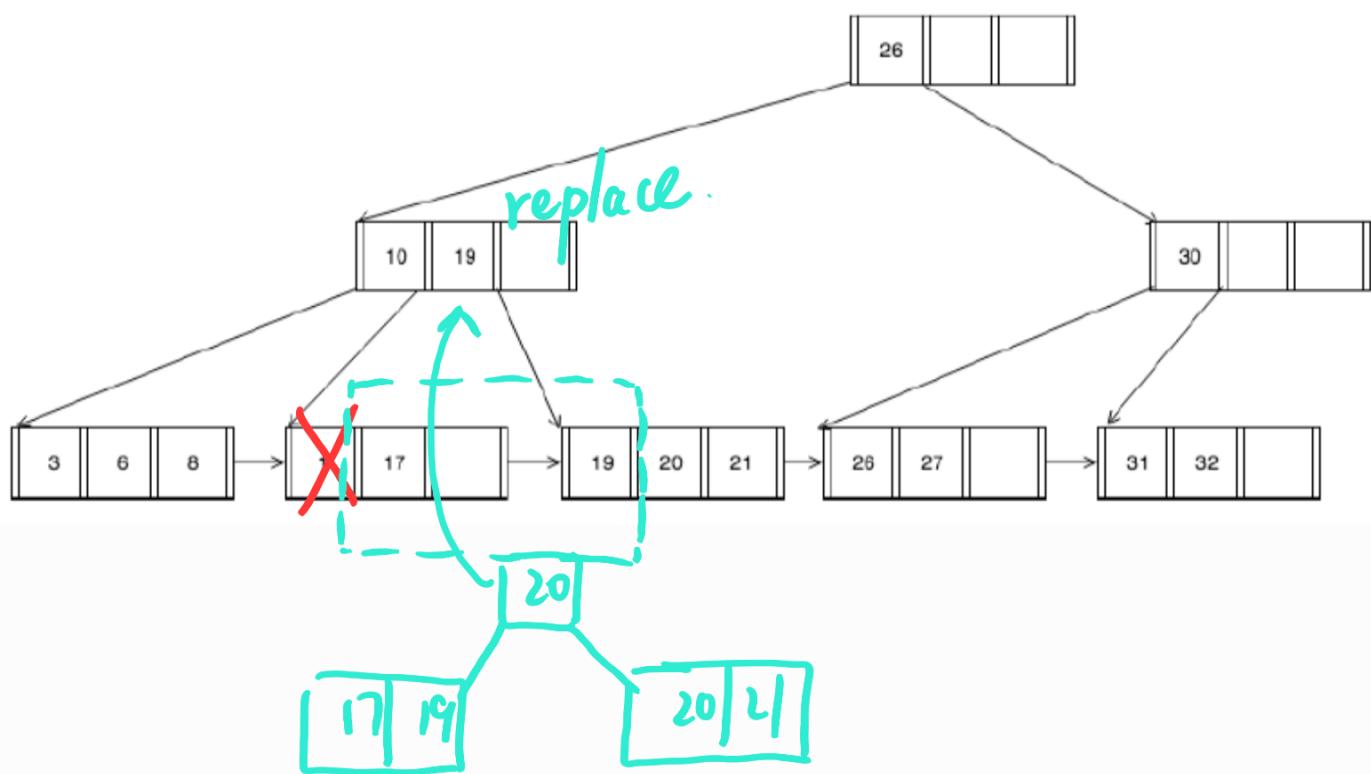
half Full :

