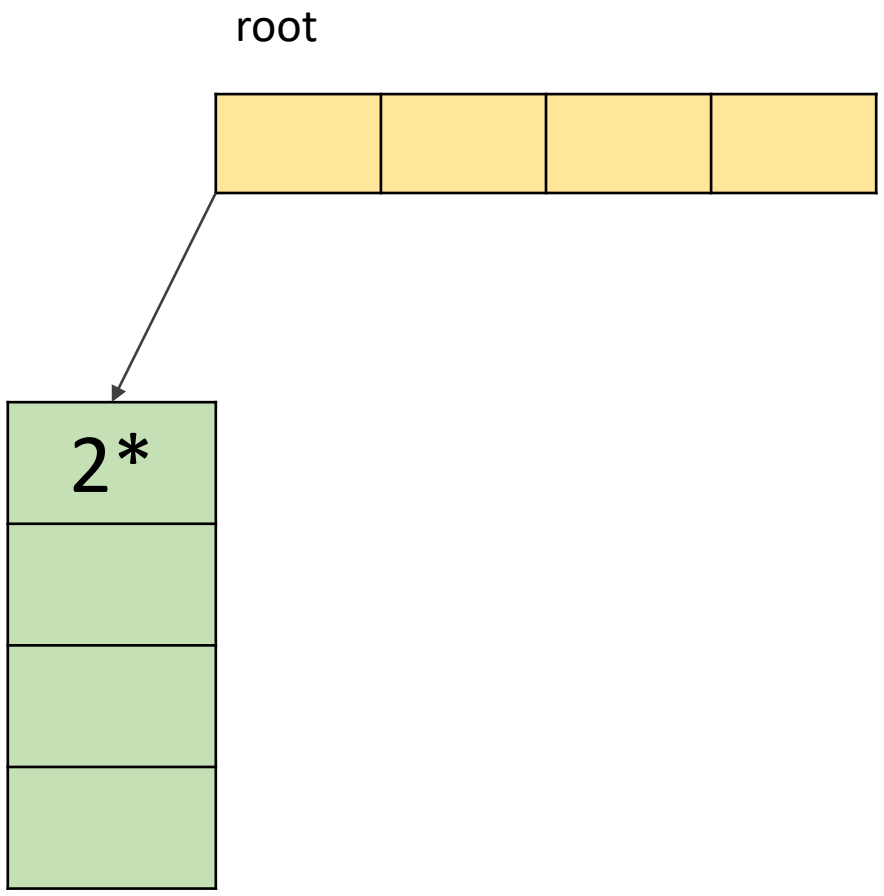
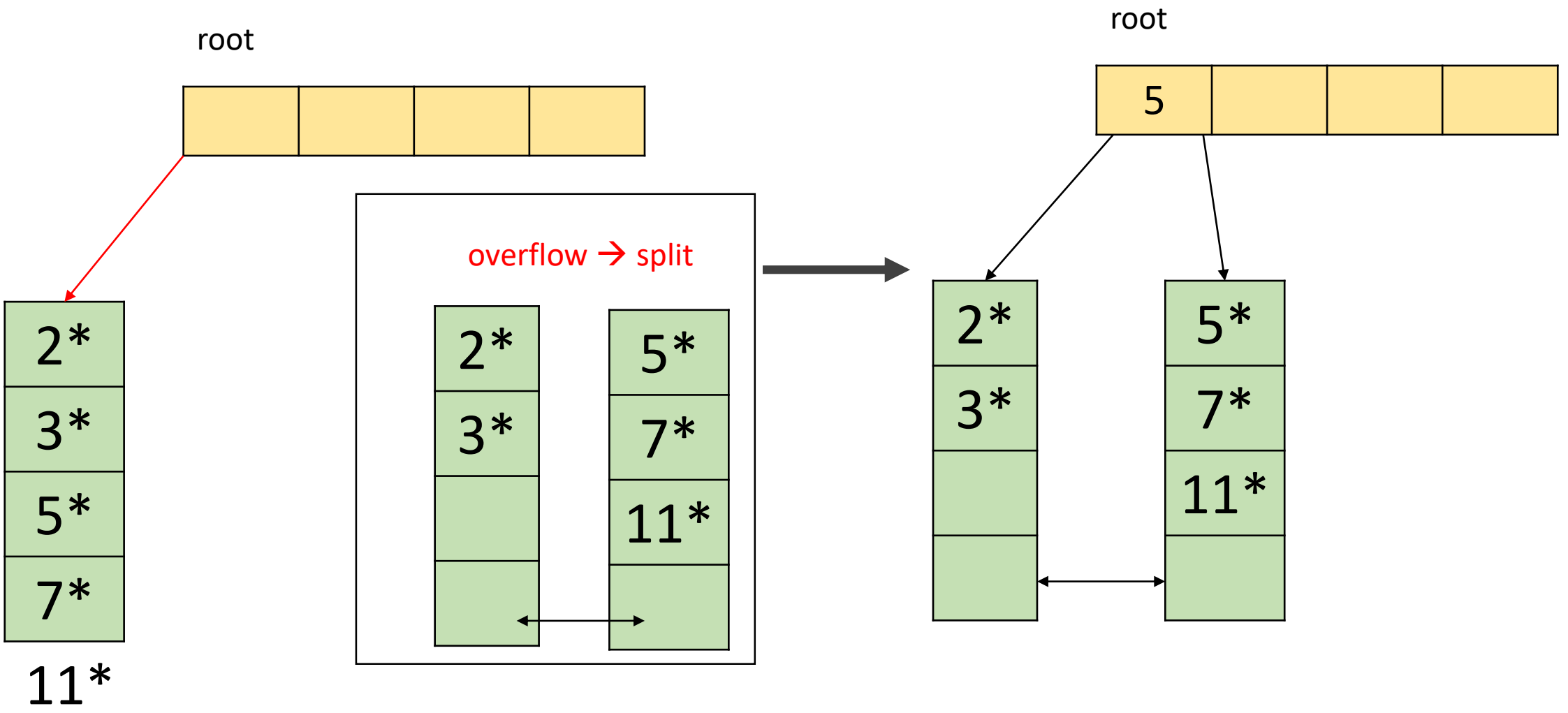
D1

