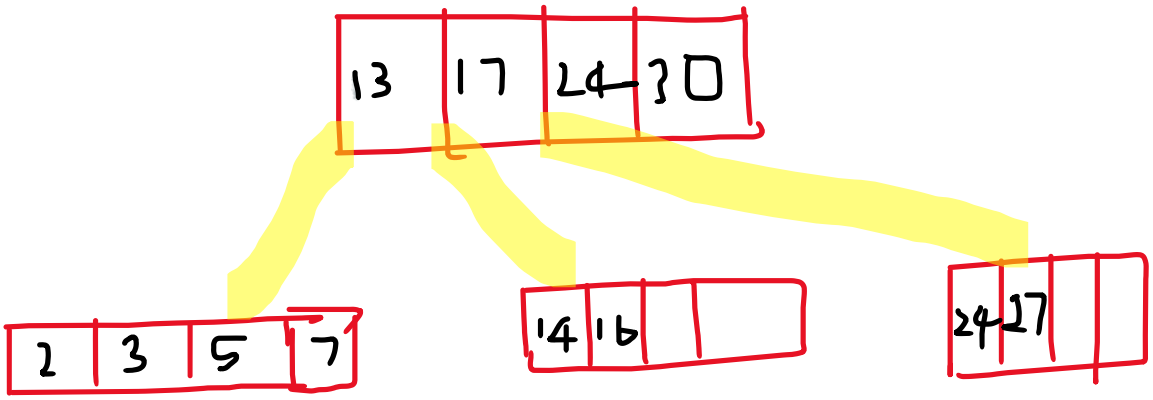
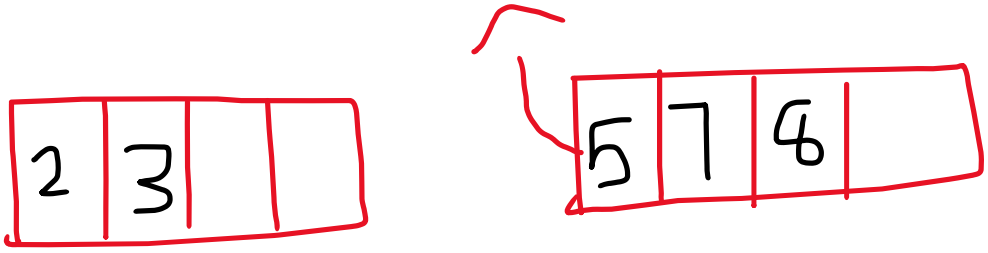
B+ tree insert