$$\lceil M/2 \rceil - 1 \leq \text{num of keys} \leq M-1 \quad (3)$$

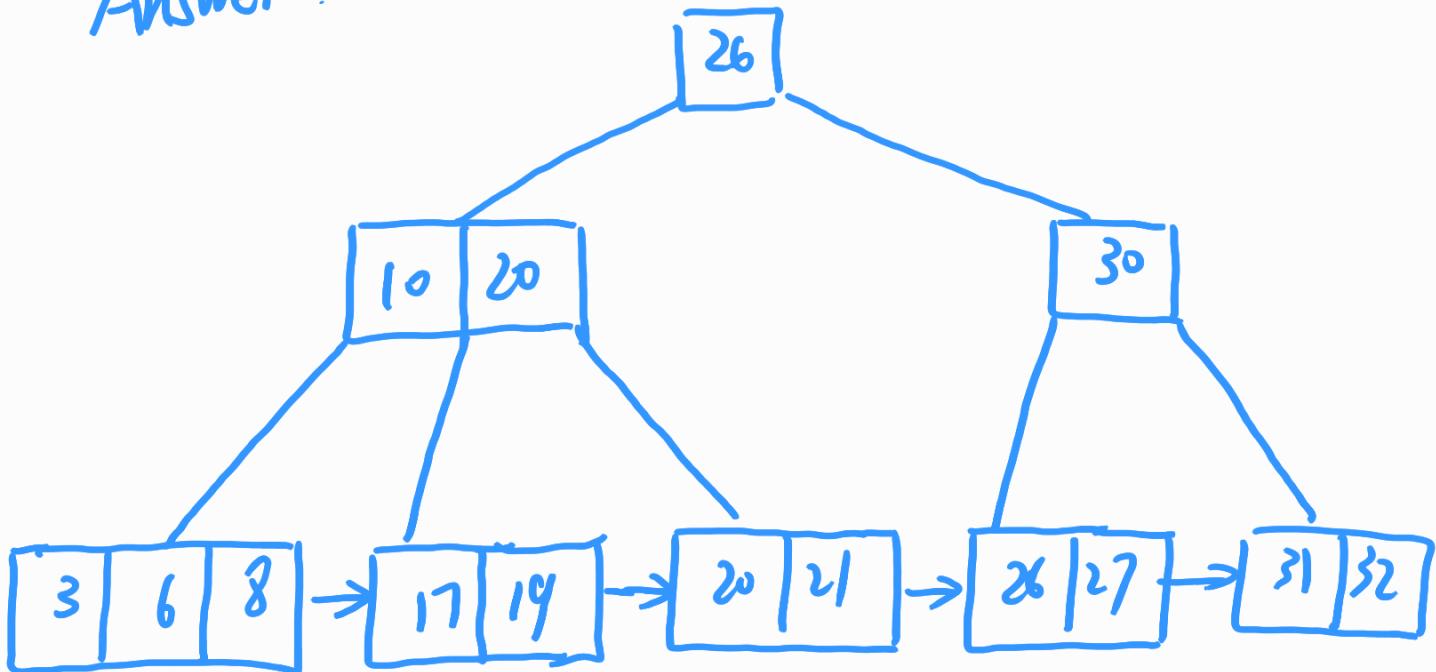
(1)