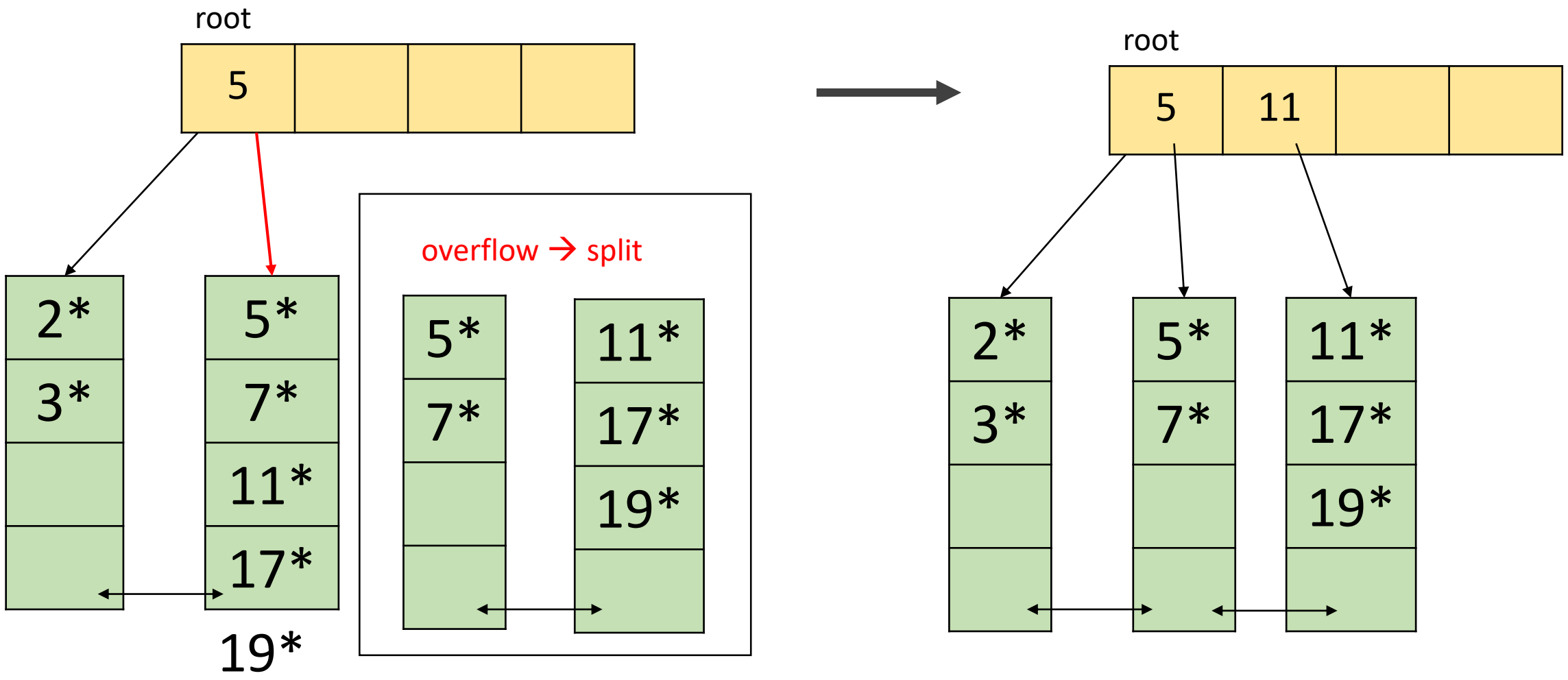
insert2



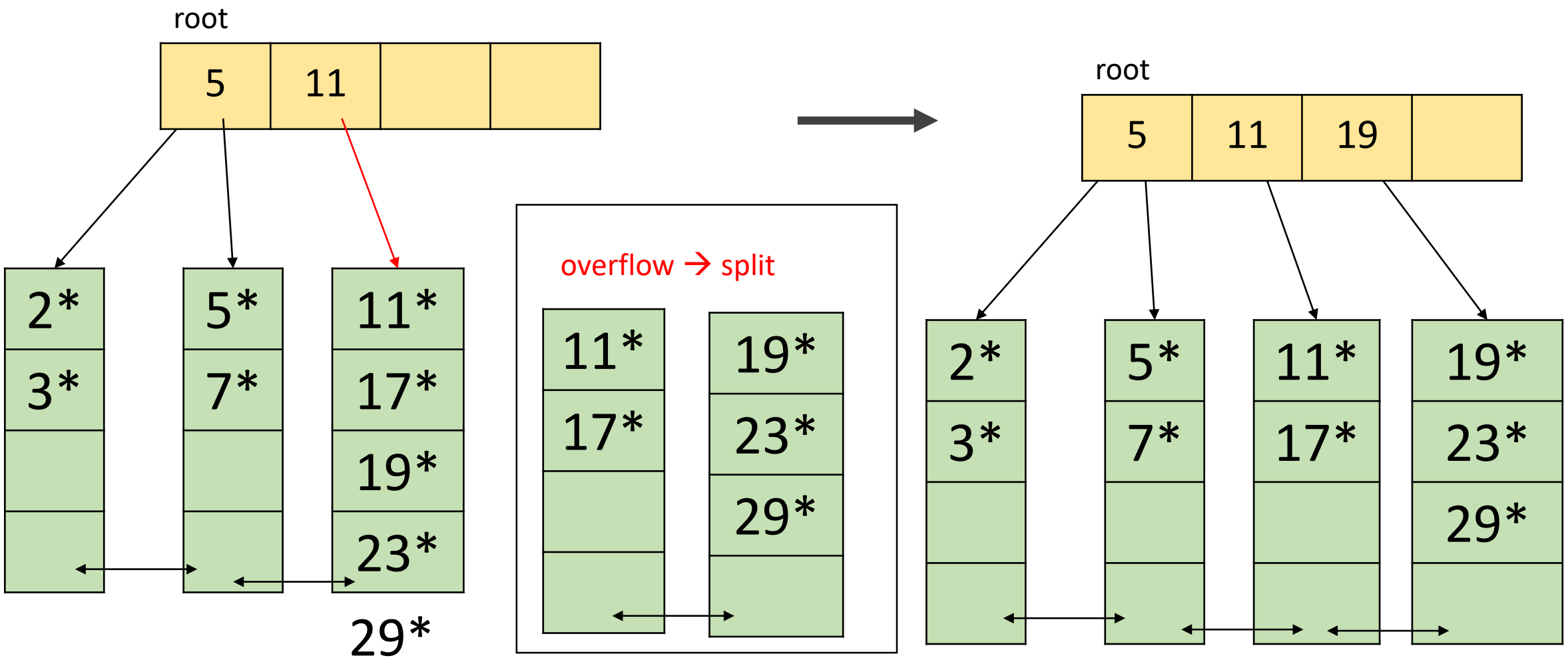
Insert 11



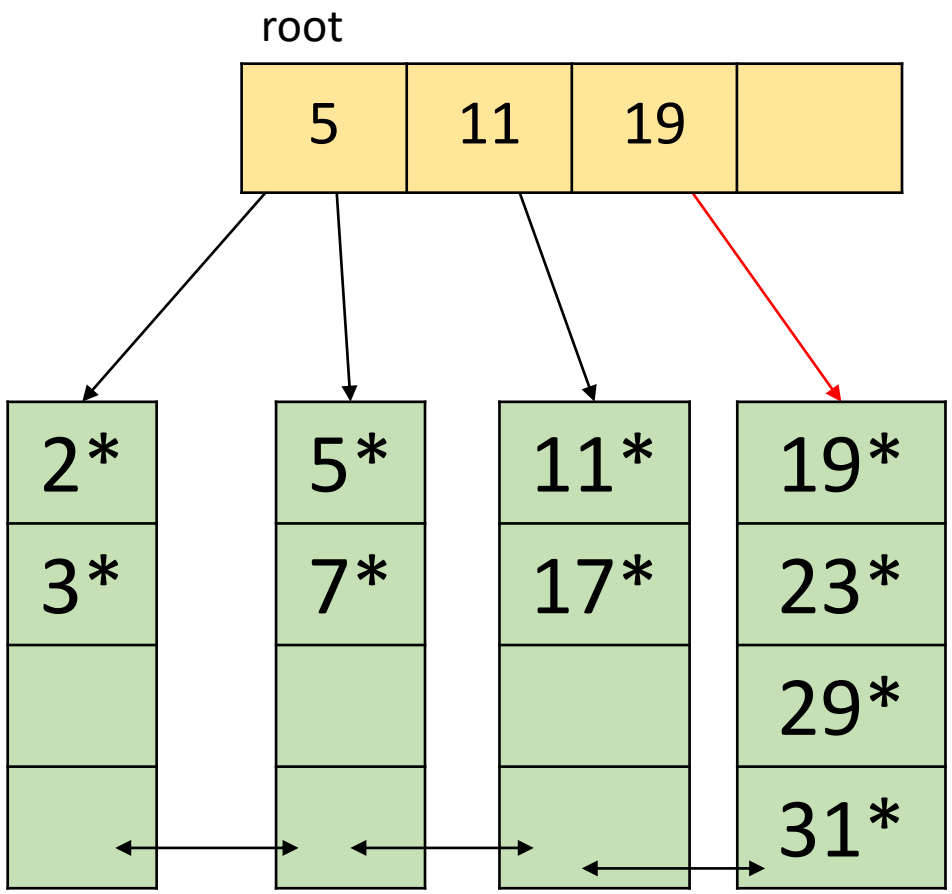
Insert 19


root
5
2*
3*
5*
7*
11*
17*
19*
overflow → split
5*
7*
11*
19*
root
5
11
2*
3*
5*
7*
11*
17*
19*

Insert 29

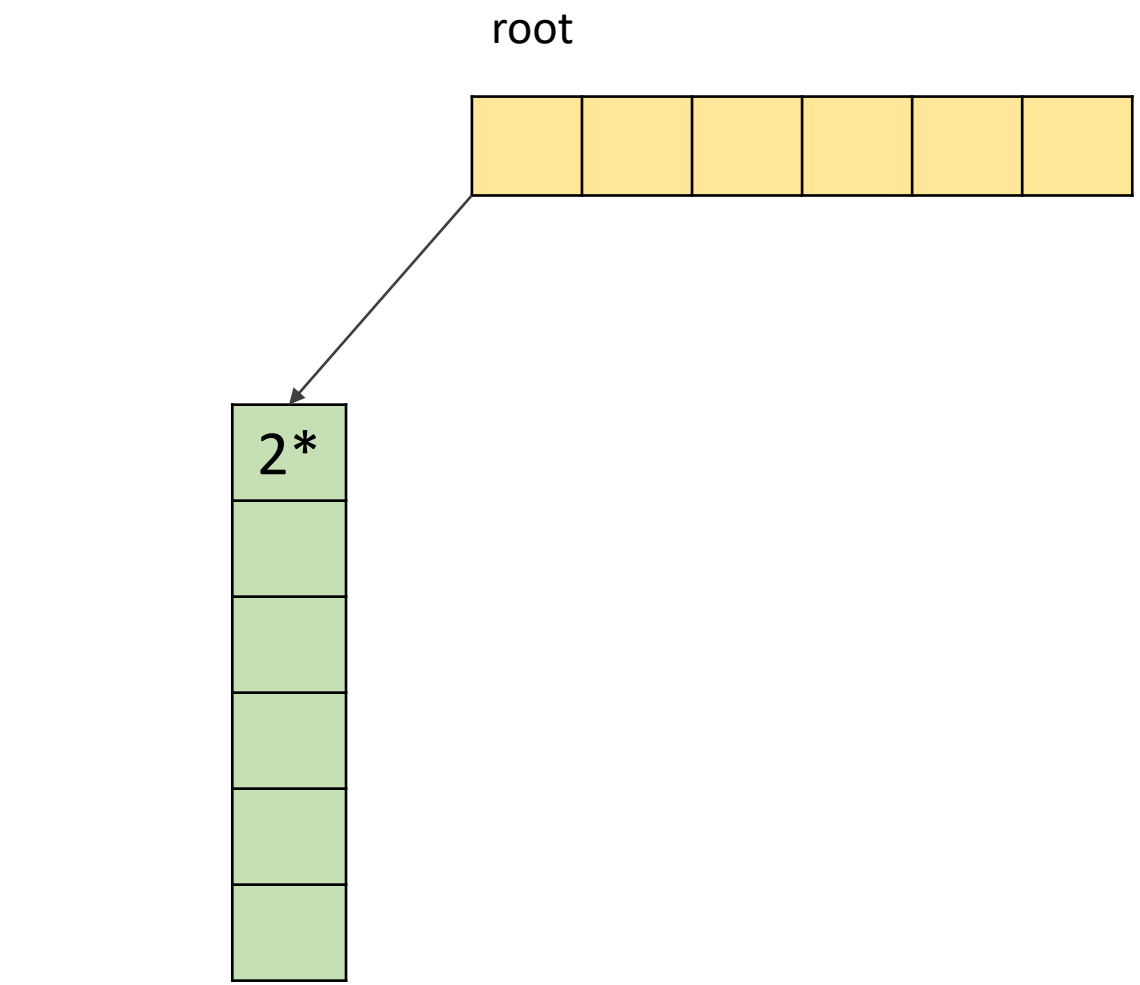

root
5
11
2*
3*
5*
7*
11*
17*
19*
23*
29*
overflow → split
11*
17*
19*
23*
29*
root
5
11
19
2*
3*
5*
7*
11*
17*
19*
23*
29*