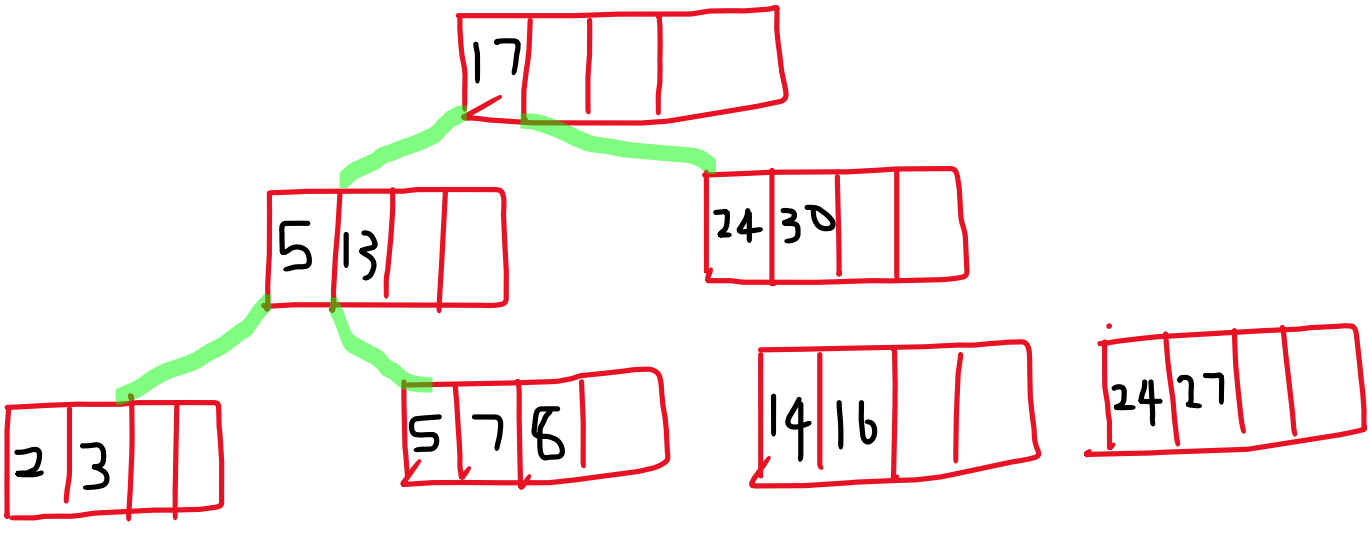


Hitann iht B+ tree ekt 8 insert krnn oni kiyla. Etkota meke venne me vge seen ekak. 8 pallehatta conditions valata anuva availla place vena (parent t vada kuda nm left and equal or vishalanm right). Ehidi 8 enne (2,3,5,7) node ekt. But ema node eke enough space ekk na 8 save krgnn. Assume ek 8 natuva 15 una nm (14,16) node ekt eka avill e deka madin place venva(14,15,16) lesa. Ey save una gmn sort venva. But ape scenario ekt anuva ek enne (2,3,5,7,8) but eke 8 enn space ekk na.

Ehidi krnne meka dekt bedala mada agaya aran eka **copy up** krnva. Etkota venne mema



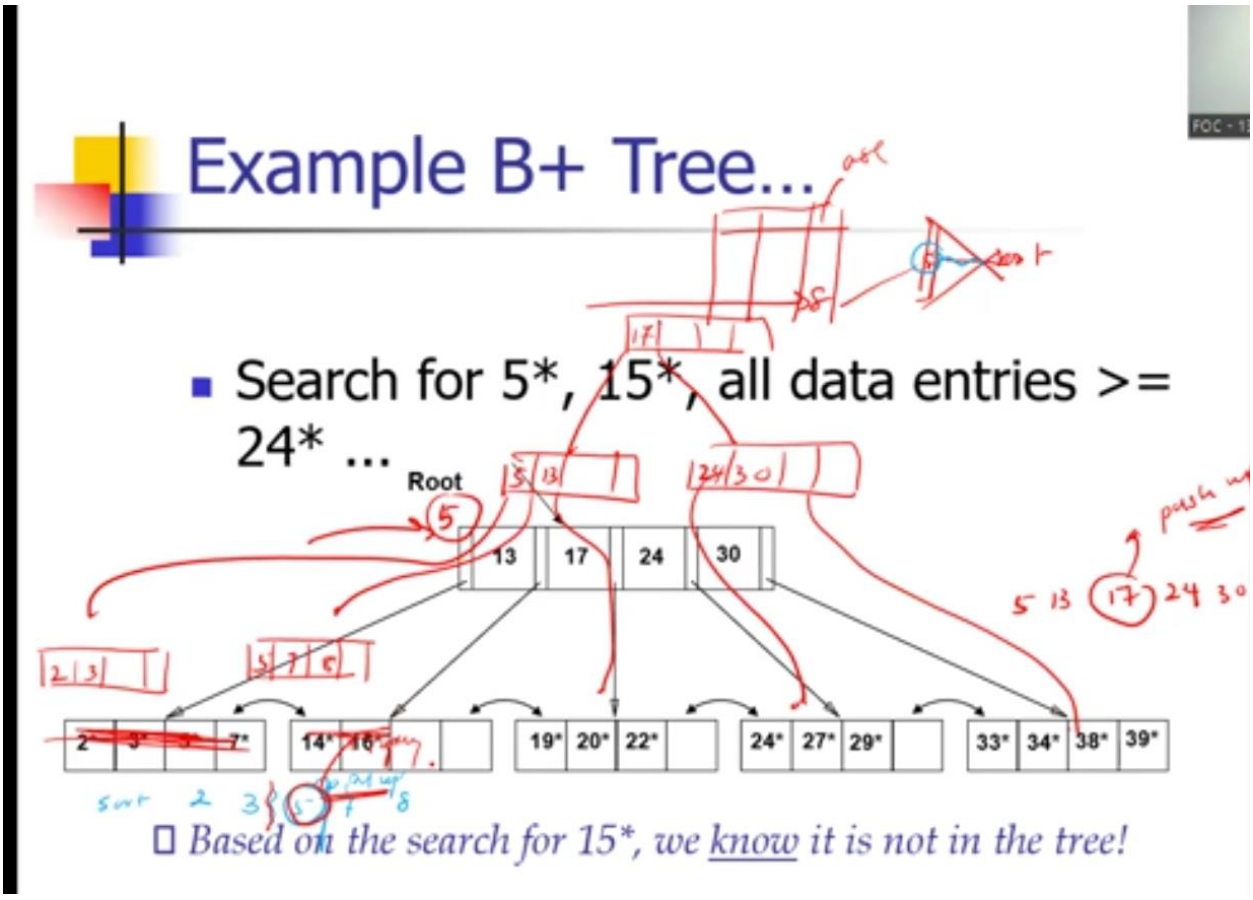
Passe 5 yanava udata. Parent ekt. Ehidi parent eke enough space ekk tiyeinm aulk na. but ema nattan ehidi venne **push up** krnva. Ehidi ape scenario ekt anuva etn space ek adui. Ek nisa value tika sort krl middle value ek push up krnva. Etkota ek tiyenne me vge



