



Hand-drawn recursion tree for the merge sort algorithm. The root node is $a[0:9]$ with subarray $[-35, -32, -5, -3, 7, 12, 13, 12, 12]$. It branches into $a[0:4]$ and $a[5:9]$. $a[0:4]$ branches into $a[0:0]$ and $a[2:4]$, which further branches into $a[1:3]$ and $a[4:4]$. $a[5:9]$ branches into $a[5:5]$ and $a[7:9]$, which further branches into $a[6:8]$ and $a[8:9]$. Each node contains the subarray elements. To the right, there are additional handwritten notes and small diagrams, including a sequence $5: -15, 12, 10$ and a small tree structure with nodes 13, 12, 1, 13, 1, 13, 1, 13.

1:

```
graph TD
    T1((12)) --- T1L((7))
    T1 --- T1R((-35))
    T2((19)) --- T2L((-3))
    T3((23)) --- T3L((19))
    T3 --- T3R((-12))
```

2.

```
graph TD
    19_1((19)) --> 12((12))
    19_1 --> 13((13))
    12 --> 7((7))
    12 --> -15((-15))
    13 --> -3((-3))
    23((23)) --> 19_2((19))
    23 --> -32((-32))
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$\{ : \}$

2, 7, 12, 13, -5, -12, 9, -15, -3

4 = -3, 27 wrapped and

6: 12, -75 mapped and inserted

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graph TD
    7((7)) -- 0 --> -3((-3))
    7 -- 2 --> -5((-5))
    -3 -- 1 --> -12((-12))
    -3 -- 1 --> -8((-8))
  
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$-3, -15, -5, -12, 2, 12, 13, 13, 19, 23$

$-5, -15, -32, -3, 2, 12, 13, 18, 19, 27$

$-15, -32, -5, -3, 7, 12, 13, 17, 19, 23$

$-32, -18, -5, -3, 2, 12, 13, 17, 19, 23$

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