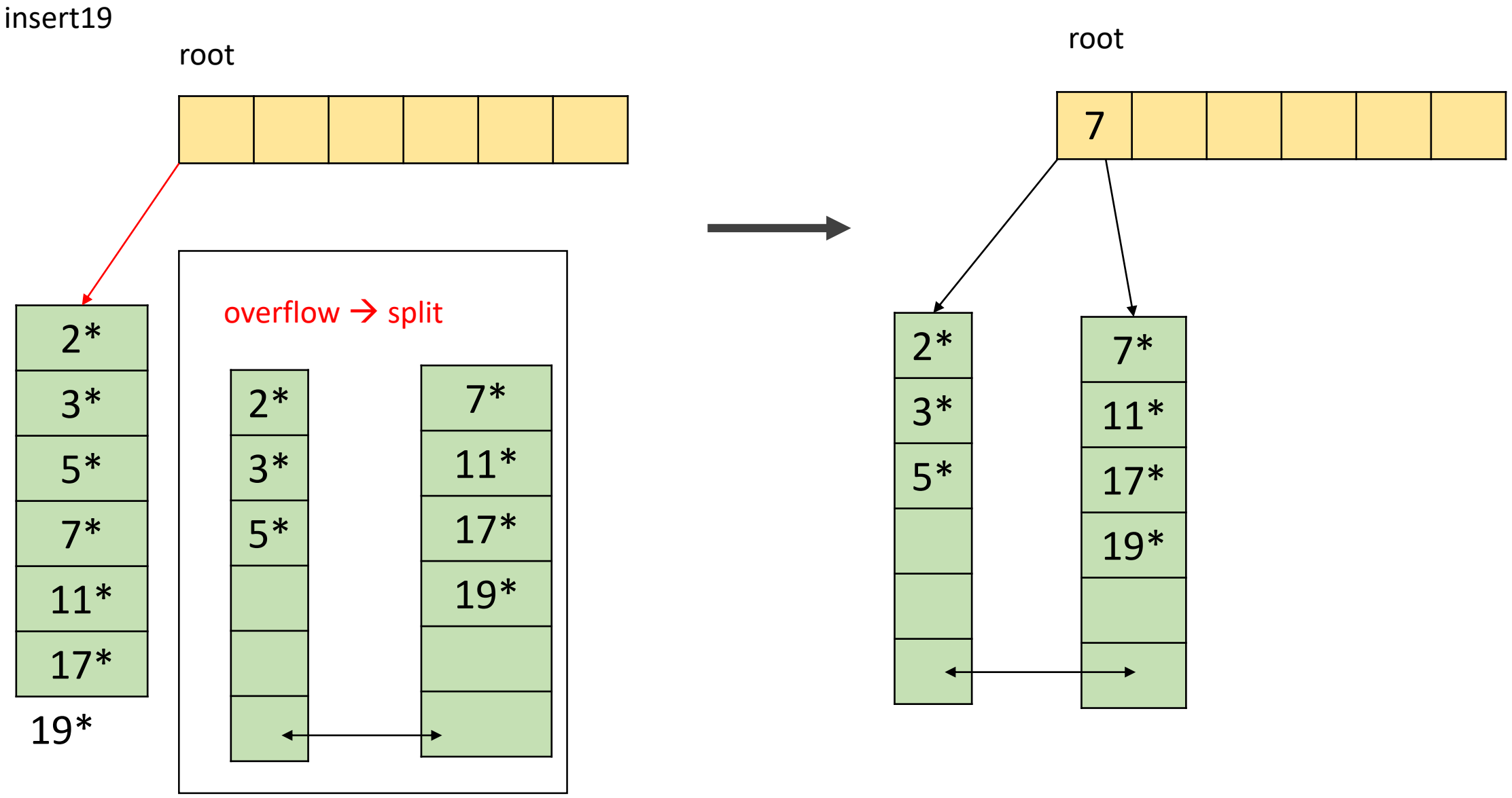
Insert 31



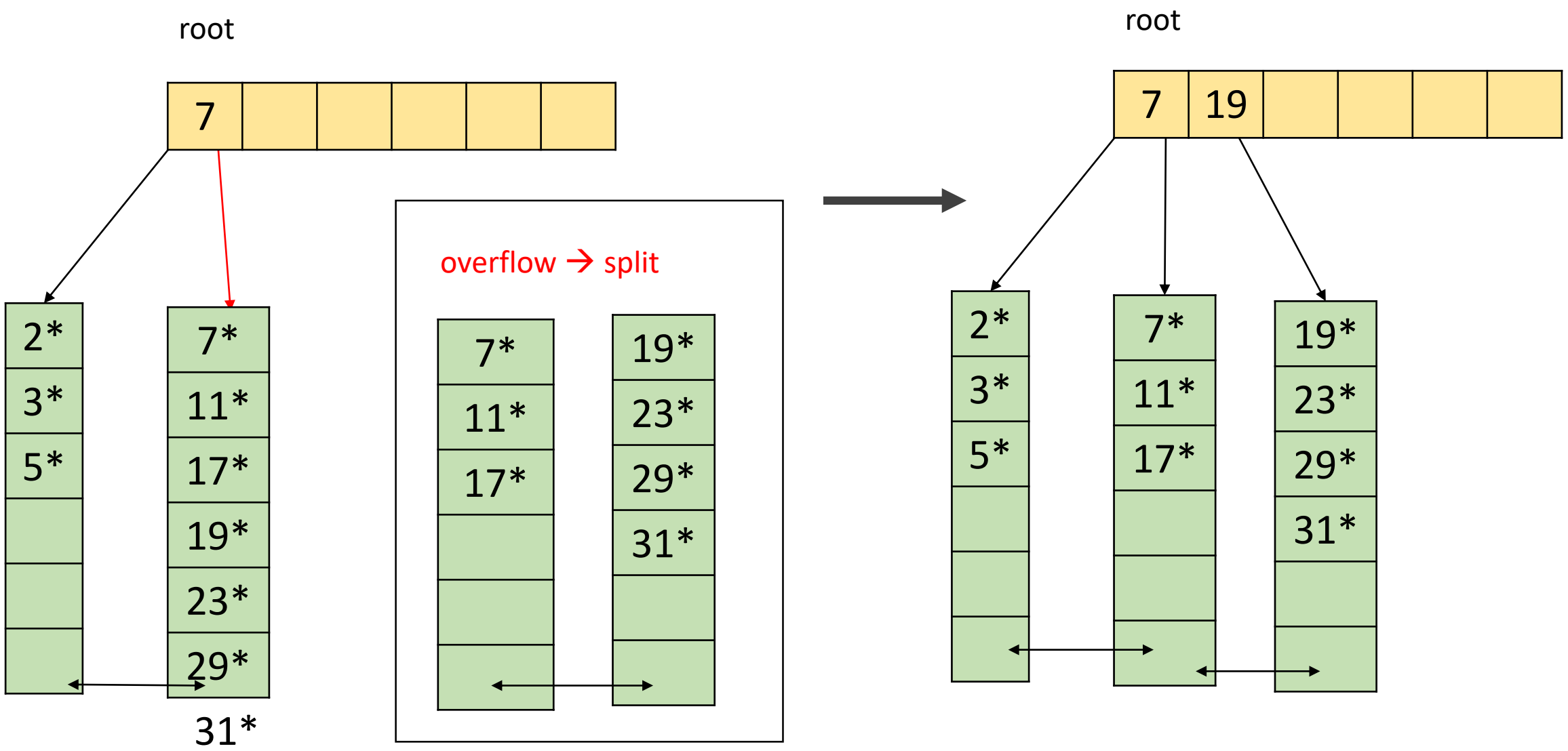
D2

insert2



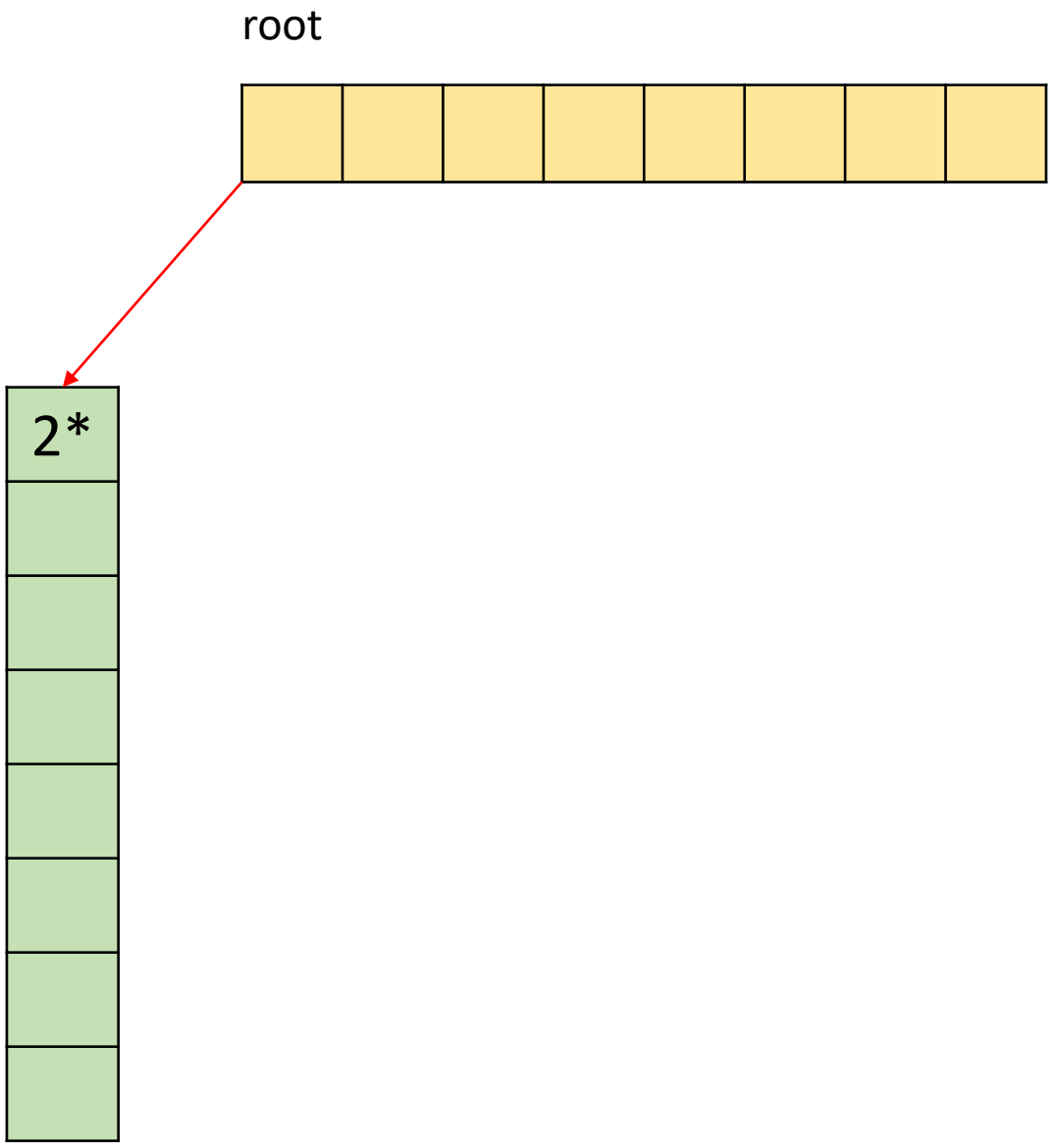

insert19
root
2*
3*
5*
7*
11*
17*
19*
overflow → split
2*
3*
5*
7*
11*
17*
19*
root
7
2*
3*
5*
7*
11*
17*
19*

