Divide and conquer splits each array into left and right subarrays.

Counting Inversions: Example
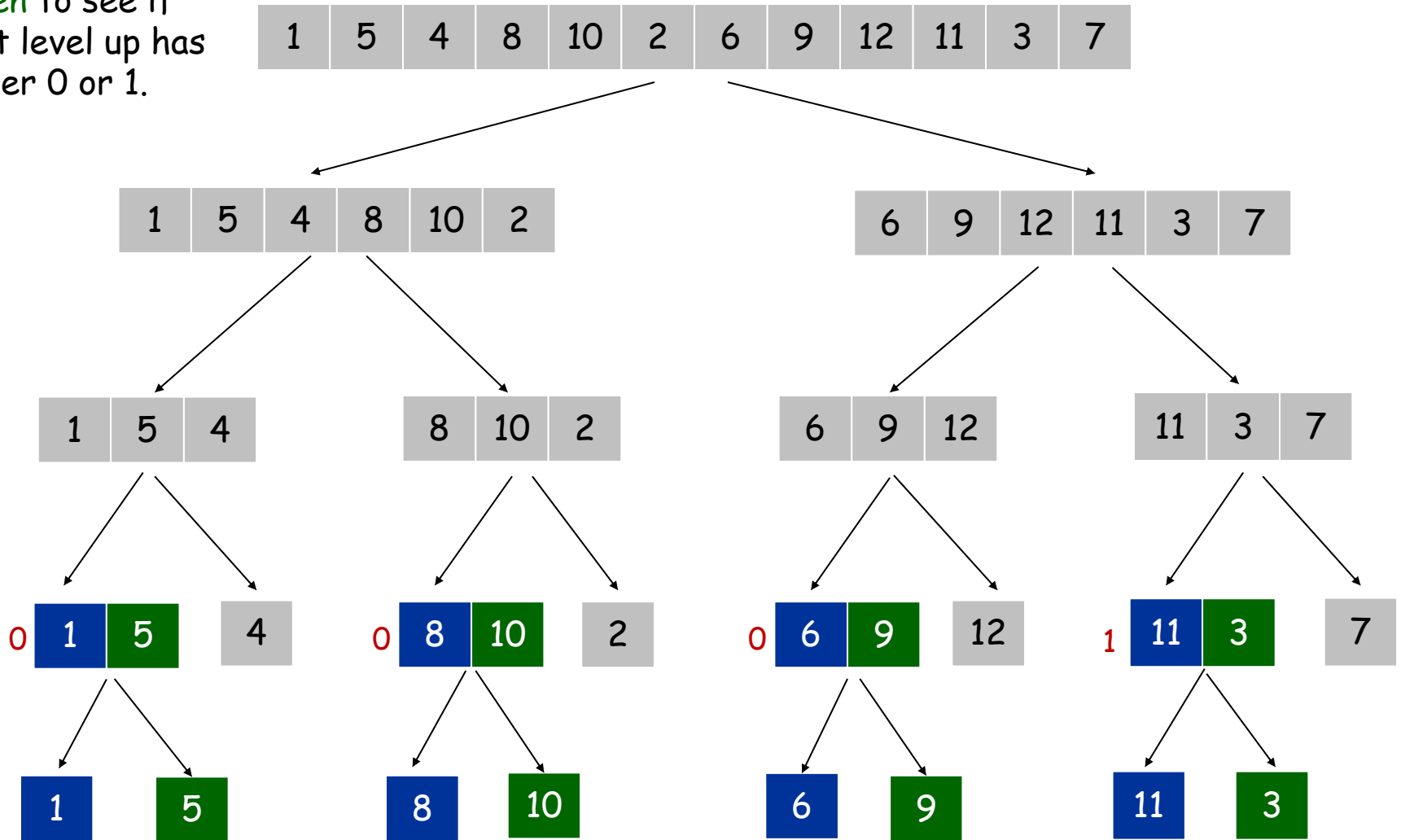
| 1 | 5 | 4 | 8 | 10 | 2 | 6 | 9 | 12 | 11 | 3 | 7 |