Push Up = Value ek remove krn udata ynva

Copy Up = Value ek etn tiyeddi copy ekk udata yavanava

Lecture note eka



Example For B+ tree

Student Table

Name	DOB	Age
Lahiru	2022/12/09	12
Sadun	2022/12/8	15
		11
		17
		20
		14
		19
		9
		13

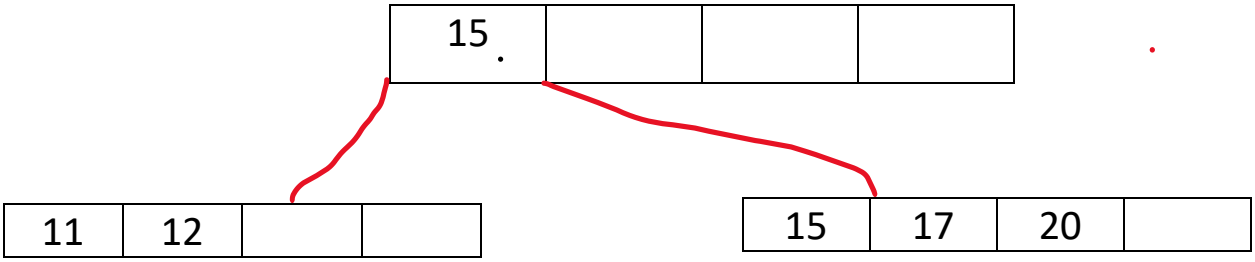
Then I'm going to create a B+ tree index for that table using the age column. Firstly, it will empty bcz table also empty. Then when we add data to table B+ tree index also fill it with that data. Assume api issellam Lahiru, sadun pilivelata data add krddi age avilla tiyenne 12,15,11,17 pilivelata. But ek table eke save vela tiyenne 11,12,15,17 vidiyt. Bcz kalin qwa vge index ekk data nitr save venne sorted vela.

(B+ tree ekk typical order number ek 100. It means one node can have 200 values. But in this case, we got 2 as an order number. So, one node can have 4 values)

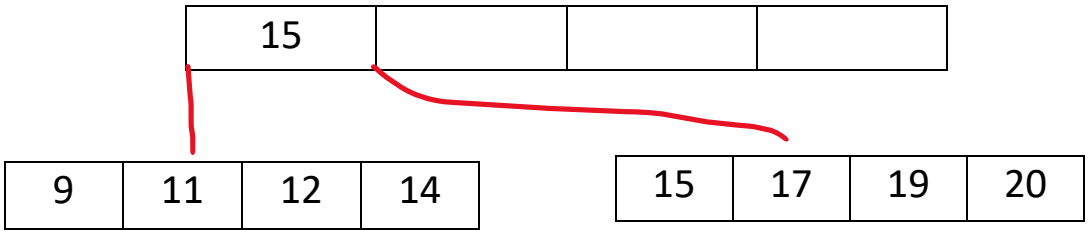
11	12	15	17

Then assume api passweni column ekat table ekt isert krddi e value ek(20) B+ tree index eket save venna oni. But first node ek full. Then api blmu ek krnne komada kiyla.