insert31

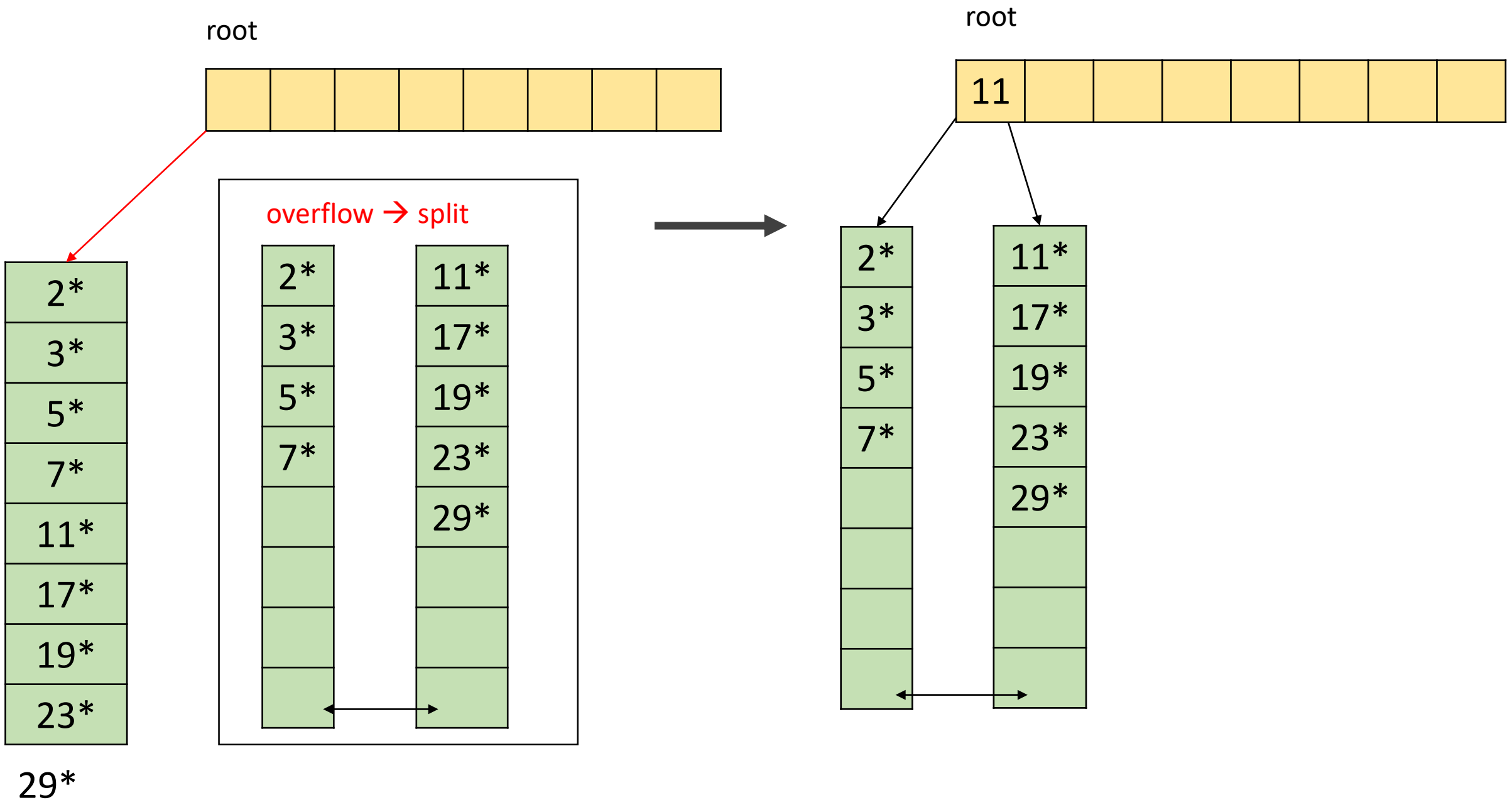

root
7
2*
3*
5*
7*
11*
17*
19*
23*
29*
31*
overflow → split
7*
11*
17*
19*
23*
29*
31*
root
7
19
2*
3*
5*
7*
11*
17*
19*
23*
29*
31*

D3

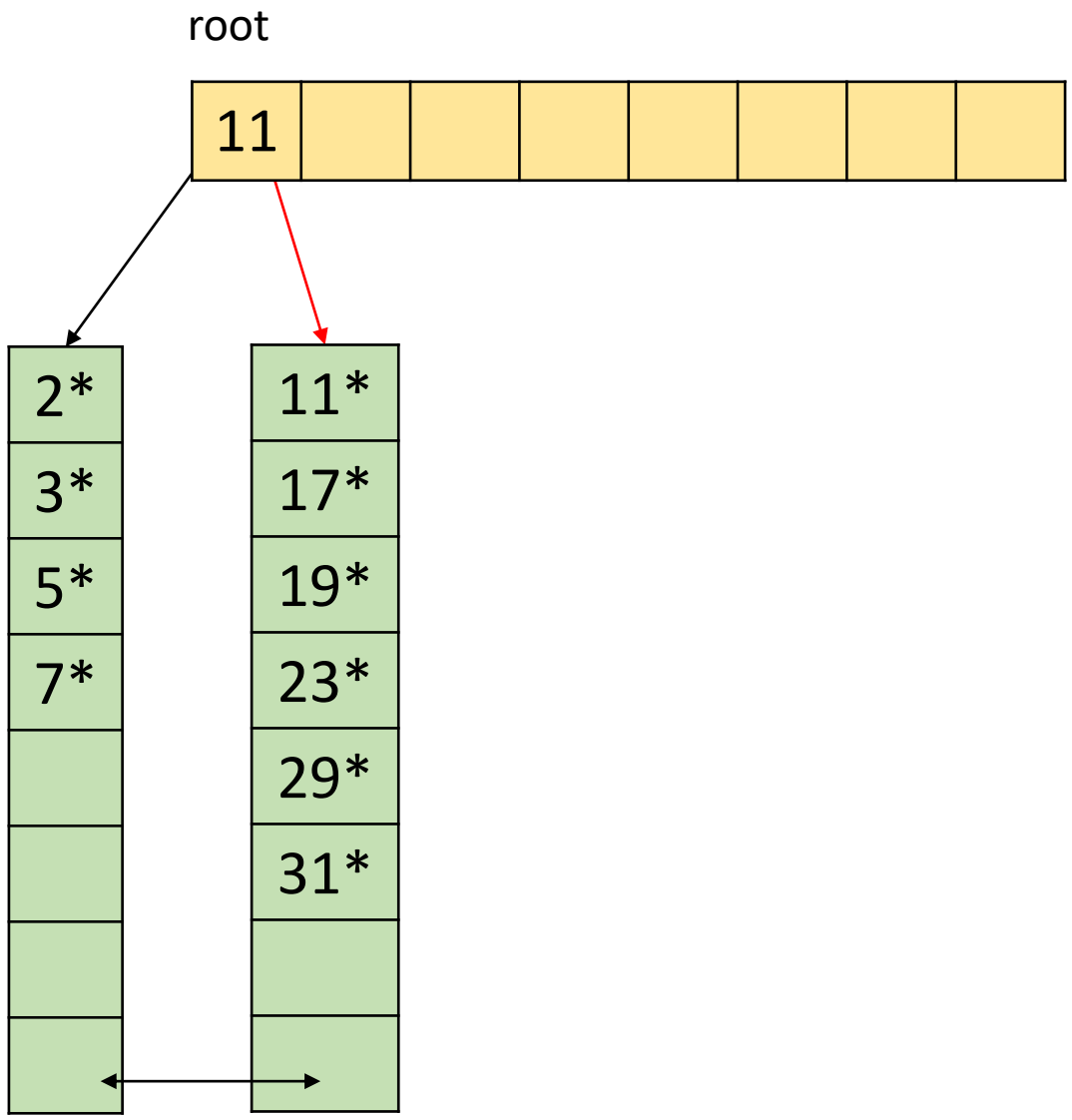
insert2



insert29

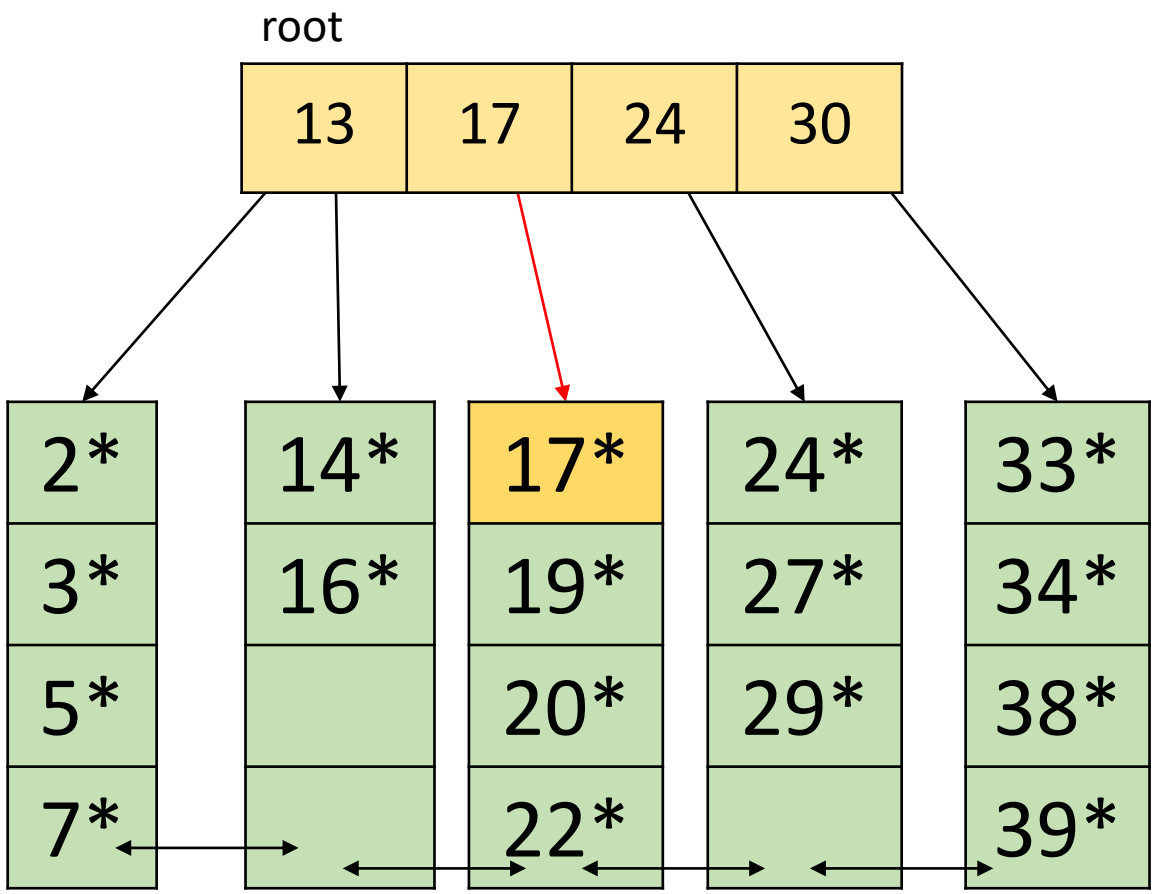

root
2*
3*
5*
7*
11*
17*
19*
23*
29*
overflow → split
2*
3*
5*
7*
11*
17*
19*
23*
29*
root
11
2*
3*
5*
7*
11*
17*
19*
23*
29*