| 1 | 5 | 4 | 8 | 10 | 2 |

| 6 | 9 | 12 | 11 | 3 | 7 |

| 1 | 5 | 4 |

| 8 | 10 | 2 |

| 6 | 9 | 12 |

| 11 | 3 | 7 |

| 1 | 5 | | 4 |

| 8 | 10 | | 2 |

| 6 | 9 | | 12 |

| 11 | 3 | | 7 |

| 1 | | 5 |

| 8 | | 10 |

| 6 | | 9 |

| 11 | | 3 |

Counting Inversions: Example
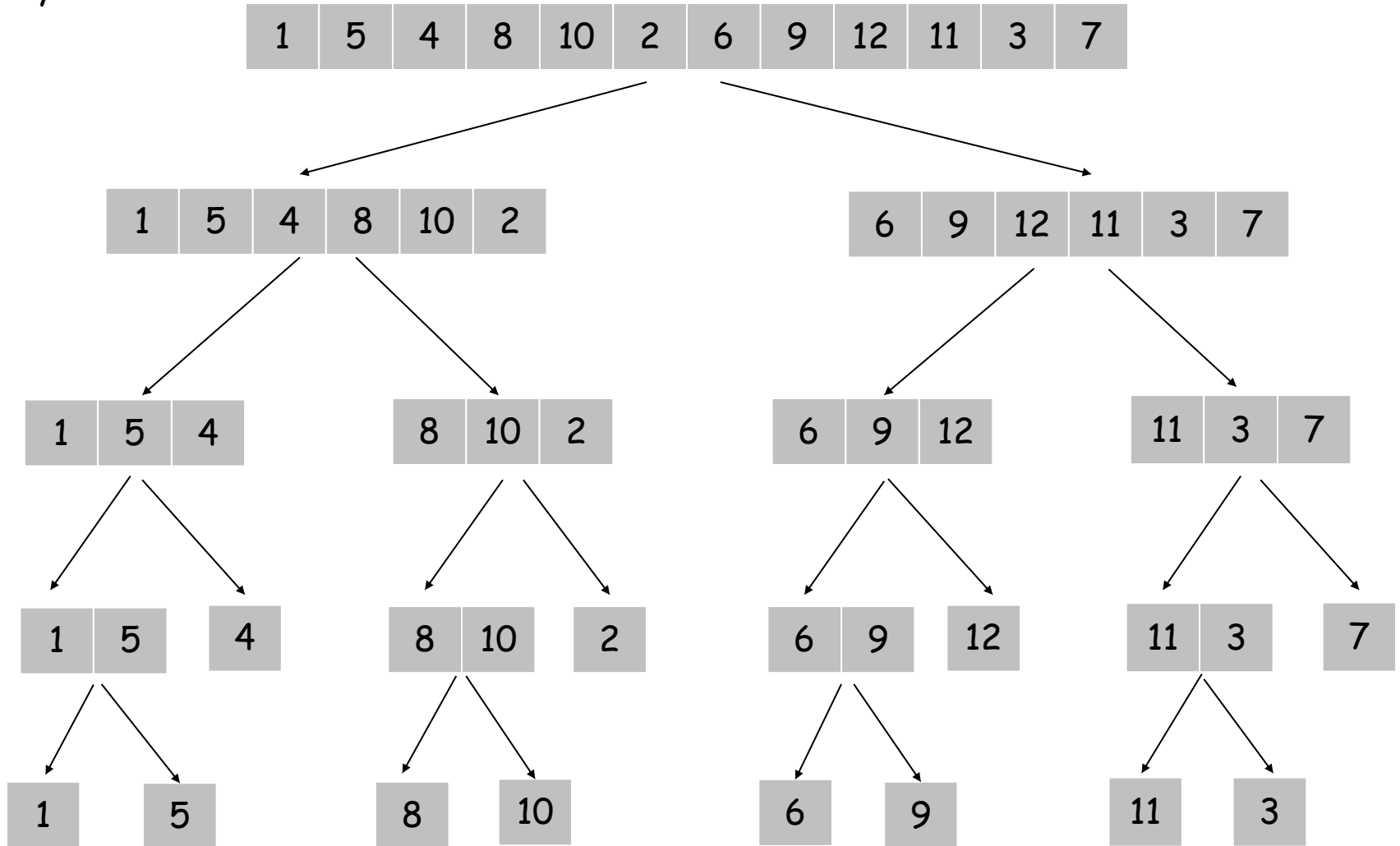
Bottom level has 0 inversions. Compare blue and green to see if next level up has either 0 or 1.

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

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

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

0 | 1 | 5 | | 4 |

0 | 8 | 10 | | 2 |

0 | 6 | 9 | | 12 |

1 | 11 | 3 | | 7 |

| 1 | | 5 |

| 8 | | 10 |

| 6 | | 9 |

| 11 | | 3 |

2
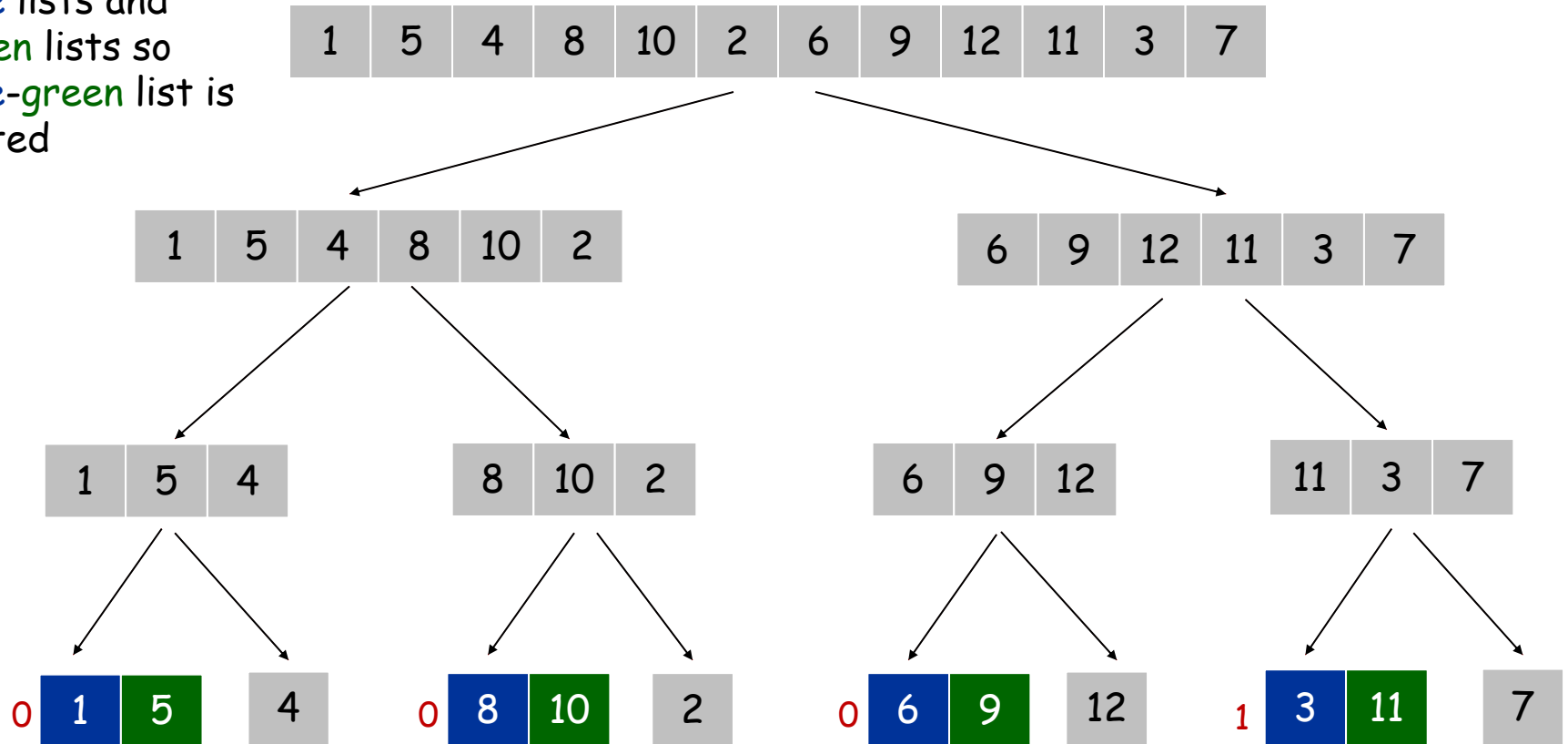
When calculating blue-green inversions, merge blue lists and green lists so blue-green list is sorted

Counting Inversions: Example

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

| 1 | 5 | 4 | 8 | 10 | 2 |

| 6 | 9 | 12 | 11 | 3 | 7 |

| 1 | 5 | 4 |

| 8 | 10 | 2 |

| 6 | 9 | 12 |

| 11 | 3 | 7 |

0 | 1 | 5 | 4

0 | 8 | 10 | 2

0 | 6 | 9 | 12

1 | 3 | 11 | 7

| 1 | 5 |

| 8 | 10 |

| 6 | 9 |

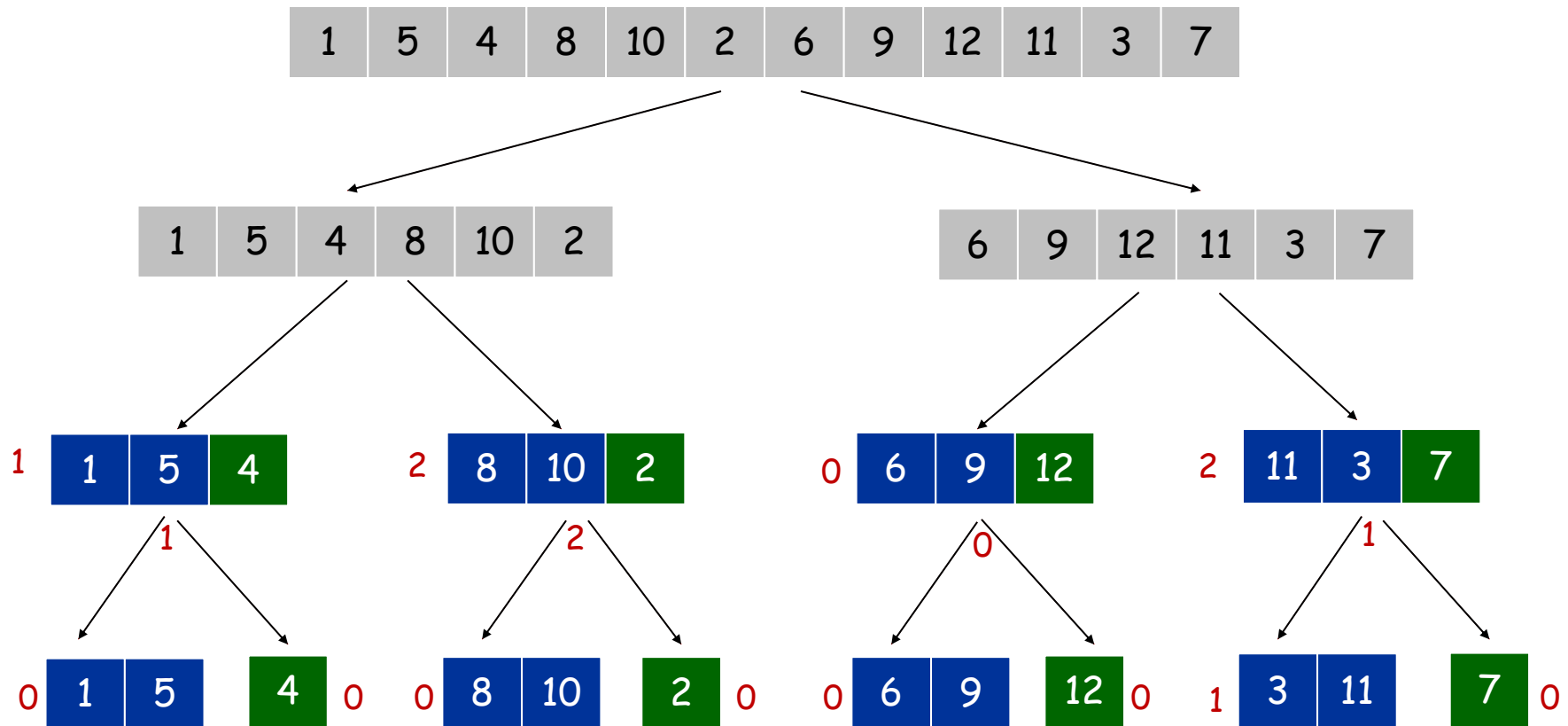| 11 | 3 |

When calculating blue-green inversions, merge blue lists and green lists so blue-green list is sorted

Counting Inversions: Example

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

1	5	4	8	10	2

6	9	12	11	3	7

1	5	4

8	10	2

6	9	12

11	3	7

0 | 1 | 5 | | 4 |

0 | 8 | 10 | | 2 |

0 | 6 | 9 | | 12 |

1 | 3 | 11 | | 7 |

Counting Inversions: Example

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

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

1 **1 5 4**   2 **8 10 2**   0 **6 9 12**   2 **11 3 7**

1   2   0   1

0 **1 5** **4** 0   0 **8 10** **2** 0   0 **6 9** **12** 0   1 **3 11** **7** 0
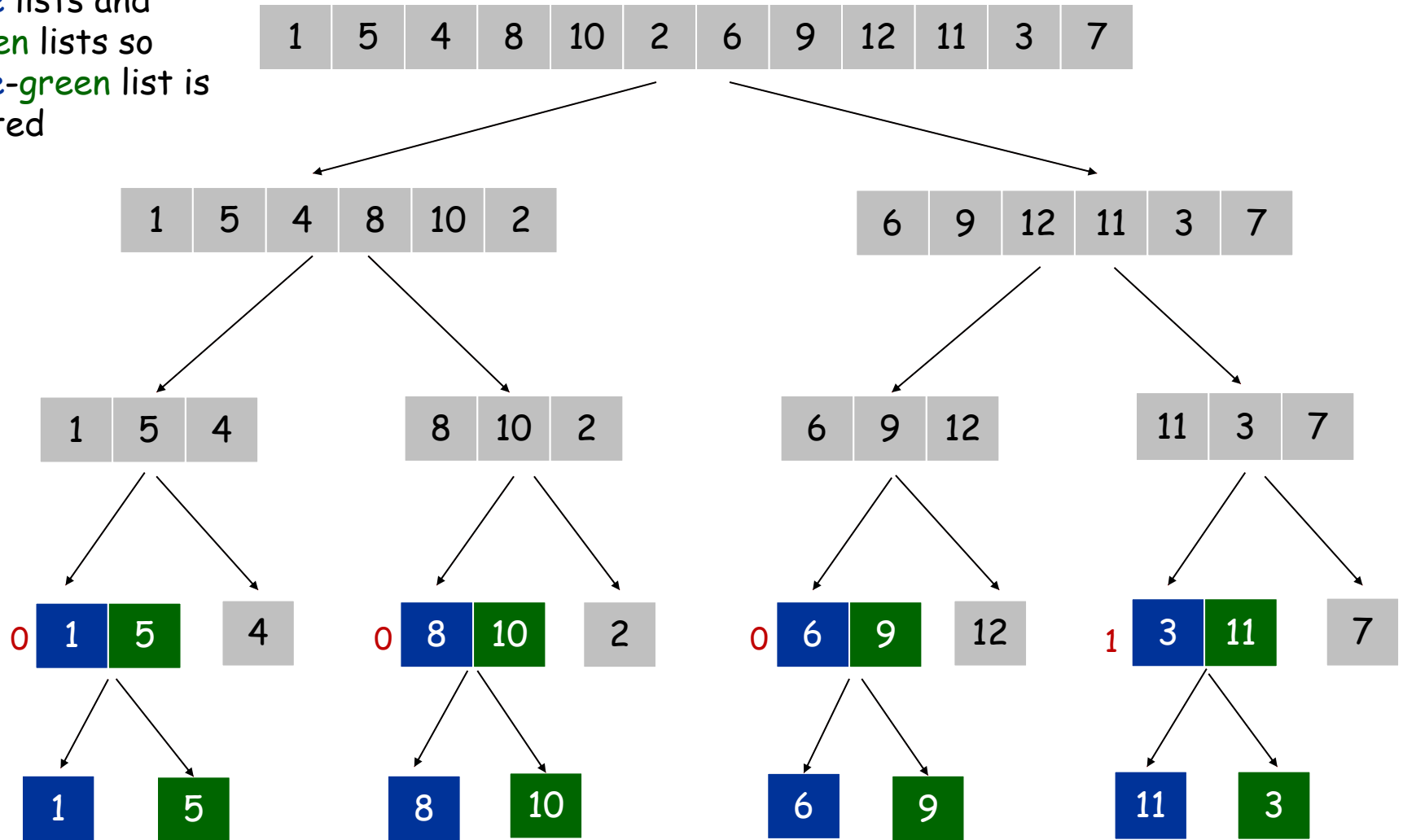
Each level is split into Blue left and Green Right.
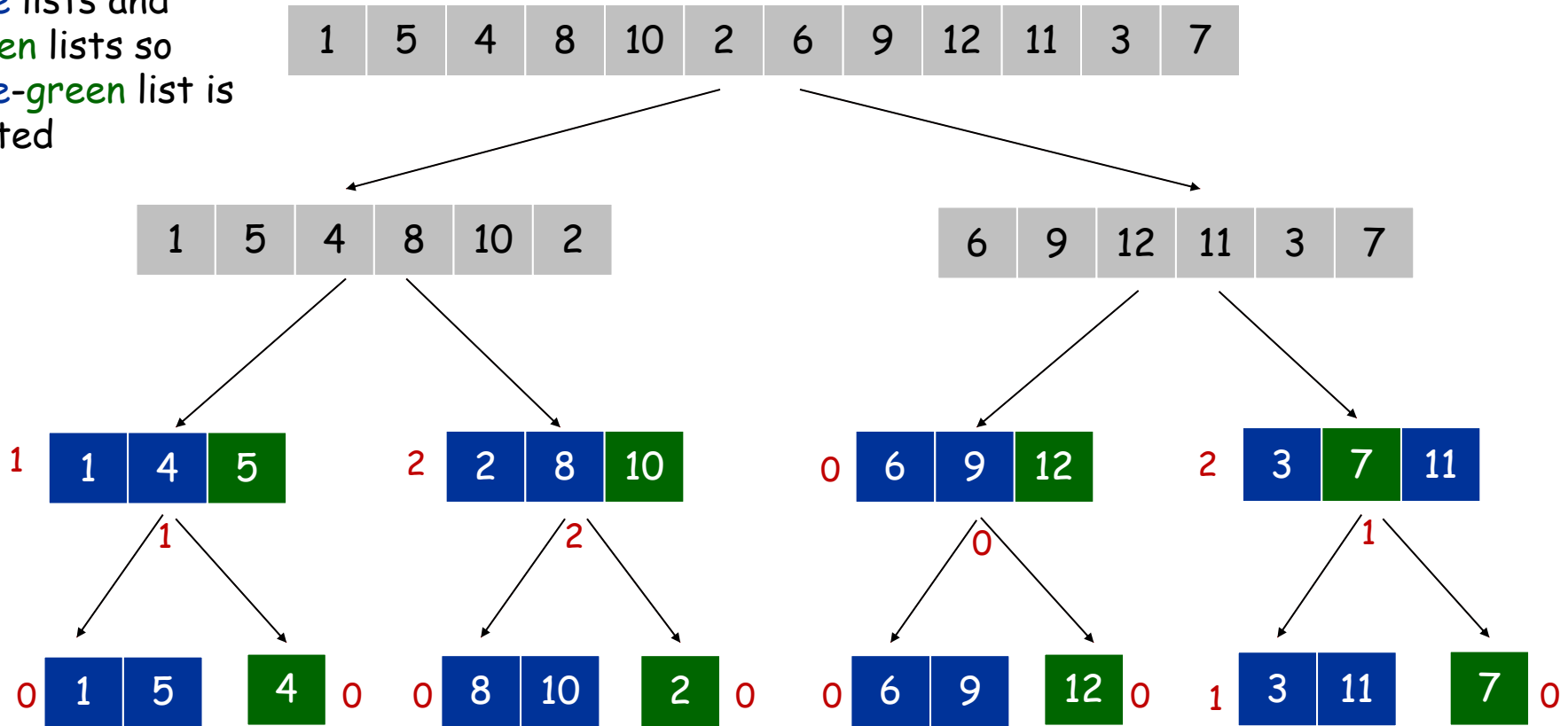Blue and Green subarrays are pre-sorted and the # of their internal inversions is known.
Add Blue inversions + Green Inversions plus Blue-Green inversions to get total inversions
Total inversions will be on side of array.
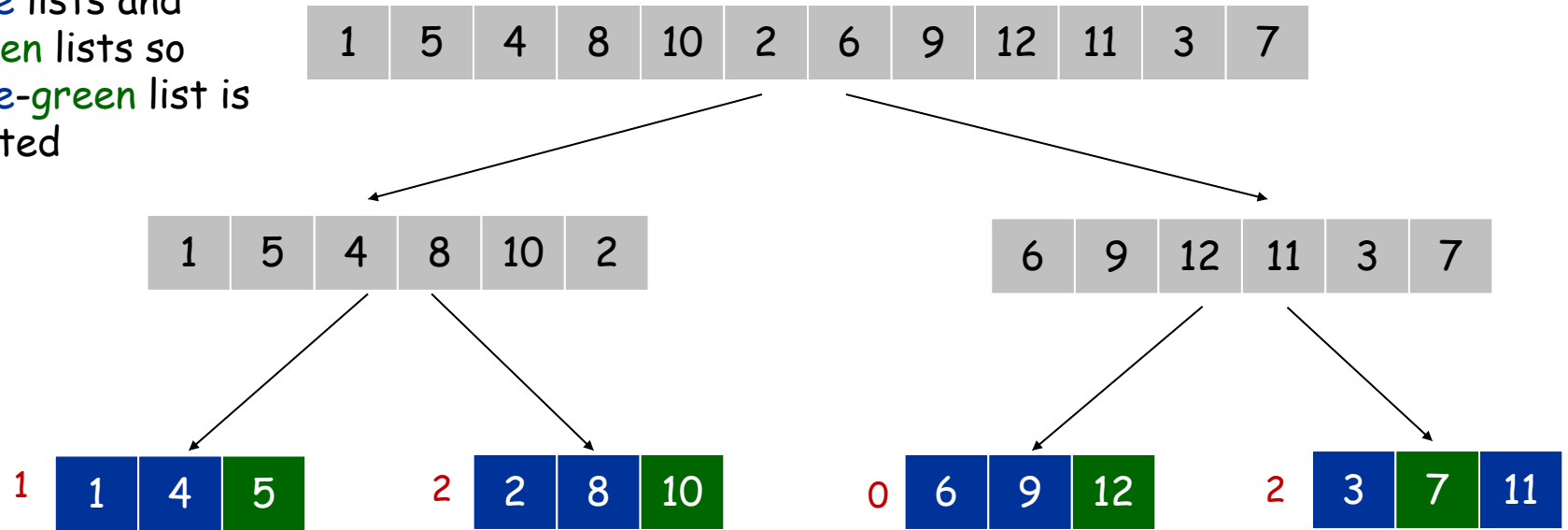BG inversions will be shown directly under array

When calculating blue-green inversions, merge blue lists and green lists so blue-green list is sorted
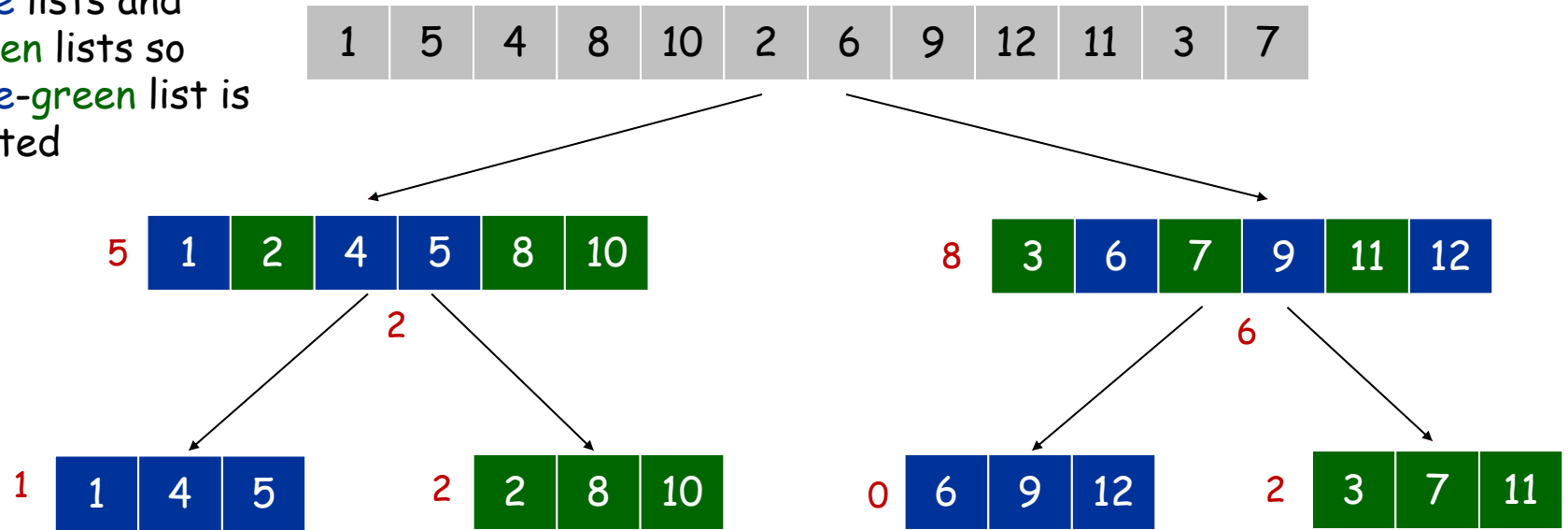
Counting Inversions: Example

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

1 5 4 8 10 2

6 9 12 11 3 7

1 · 1 4 5 · 1

2 · 2 8 10 · 2

0 · 6 9 12 · 0

2 · 3 7 11 · 1

0 · 1 5 · 4 0

0 · 8 10 · 2 0

0 · 6 9 · 12 0

1 · 3 11 · 7 0

When calculating
blue-green
inversions, merge
blue lists and
green lists so
blue-green list is
sorted

Counting Inversions: Example

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

| 1 | 5 | 4 | 8 | 10 | 2 |

| 6 | 9 | 12 | 11 | 3 | 7 |

1 | 1 | 4 | 5 |

2 | 2 | 8 | 10 |

0 | 6 | 9 | 12 |

2 | 3 | 7 | 11 |

When calculating blue-green inversions, merge blue lists and green lists so blue-green list is sorted

Counting Inversions: Example

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

5 | 1 | 2 | 4 | 5 | 8 | 10 |

8 | 3 | 6 | 7 | 9 | 11 | 12 |
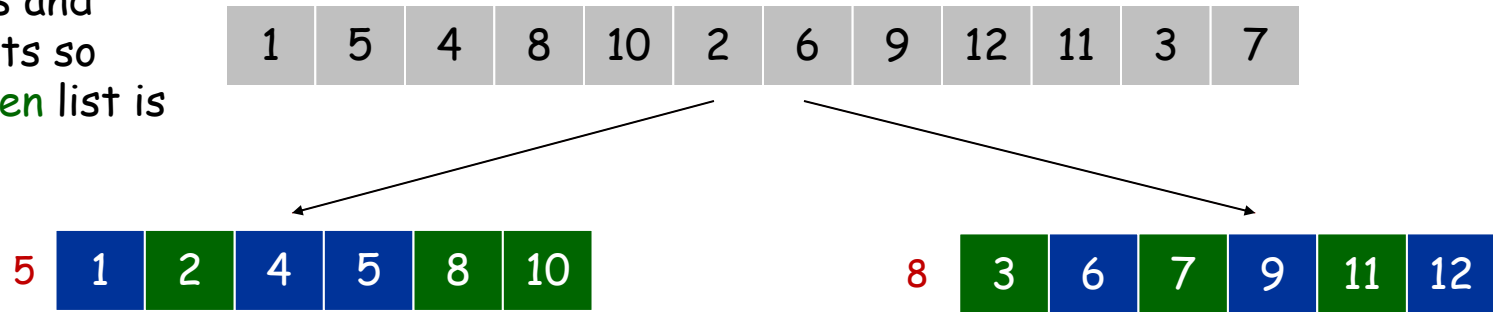
2

6

1 | 1 | 4 | 5 |

2 | 2 | 8 | 10 |

0 | 6 | 9 | 12 |

2 | 3 | 7 | 11 |

Add Blue inversions + Green Inversions plus Blue-Green inversions to get total inversions
Total inversions will be on side of array.
BG inversions will be shown directly under array

When calculating blue-green inversions, merge blue lists and green lists so blue-green list is sorted
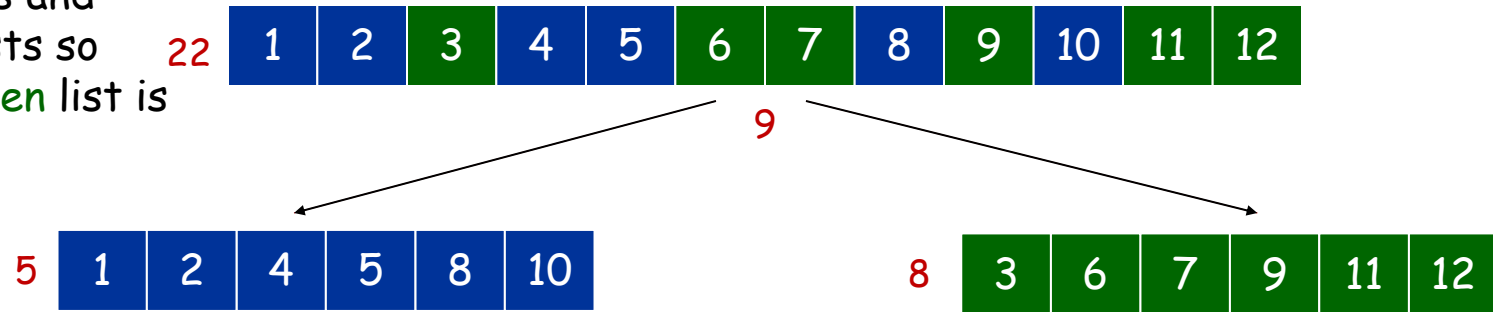
Counting Inversions: Example

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

5 | 1 | 2 | 4 | 5 | 8 | 10 |

8 | 3 | 6 | 7 | 9 | 11 | 12 |

Add Blue inversions + Green Inversions plus Blue-Green inversions to get total inversions
Total inversions will be on side of array.
BG inversions will be shown directly under array

When calculating blue-green inversions, merge blue lists and green lists so blue-green list is sorted