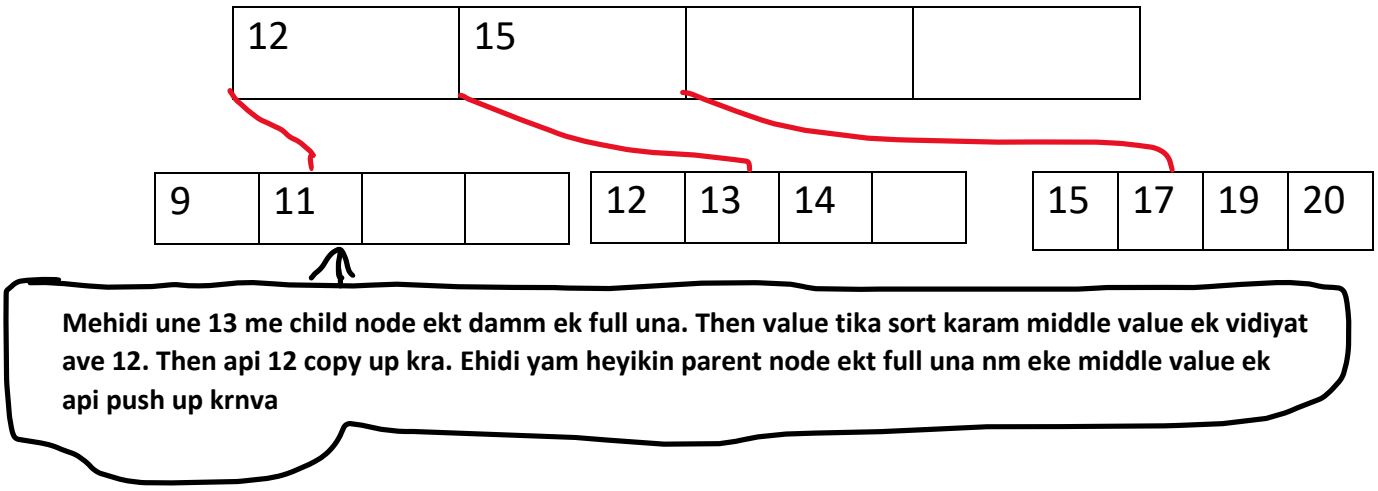
Issellam mekt 20 dala ek sorted krgnn oni. Etkota value tika enne 11,12,15,17,20 vidiyat. But apit ek node ekk tiyagann puluvn value 4k nisa ekk apita **copy up** krnn venva. Ehidi meke tiyn mada value ek api copy up krnva. Etkota diagram ek enne me vidiyt



Etana idn ilaga value tika add kr hati palleha tiynva. Then we will add 14, 19, 9, 12. **Hamatissema value ek add krl node ek sor krnva**

