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8.1
Algorithm: n nodes, k components => construct MST, using Kruskal's algorithm, add n - k edges
Test case 1:

```
10
3

1       4       5
2       6       13
3       10      4
4       13      12
5       17      3
6       8       13
7       1       3
8       4       9
9       7       5
10      9       3
```

Test case 1:

```
10
2

1       4       5
2       6       13
3       10      4
4       13      12
5       17      3
6       8       13
7       1       3
8       4       9
9       7       5
10      9       3
```

Test case 3:

```
20

2

1       3       83
2       42      74
3       80      65
4       90      98
5       23      75
6       39      65
7       67      7
```

```
8       26      17
9       59      96
10      57      21
11      10      12
12      11      95
13      5       47
14      29      81
15      75      85
16      37      6
17      85      95
18      17      44
19      84      61
20      61      11
```

8.2
Algorithm: sort the array, two pointers (lowest and highest) [approach]
Test case 1: array = [1,5,4,2,3], target = 13
Test case 1 is a general test case with all positive numbers,
Test case 2: array = [10, 4, 3, 2, 15], target = 40
Test case 2: the target can be composed of two numbers in the array
Test case 3: array = [2,3,3,5,2,1], target = 8
Test case3: include multiple numbers and multiple answers

8.3
Algorithm: recursion, each time return: { sum of the subtree, number of nodes in the subtree }, set a global variable, save the current max average in it and update it continuously
Test case 1: 1(only one node)
Test case 2: 8 2 3 -4 -5(the max subtree is the original tree)
Test case 3: 1 2 3 2000000000 300000000(the max subtree is the leaf node)
Test case 4: 1 8 -3 -1 -2(the max subtree is part of the tree)
Test case 5: 5 5 5 5 5(all(some) of the subtree have the same average)

8.4
Algorithm: sliding window
Test case 1: all the number are distinct
1 2 3 4 5 6 7 8 9 10 k = 5

Test case 2: all the number are same
6 6 6 6 6 6 6 6 6 6 k = 5

Test case3: There is more than k distinct numbers in one substring

1 2 3 4 5 6 5 6 6 6 7 8 k = 5

Test case4: There is less than k distinct numbers in one substring

1 1 2 2 3 4 3 3 3 3 3 3 k = 5

Test case 5: k = 0

1 2 3 2 2 3 4 6 6 6 6 k = 0