22 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12

9

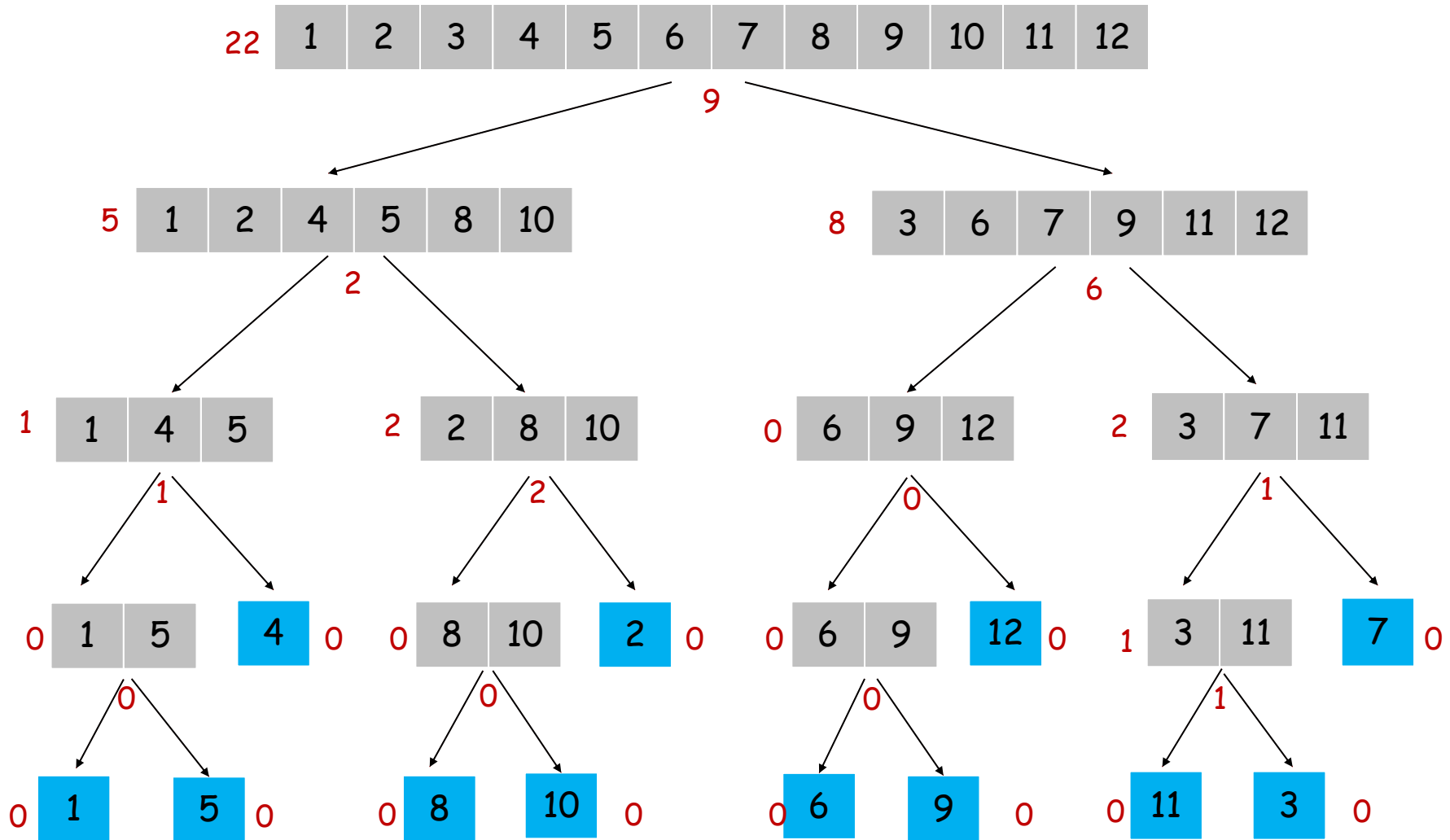5 | 1 | 2 | 4 | 5 | 8 | 10

8 | 3 | 6 | 7 | 9 | 11 | 12

Add Blue inversions + Green Inversions plus Blue-Green inversions to get total inversions
Total inversions will be on side of array.
BG inversions will be shown directly under array

Counting Inversions: Complete Worked Example
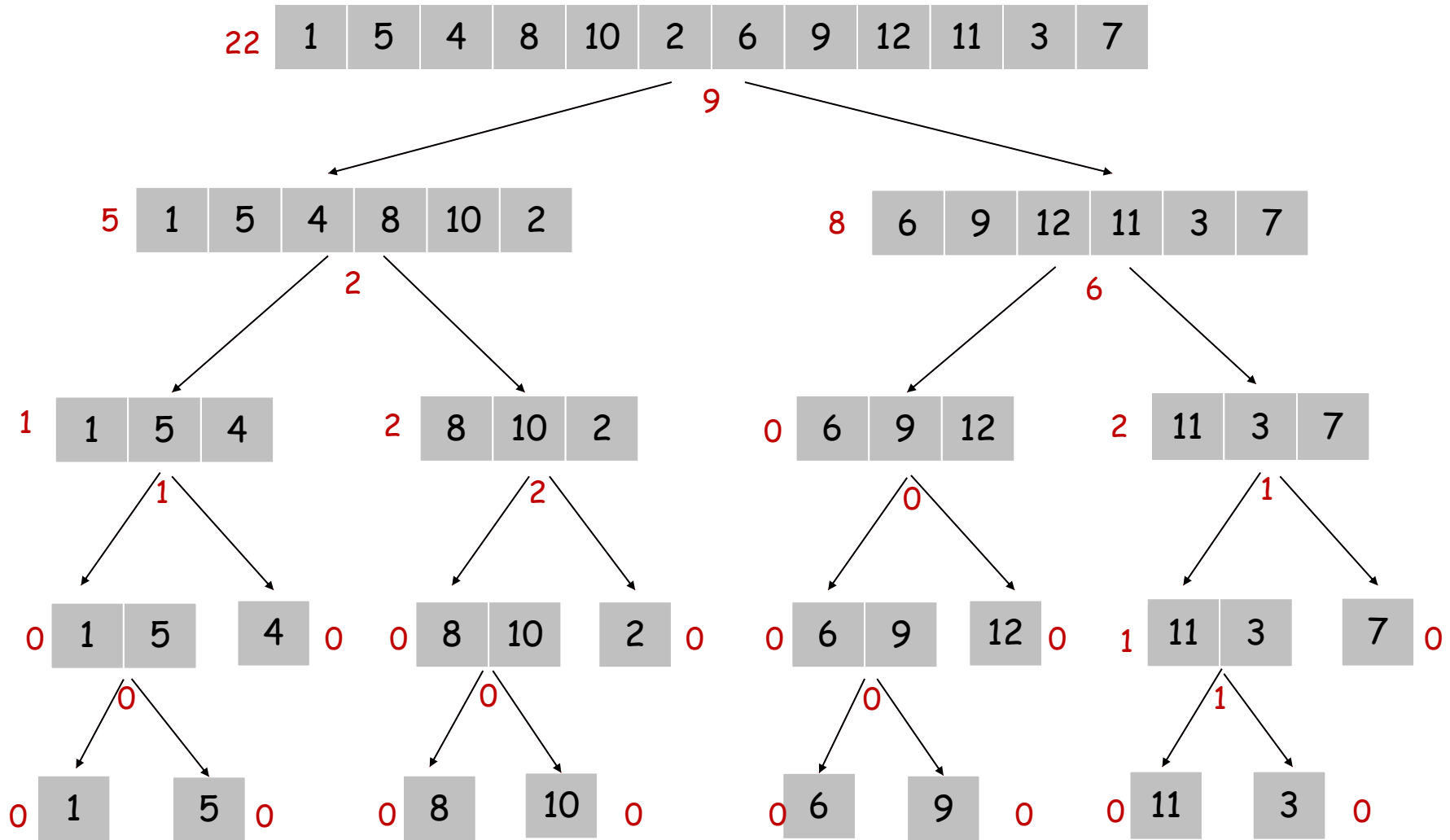
Counting Inversions: Complete Worked Example

Blue tree leaves are the original array order