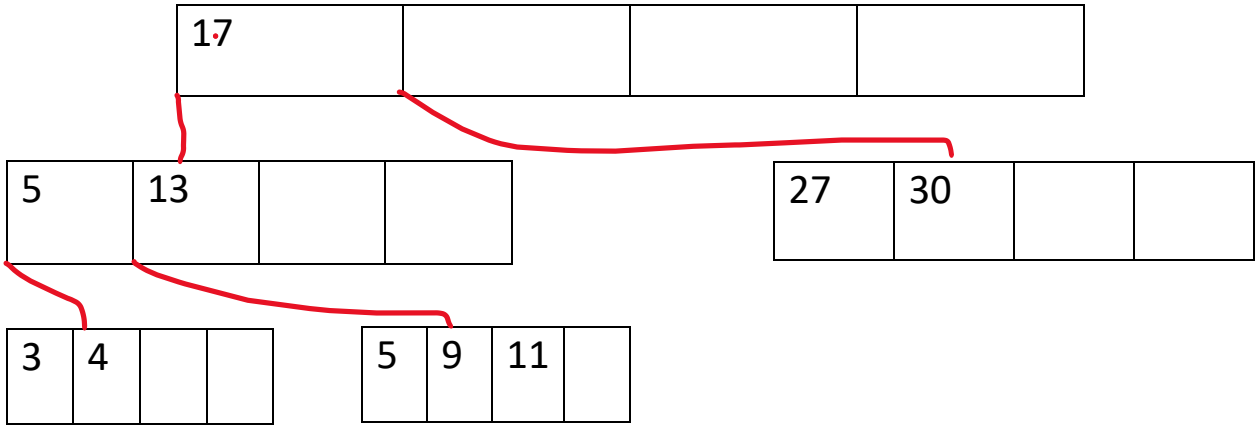


Finally, 13 add krn eka mm venam diagram ekkin pennannm,



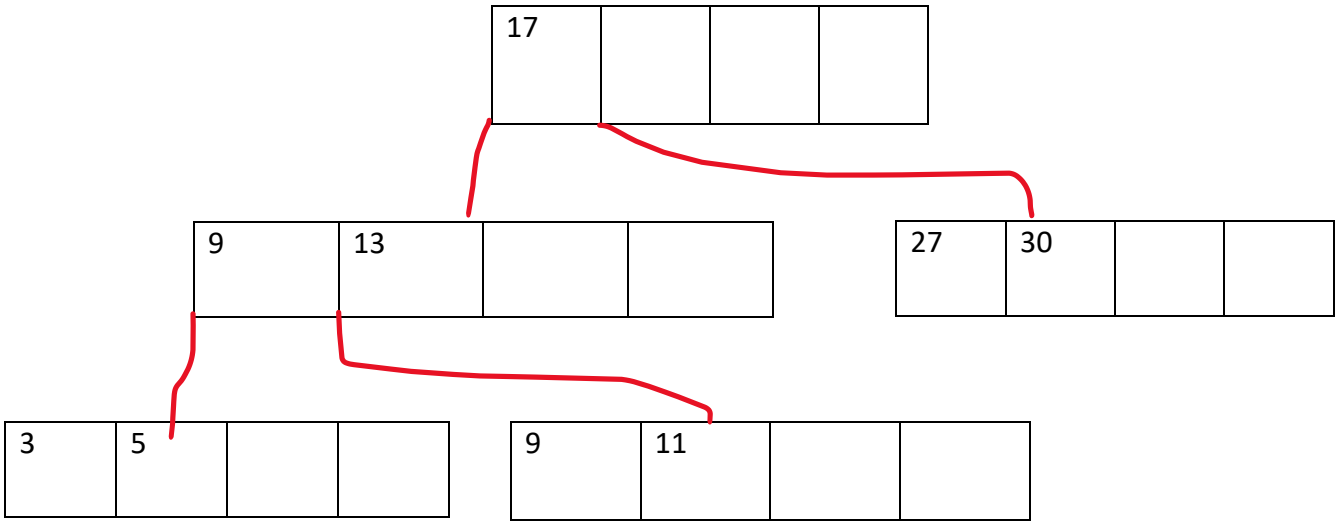
B+ tree Delete

B+ tree eke rule ekk tiyenva ek node ekk minimum 50% value tiyenna oni. E kiynne api gatta example vlt anuva ek node ekk aduma value 2kvt tiyenna oni. Root node ekk puluvn 50% vlt vada less than tiyagann. Anit evge ba. Root node ek kiynne parent node ekt.



Mekt anuva apita 11 or 9 or 6 agayan valine ekak delete krnn unot its ok. Bcz etkota value 2k ituru venva. But apita 3 or 4n ekak delete krnn oni unot vade aul ynva. Etkota 50% na e node eke.

Assume 4 delete krnva. Then e vge velavata api krnne 4 delete krl anit pattat damage ekk venne nati venna ehen value ekk gena eka. After finalizing krnva. Etkota e node deka enne memai



Tava aulk tiyenva meke assume apita me eke 5 ain krnn oni. Etkota apita ekt anit node eke help ek gannt ba. Bcz eket dn tiyenne 50%. Then like that situation ekk api krnne e node deka merge krna eka Ehidi tibba node deka delete krl alut ekk tama hadenne. Itin tibb node deka delete una nisa e parent node ekt child node nati nisa e parent node ek api remove krnva. Ape scenario ekt anuva 9. The etnat aulk tiyei e parent node eket 50% data na. Then api aaai krnne e parent node dekat akatu krna eka. Ehidida tibba node deka delete vela alut ekak hadenva. Itin etota Root node ektd child la natin isa ekt ara merge krpu alut node ekt danava. Then ek mema avasanat enne