insert31

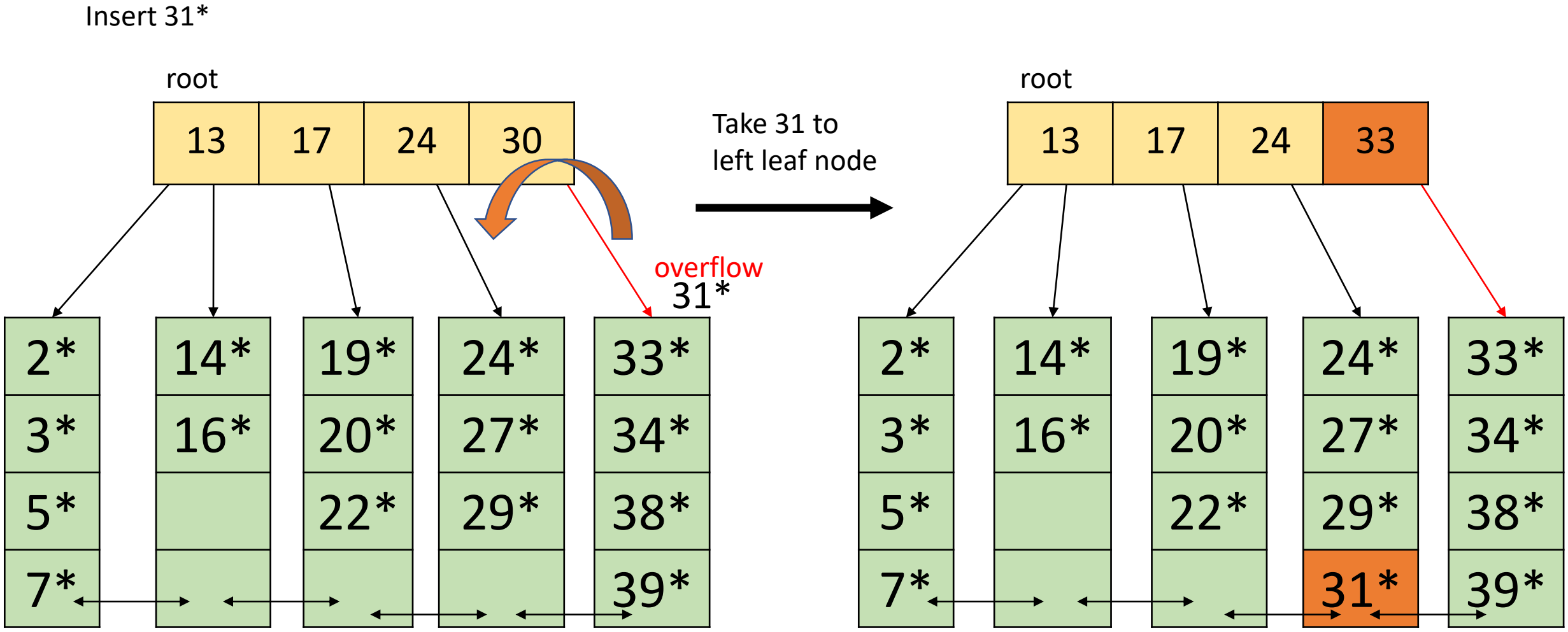


E1

Insert 17*

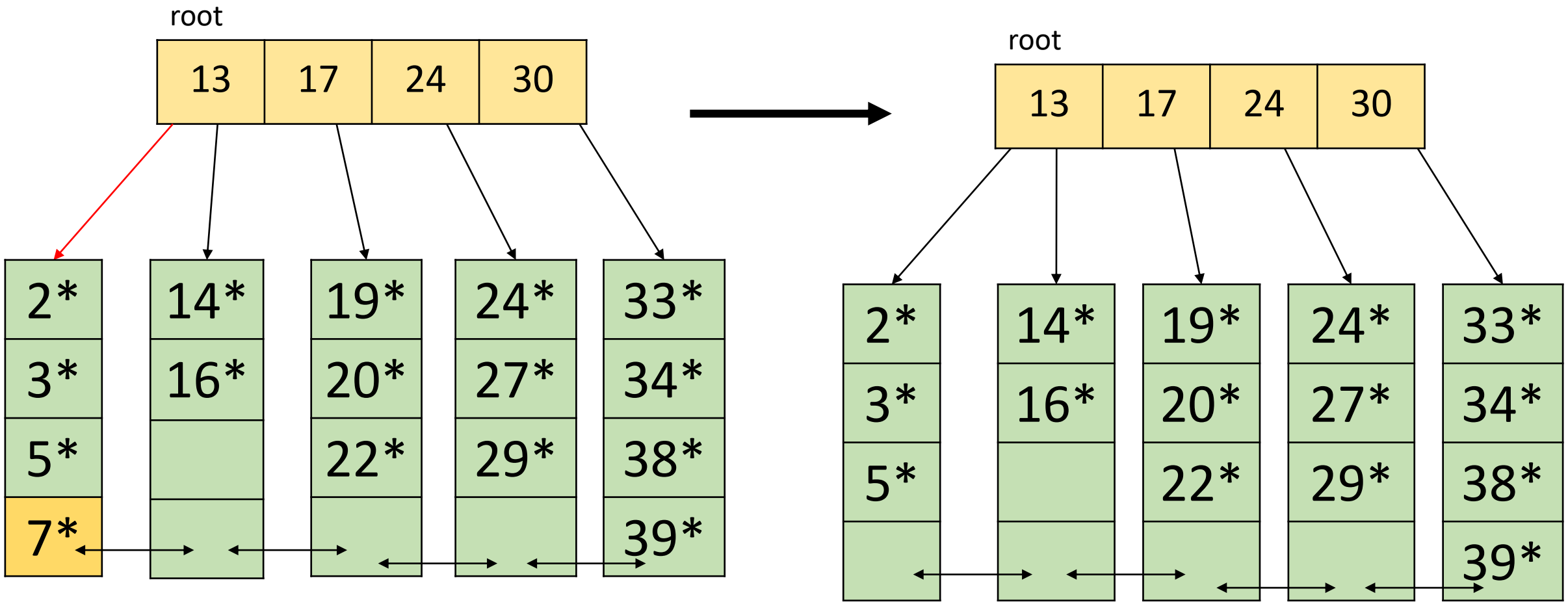


E2

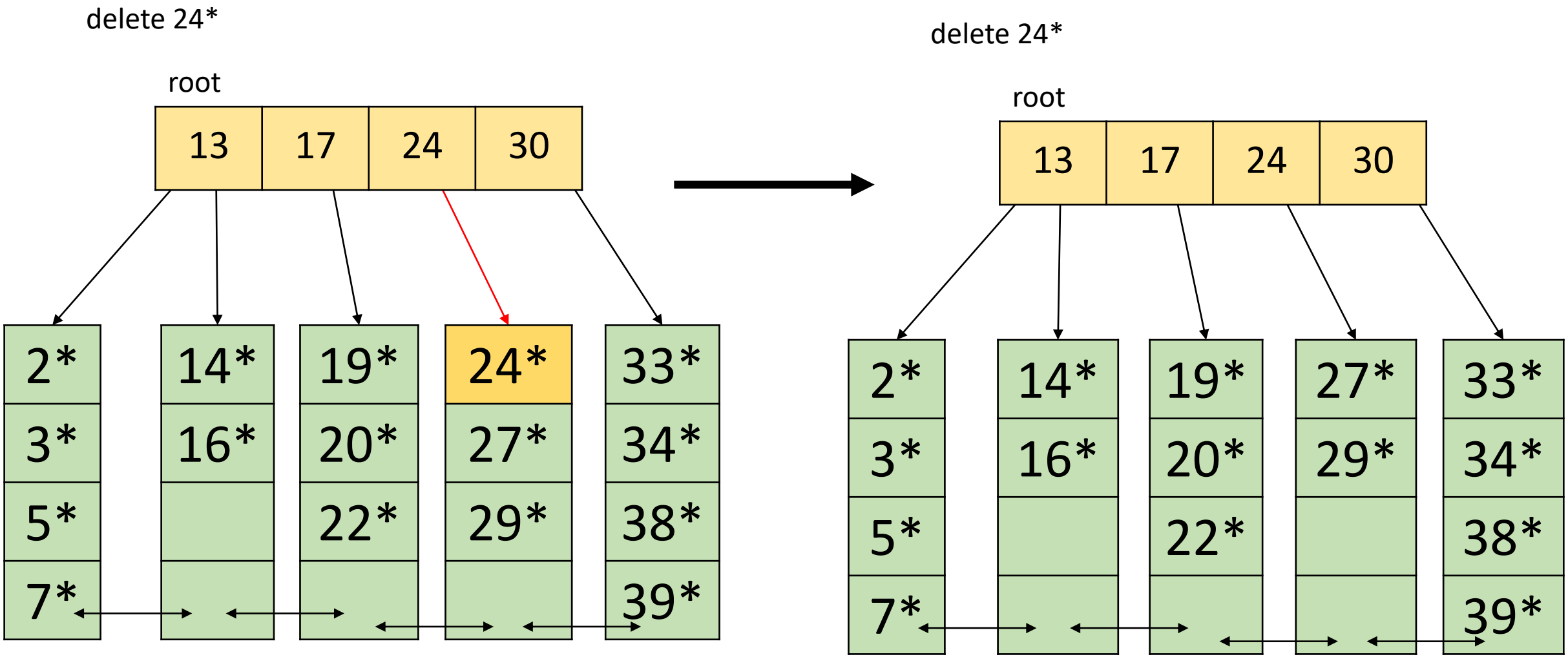

Insert 31*
root
13
17
24
30
overflow
31*
Take 31 to
left leaf node
root
13
17
24
33
2*
3*
5*
7*
14*
16*
19*
20*
22*
24*
27*
29*
31*
33*
34*
38*
39*

E3

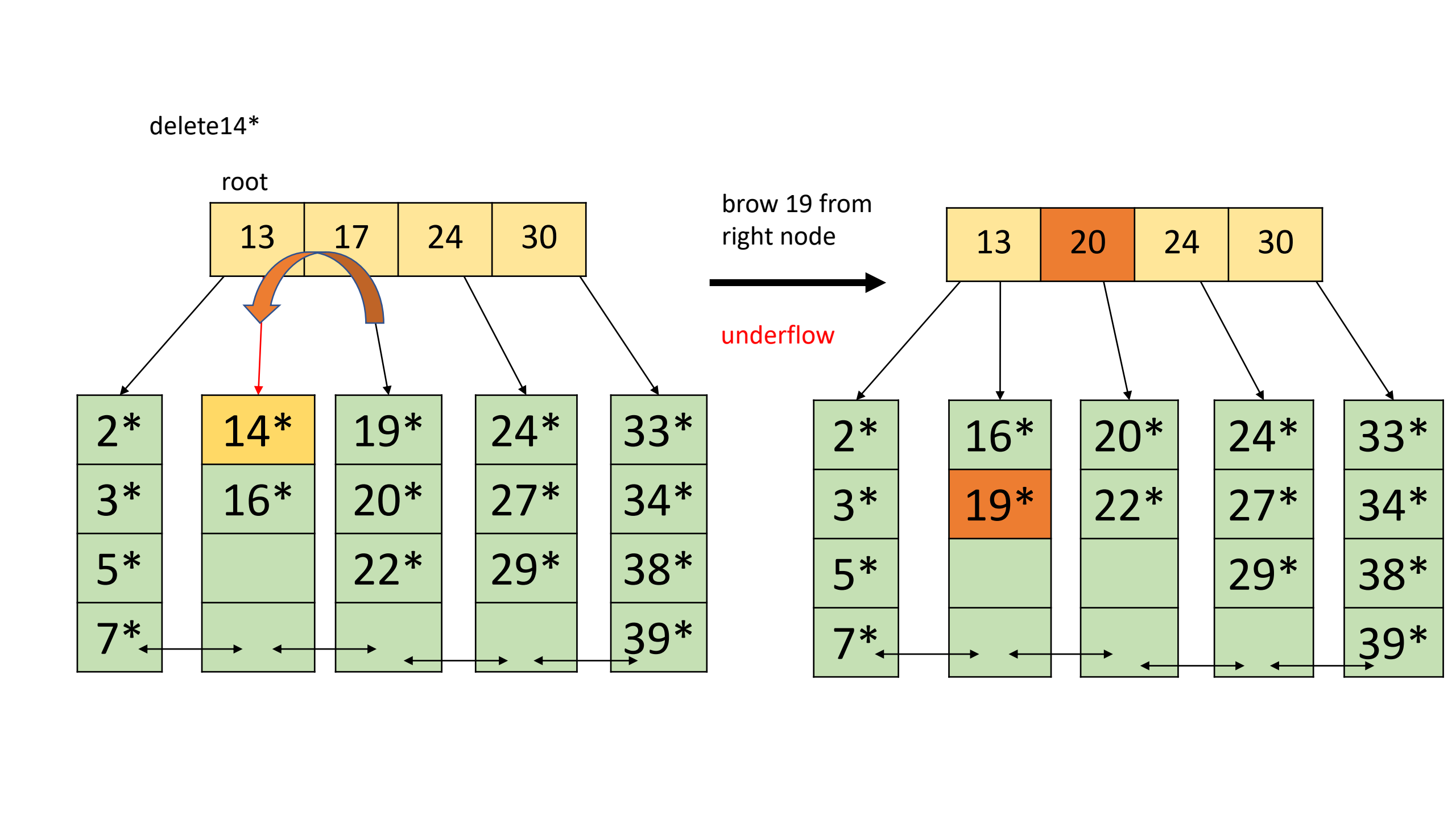
Delete 7*


root
13
17
24
30
2*
3*
5*
7*
14*
16*
19*
20*
22*
24*
27*
29*
33*
34*
38*
39*
root
13
17
24
30
2*
3*
5*
14*
16*
19*
20*
22*
24*
27*
29*
33*
34*
38*
39*

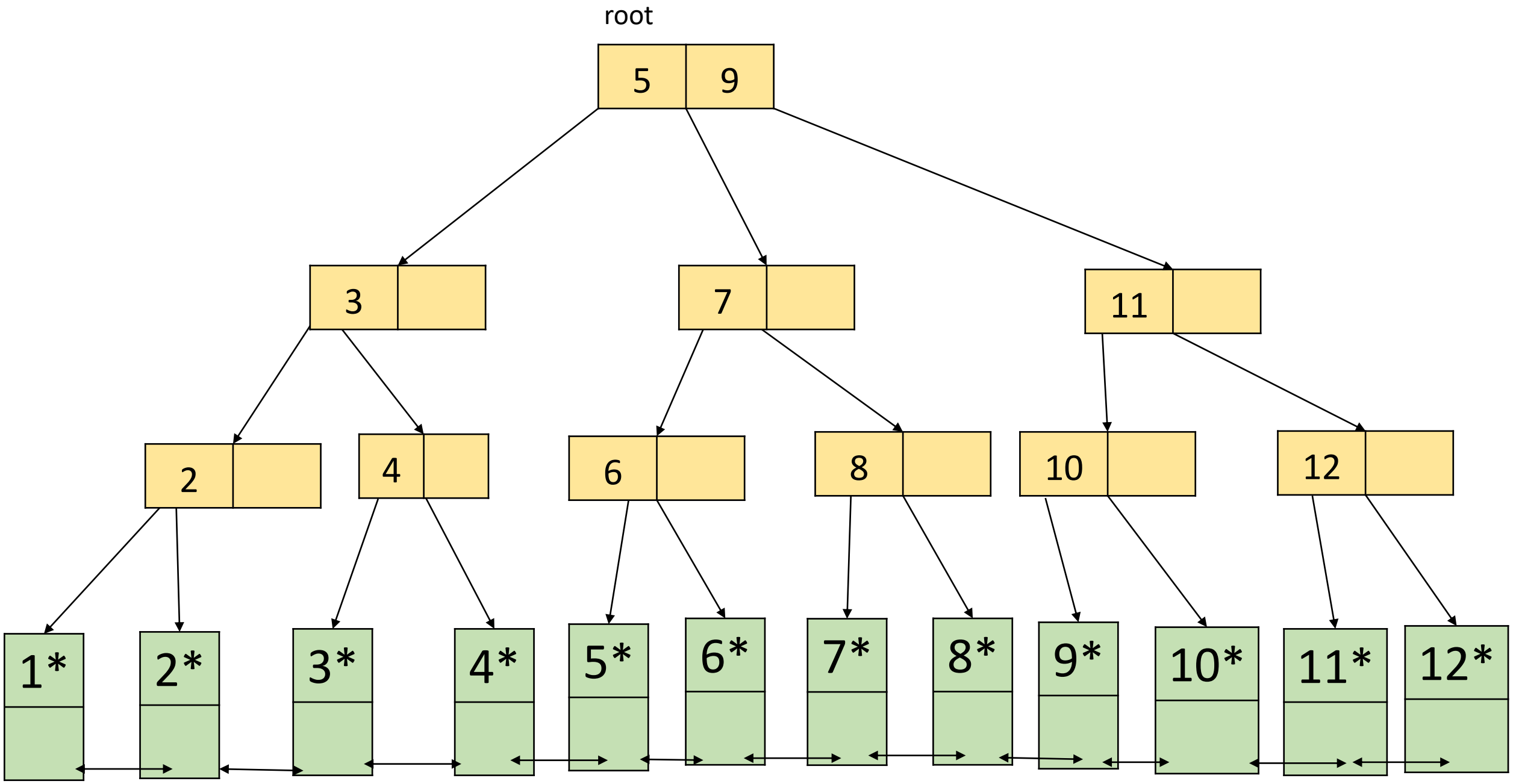
E4

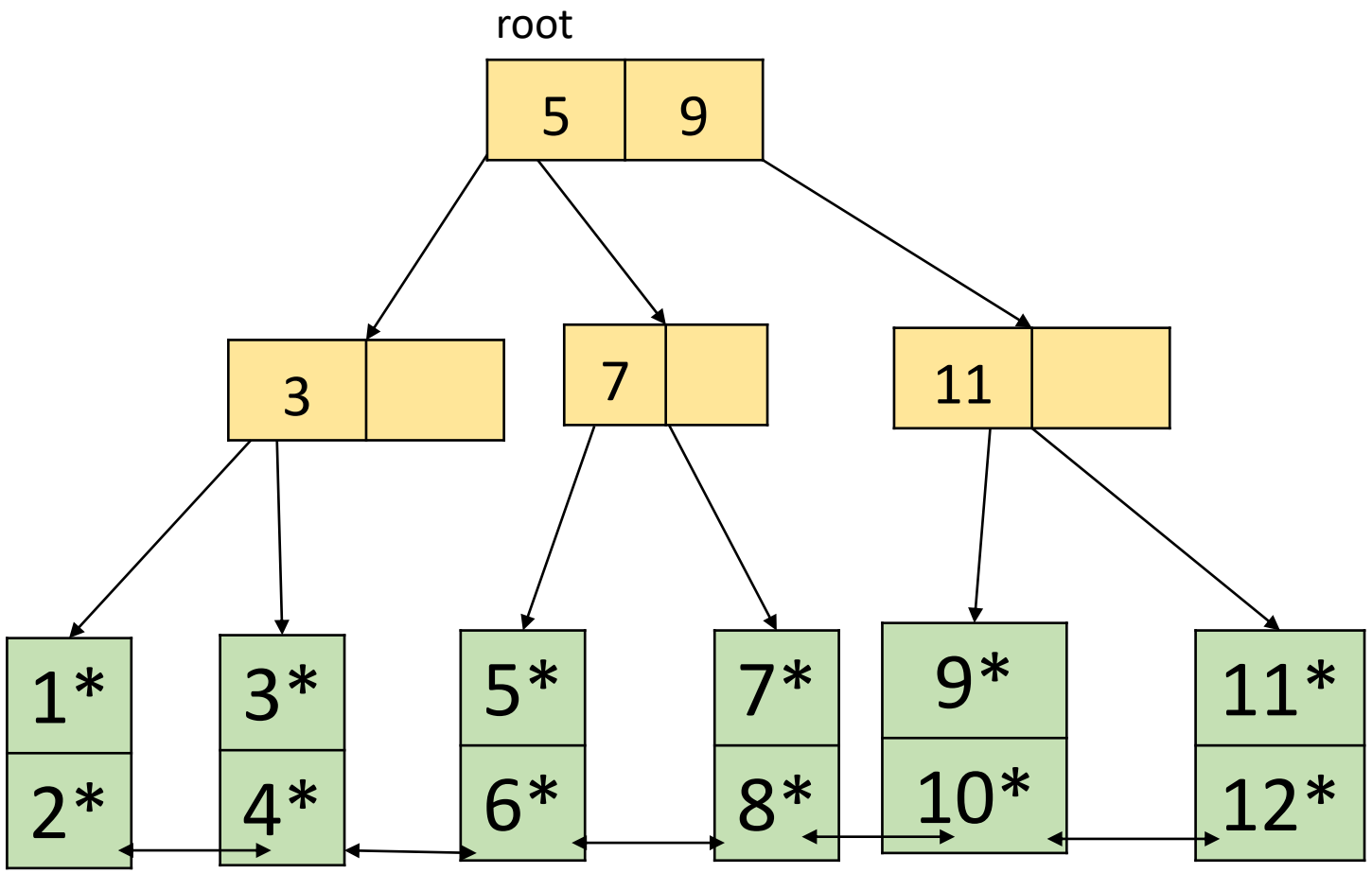

delete 24*
root
13
17
24
30
2*
3*
5*
7*
14*
16*
19*
20*
22*
24*
27*
29*
33*
34*
38*
39*
delete 24*
root
13
17
24
30
2*
3*
5*
7*
14*
16*
19*
20*
22*
27*
29*
33*
34*
38*
39*

E5

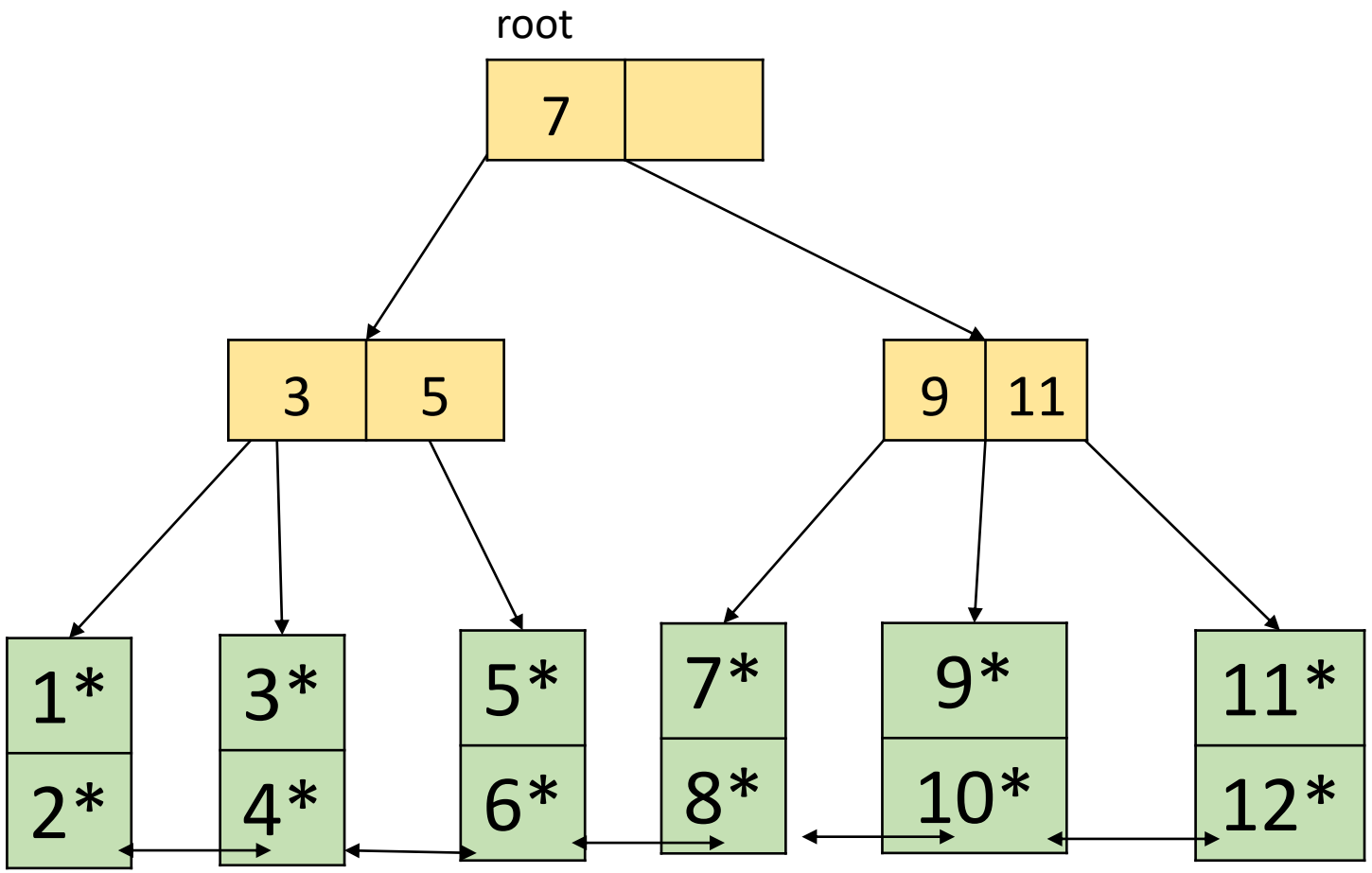

delete14*
root
13
17
24
30
2*
3*
5*
7*
14*
16*
19*
20*
22*
24*
27*
29*
33*
34*
38*
39*
brow 19 from
right node
underflow
13
20
24
30
2*
3*
5*
7*
16*
19*
20*
22*
24*
27*
29*
33*
34*
38*
39*

F3

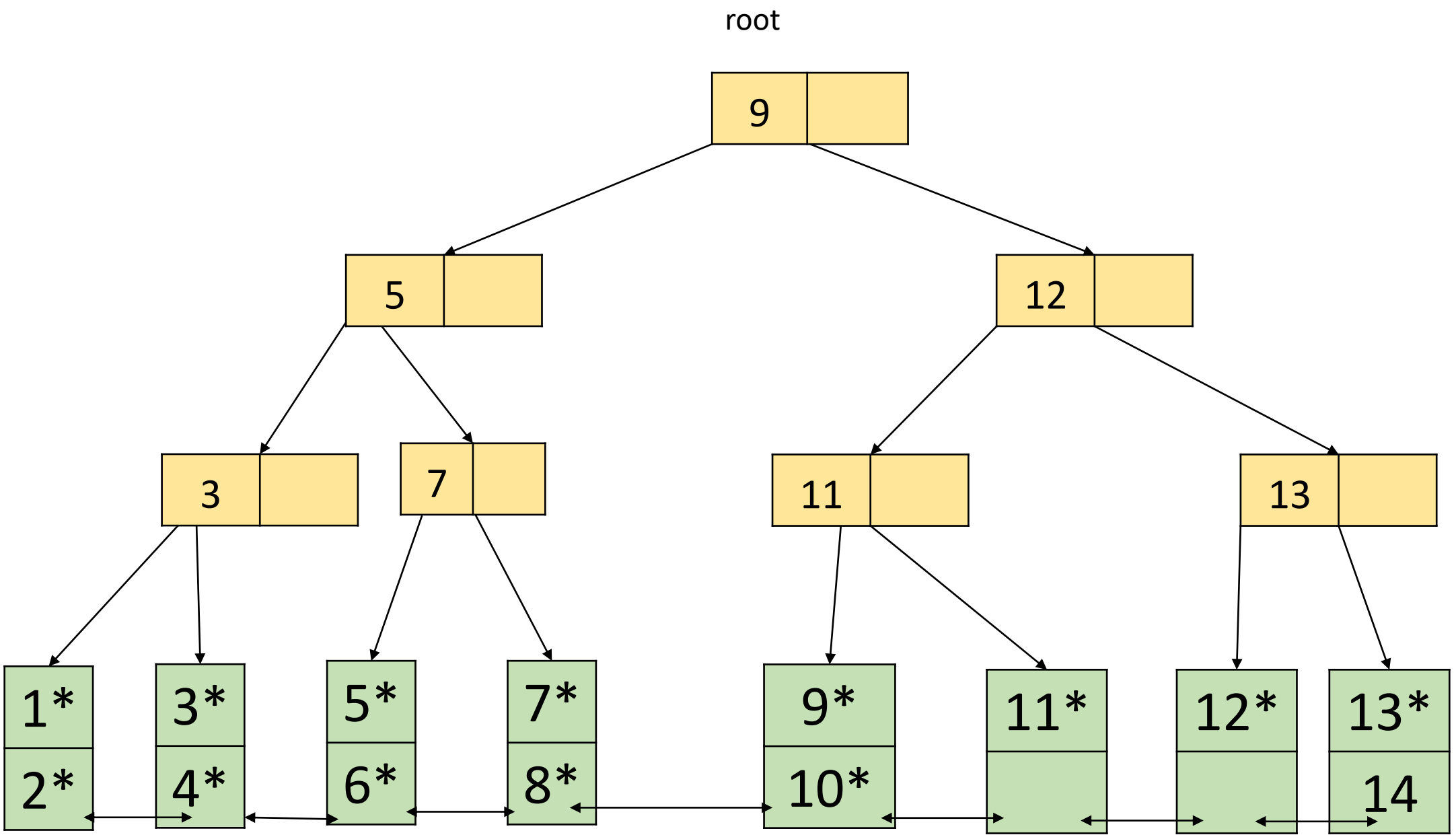

root
5
9
3
7
11
2
4
6
8
10
12
1*
2*
3*
4*
5*
6*
7*
8*
9*
10*
11*
12*


root
5
9
3
7
11
1*
2*
3*
4*
5*
6*
7*
8*
9*
10*
11*
12*

F4

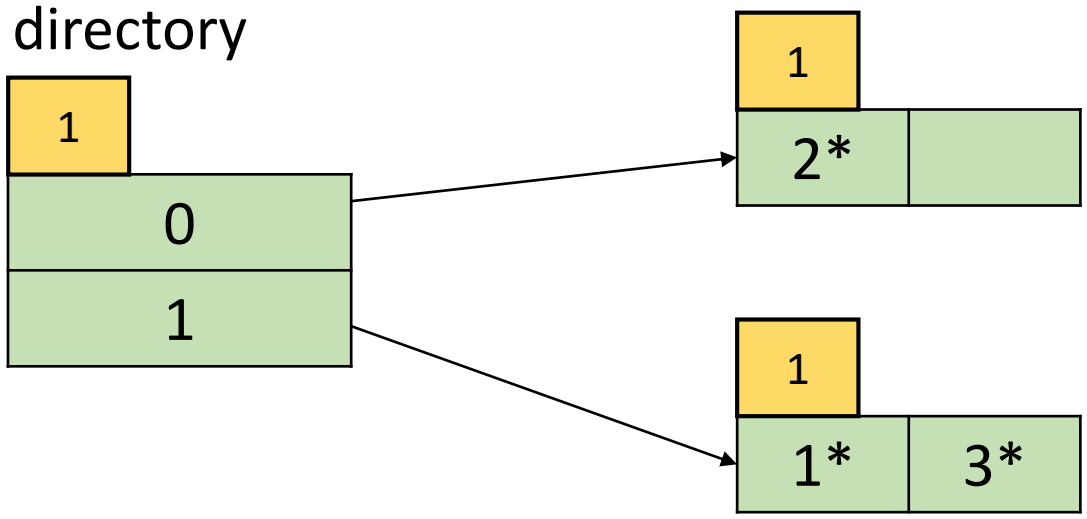

root
7
3
5
9
11
1*
2*
3*
4*
5*
6*
7*
8*
9*
10*
11*
12*

F5


root
9
5
12
3
7
11
13
1*
2*
3*
4*
5*
6*
7*
8*
9*
10*
11*
12*
13*
14

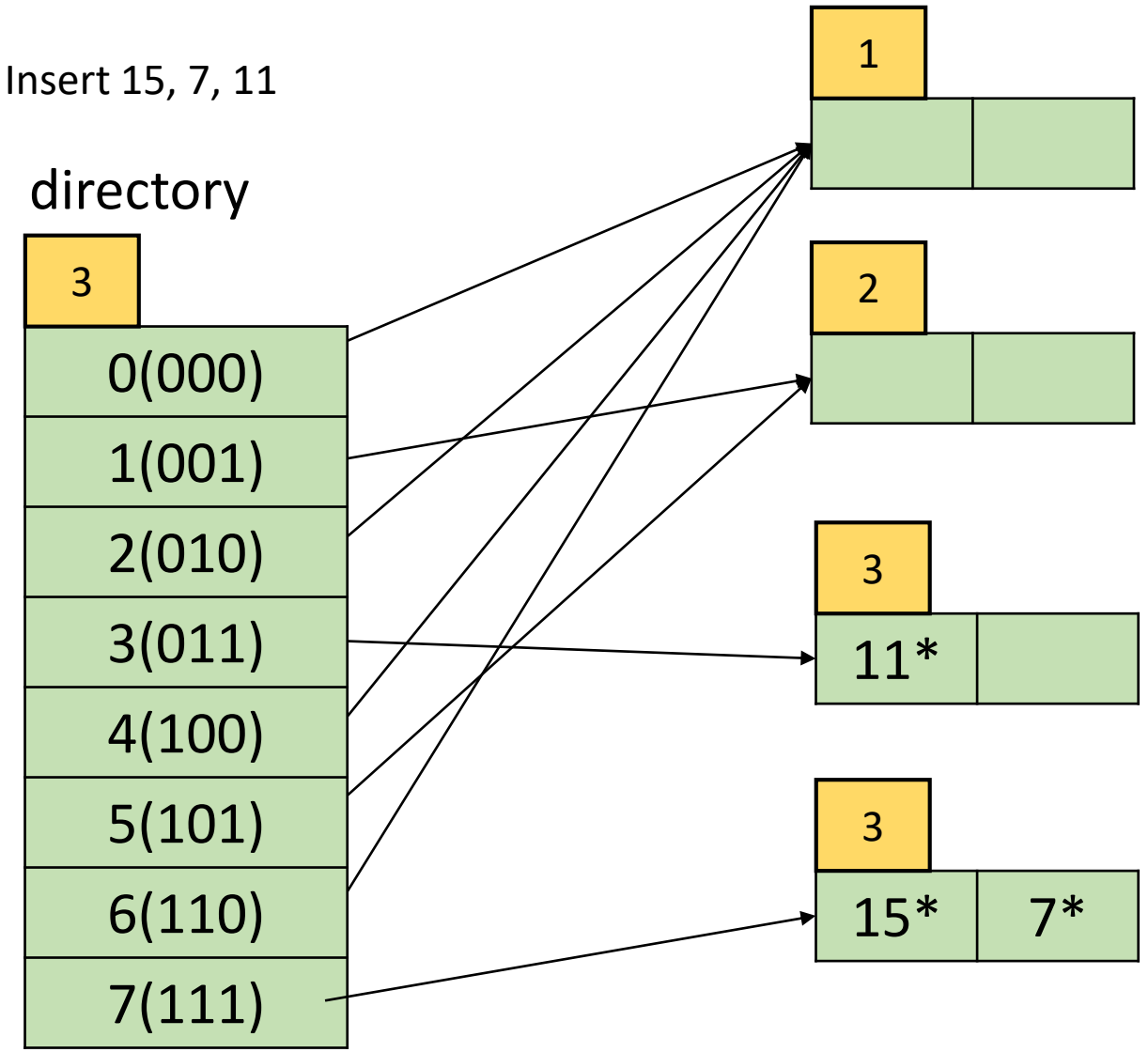
G1

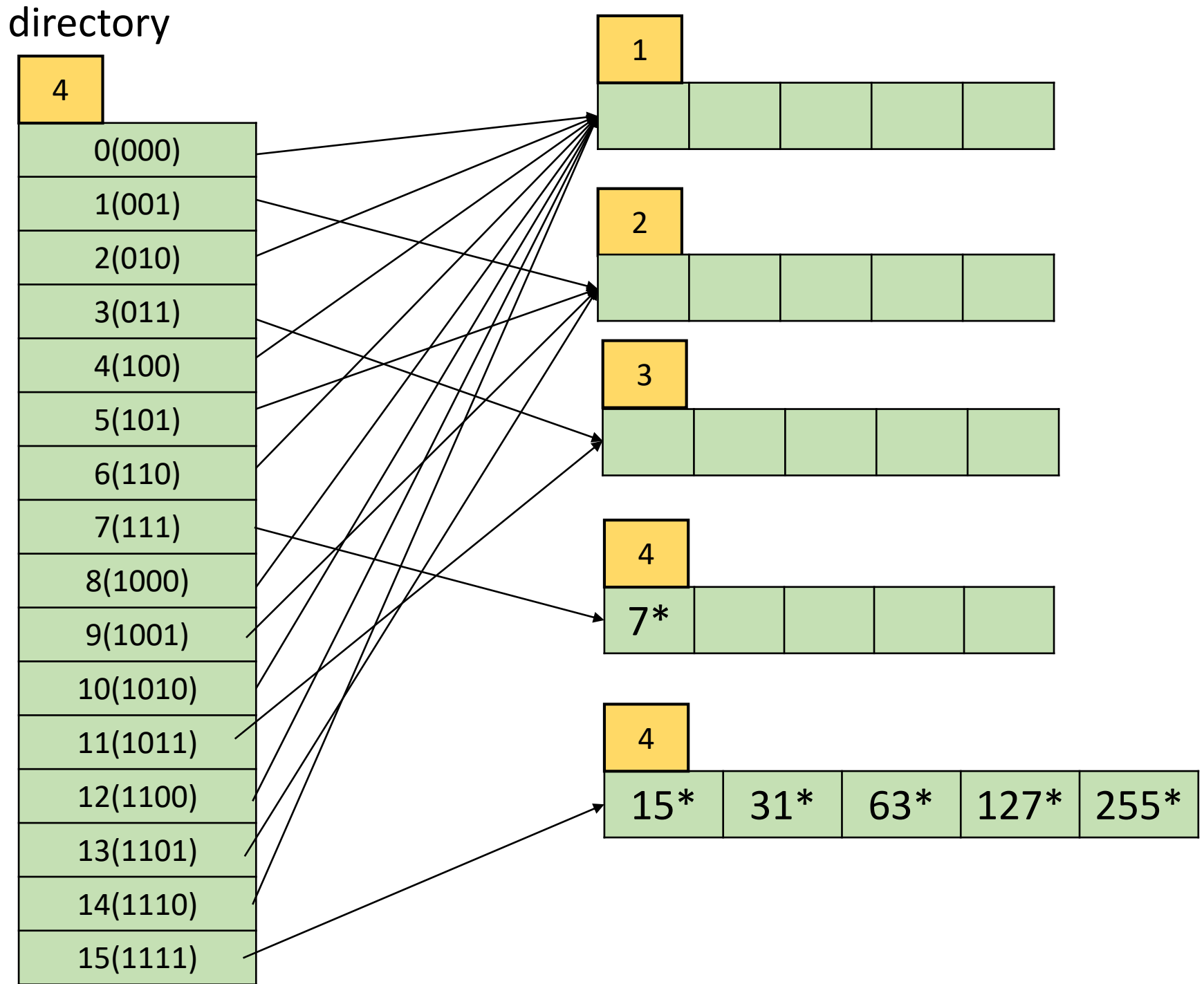
Insert 1, 2, 3



G2

Insert 15, 7, 11



H1/H2

Insert 7, 15, 31, 63, 127, 255