2. external sorting

Note that we need 2 dummy runs (run length is zero)
for optimal 4-way merge which must merged first to be optimal.

* 4-way merge sequence :
  step 1: (0,0,100,200) ==> 300
  step 2: (300,300,400,500) ==> 1500
  step 3: (1500,600,700,800) ==> 3600

* 8-way merge :
  (100,200,300,400,500,600,700,800) ==> 3600

1) # comparisons
  o 4-way scheme:
    For each step,
    loser tree initialization needs 3 comparisons (one record produced)
    and then each record needs 2 comparisons to output.

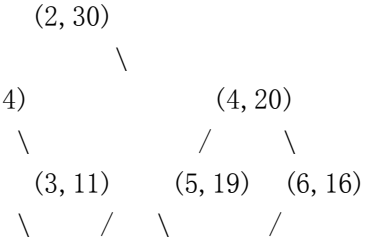
    So, the total # cmps in the 4-way scheme is
    3+(300-1)*2 + 3+(1500-1)*2 + 3+(3600-1)*2 = 10803

  o 8-way scheme:
    7 + (3600-1)*3 = 10804.

2) # disk IOs
 : Each merge step need 2 disk IOs: one for input and one for output.
 o 4-way scheme: 3*2 + 15*2 + 36*2 = 108.
 o 8-way scheme: 36*2 = 72.

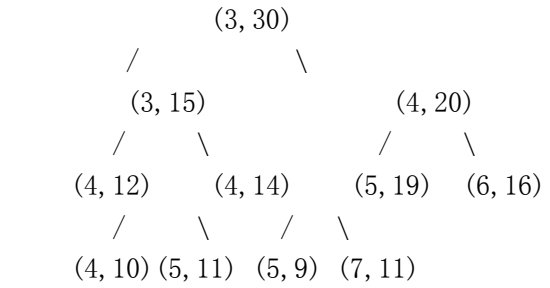
3) 8-way merge is better scheme than 4-way merge scheme
   due to the number of disk IOs.

4.
After insert(20)

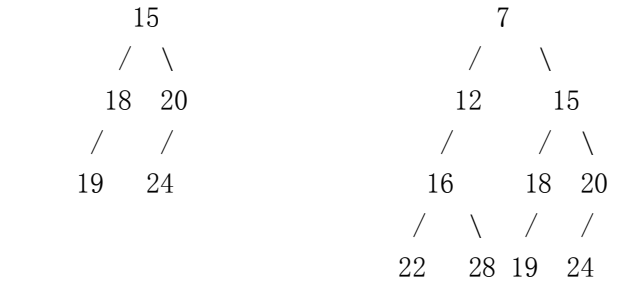


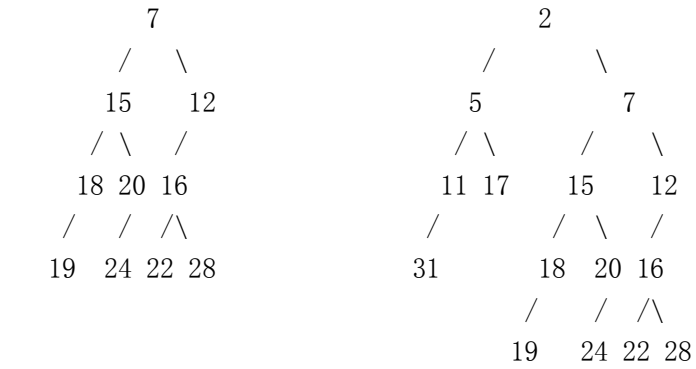
(4,10)(5,11) (5,9) (4,7) (15)

After deleteMin



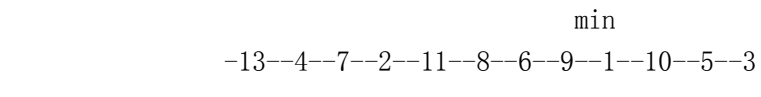
3.





5. min bionomial heap (omitted steps)

(a) insert keys



(b) DeleteMin

- delete 1
- merge each min bionomial heaps with single element