当 num of keys = half Fall,

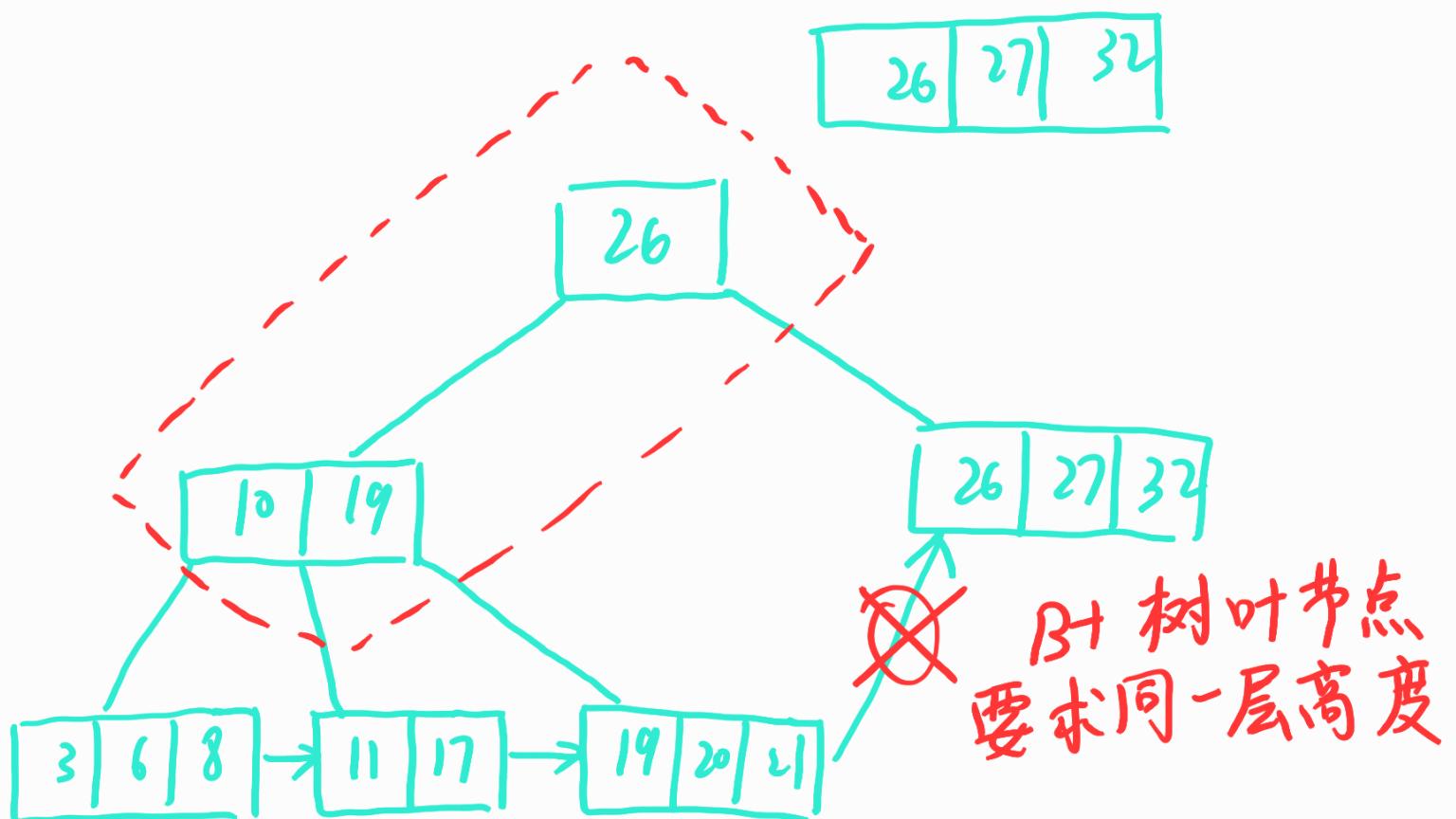
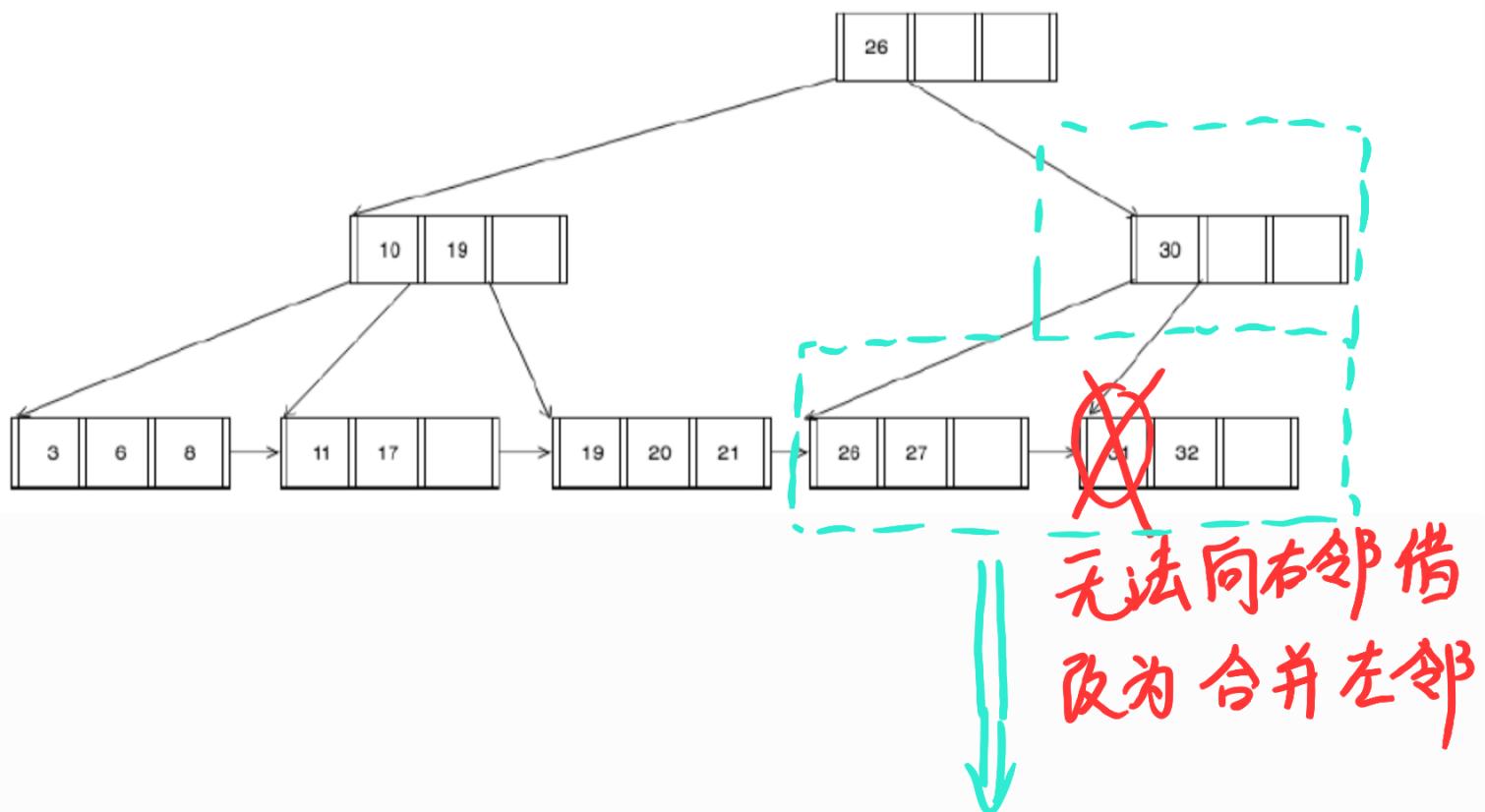
依题设，向右邻节点借



Answer :



(iv) delete 31 from original B+ Tree



Answer:

