

# Merge and Count

## Merge and count step.

- Given two sorted halves, count number of inversions where  $a_i$  and  $a_j$  are in different halves.
- Combine two sorted halves into sorted whole.

$i = 6$



3	7	10	14	18	19
---	---	----	----	----	----



2	11	16	17	23	25
---	----	----	----	----	----

two sorted halves

--	--	--	--	--	--	--	--	--	--	--	--

auxiliary array

Total:

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3	7	10	14	18	19
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2	11	16	17	23	25
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two sorted halves

6

2											
---	--	--	--	--	--	--	--	--	--	--	--

auxiliary array

Total: 6

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2	11	16	17	23	25
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two sorted halves

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auxiliary array

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3	7	10	14	18	19
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2	11	16	17	23	25
---	----	----	----	----	----

two sorted halves

6

2	3										
---	---	--	--	--	--	--	--	--	--	--	--

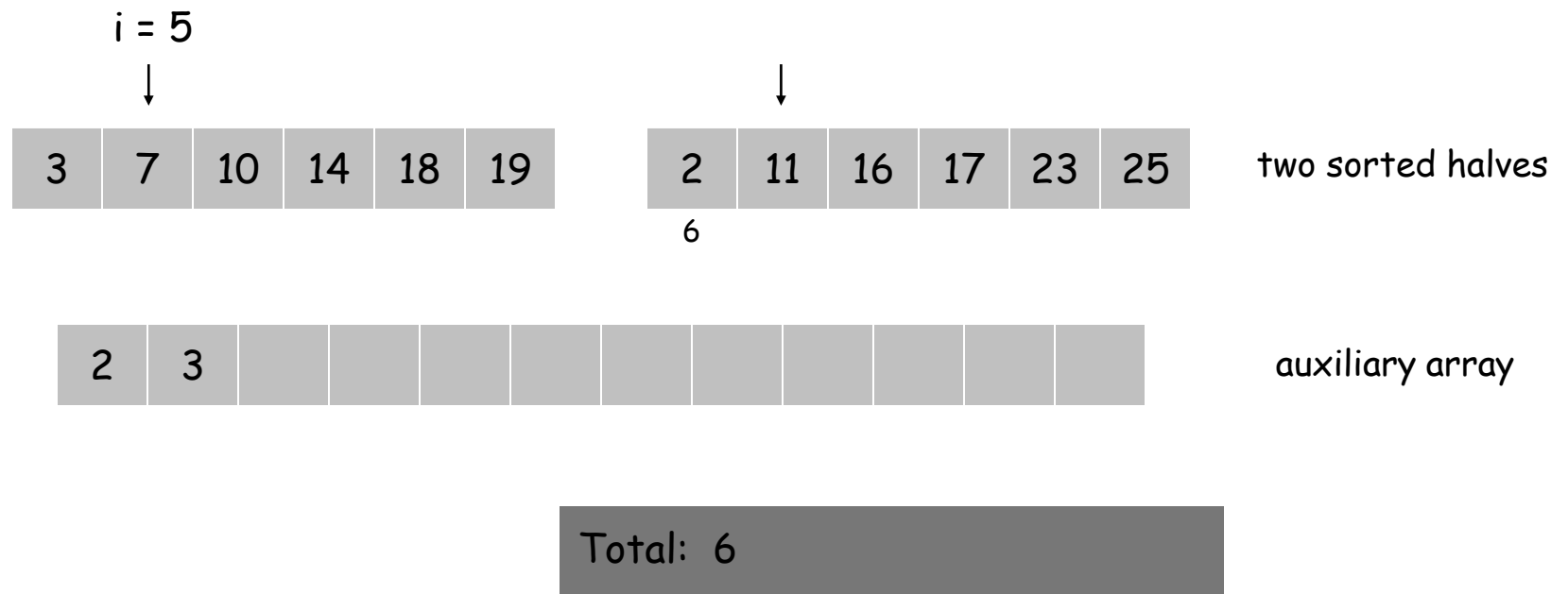
auxiliary array

Total: 6

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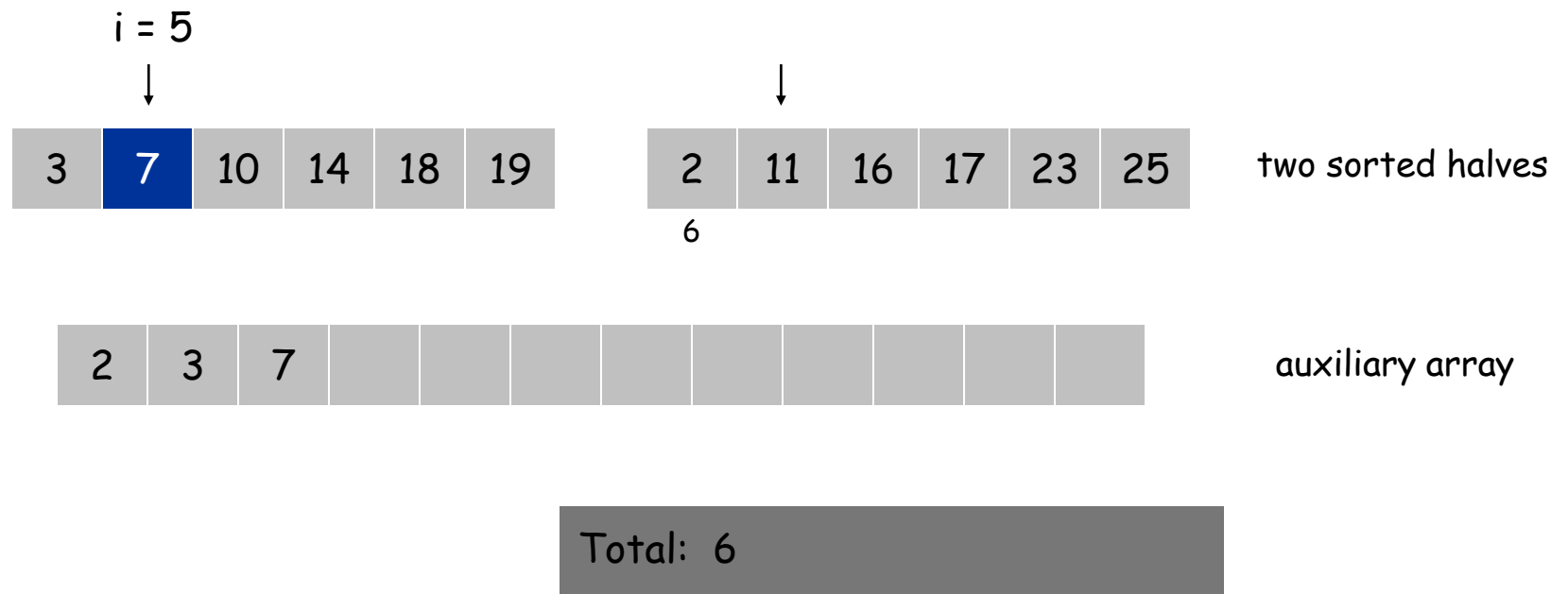
- Given two sorted halves, count number of inversions where  $a_i$  and  $a_j$  are in different halves.
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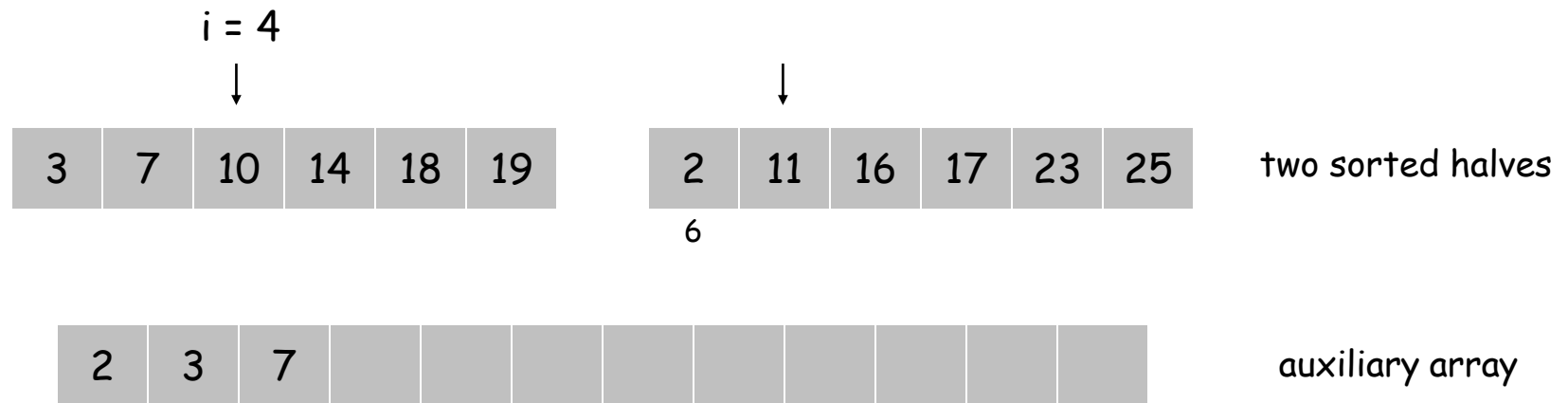
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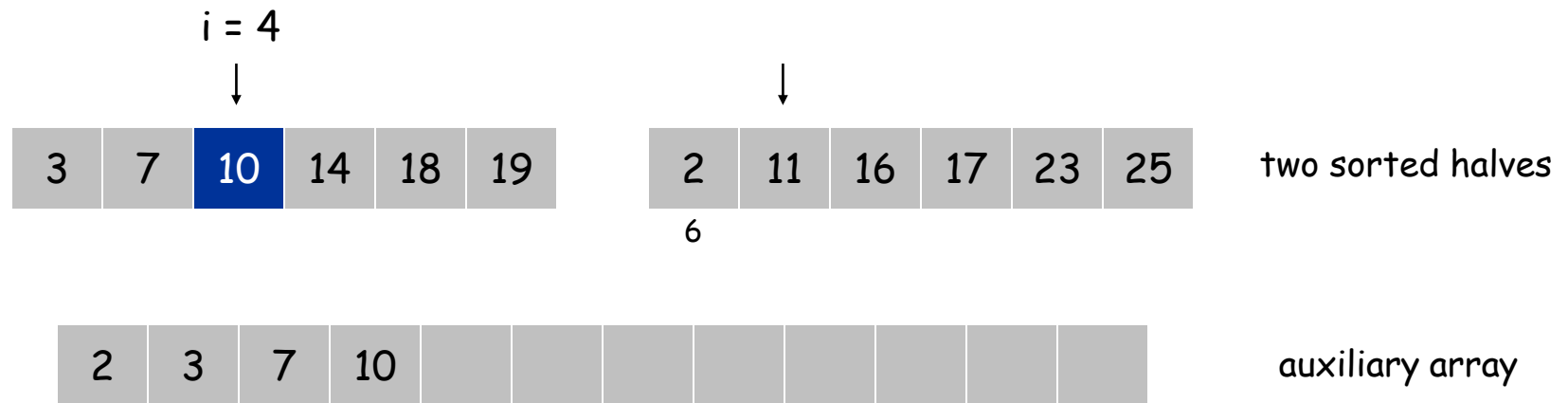


Total: 6

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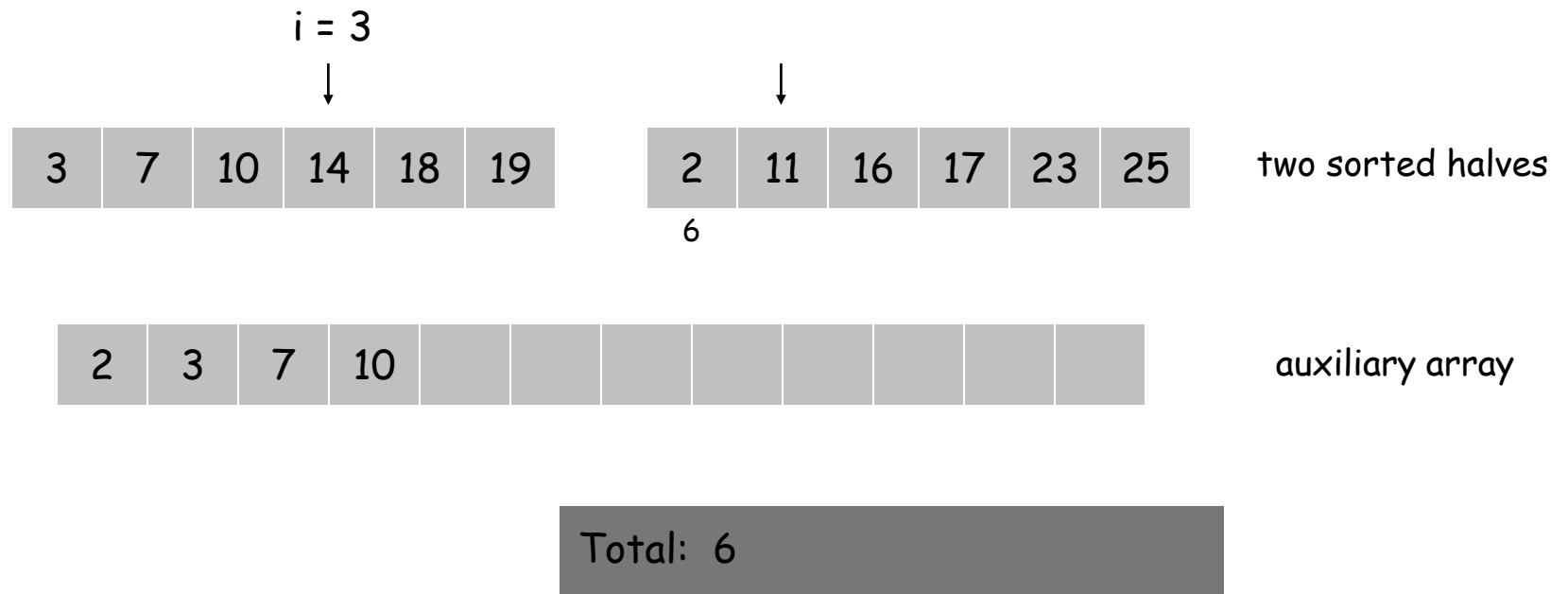
Total: 6



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## Merge and count step.

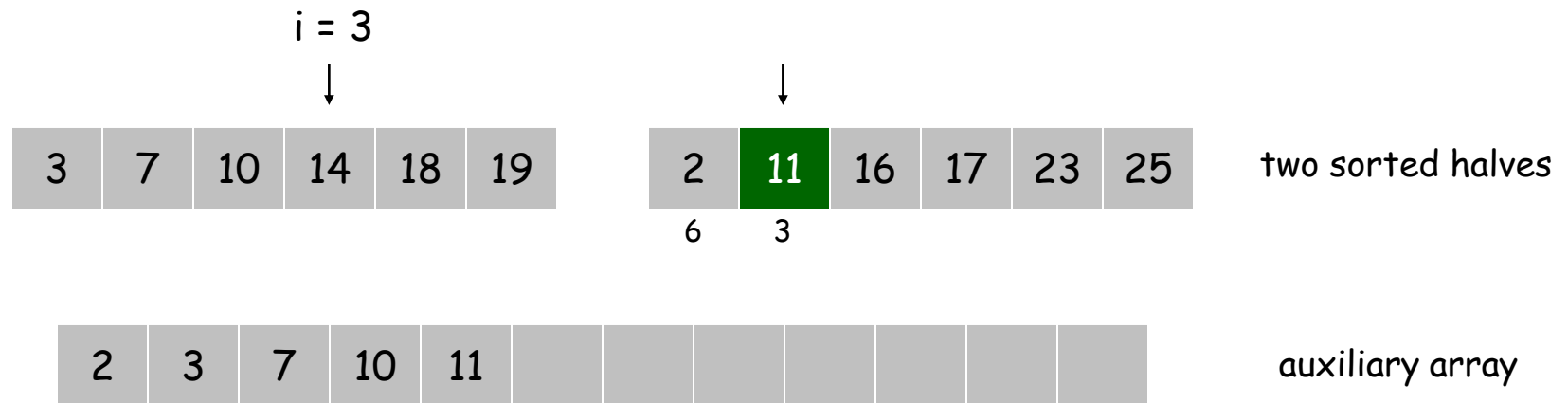
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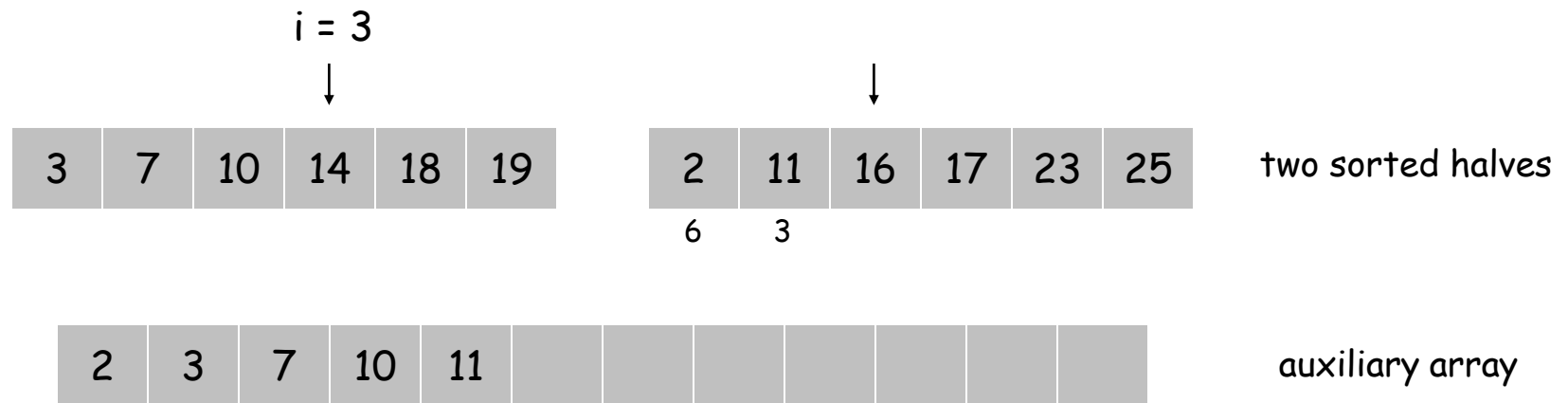


Total: 6 + 3

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- Given two sorted halves, count number of inversions where  $a_i$  and  $a_j$  are in different halves.
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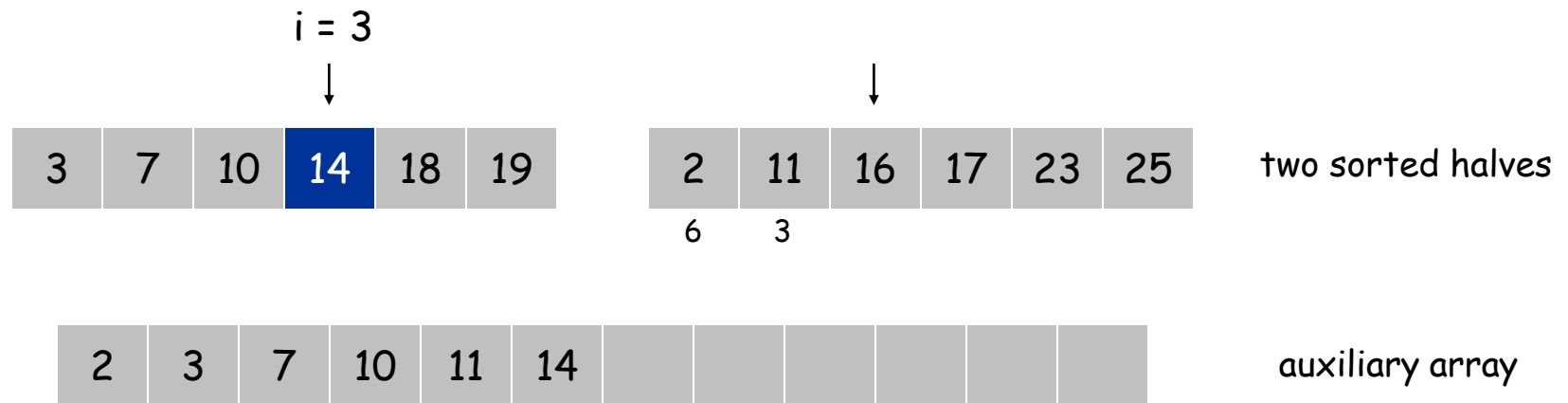


Total: 6 + 3

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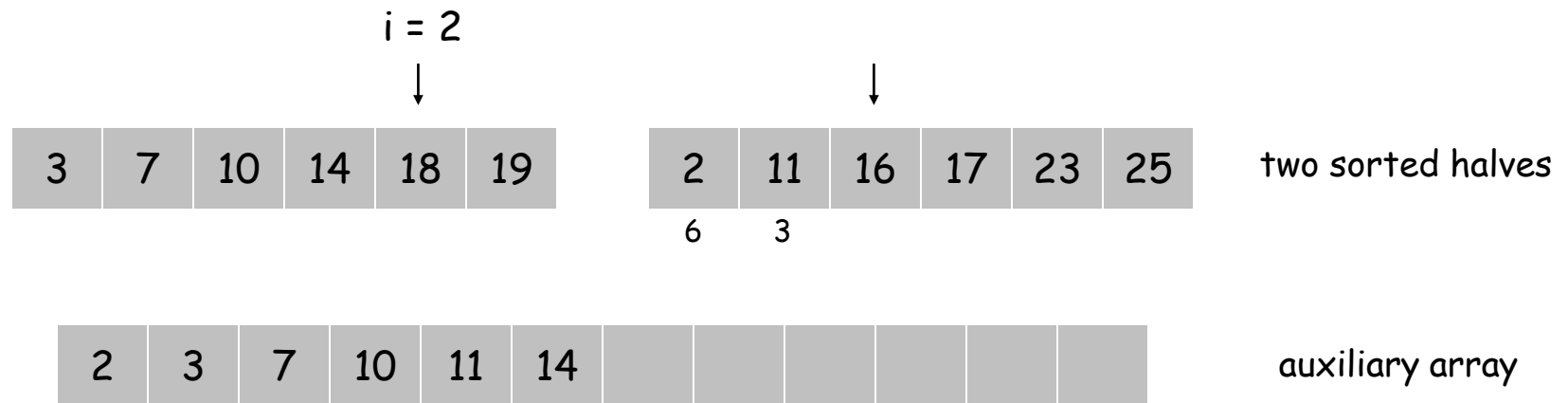


Total: 6 + 3

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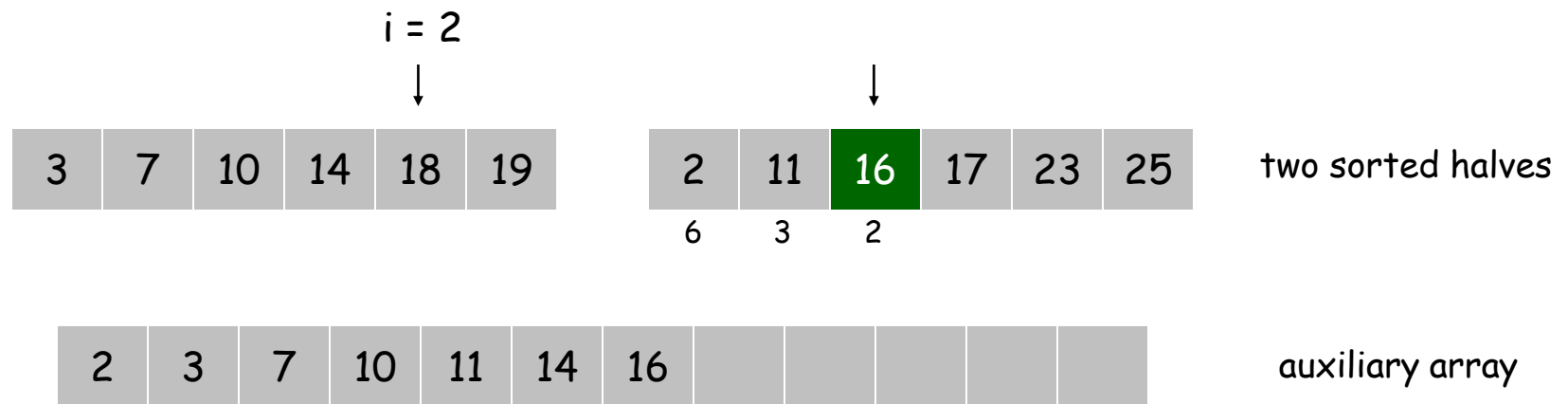


Total: 6 + 3

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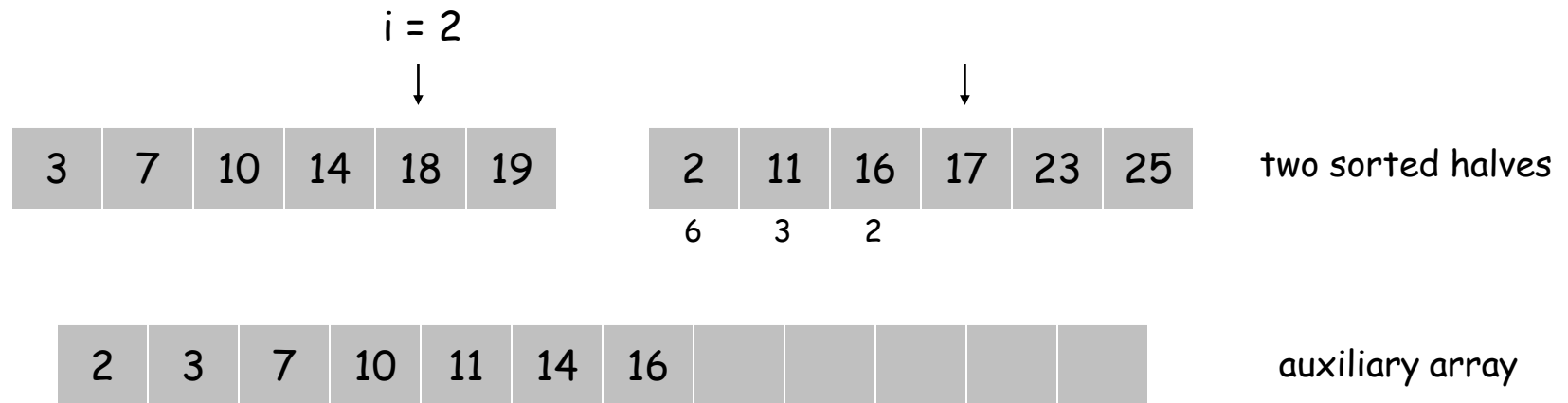


Total:  $6 + 3 + 2$

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- Given two sorted halves, count number of inversions where  $a_i$  and  $a_j$  are in different halves.
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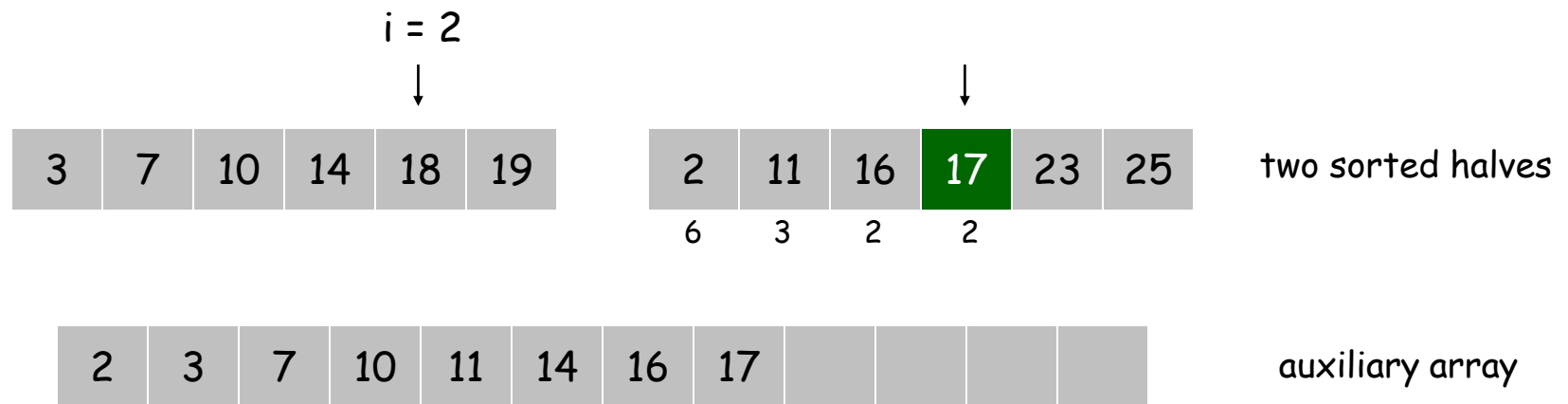


Total:  $6 + 3 + 2$

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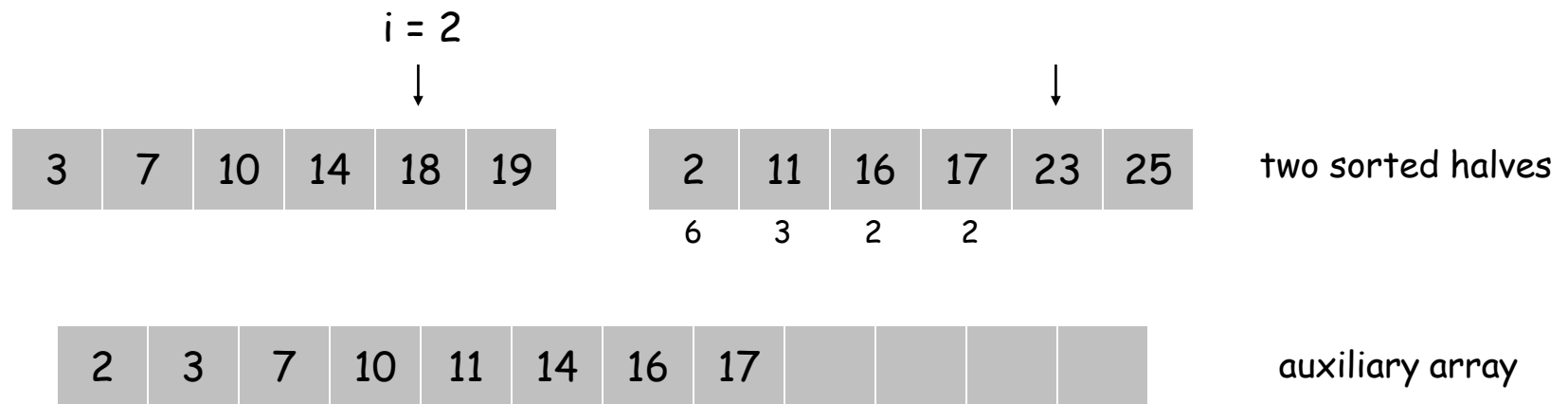
Total:  $6 + 3 + 2 + 2$



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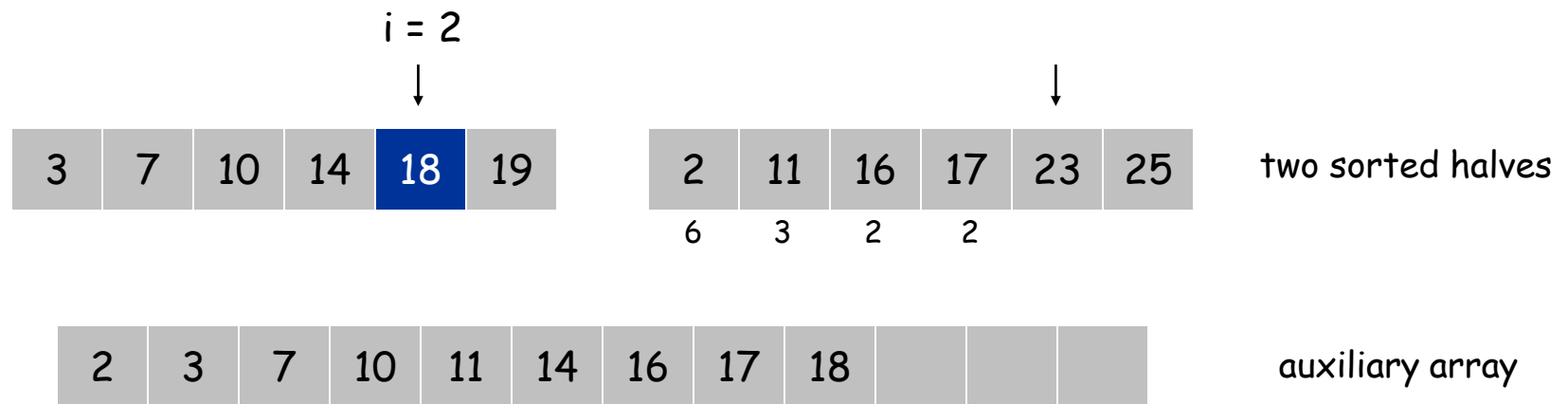


Total:  $6 + 3 + 2 + 2$

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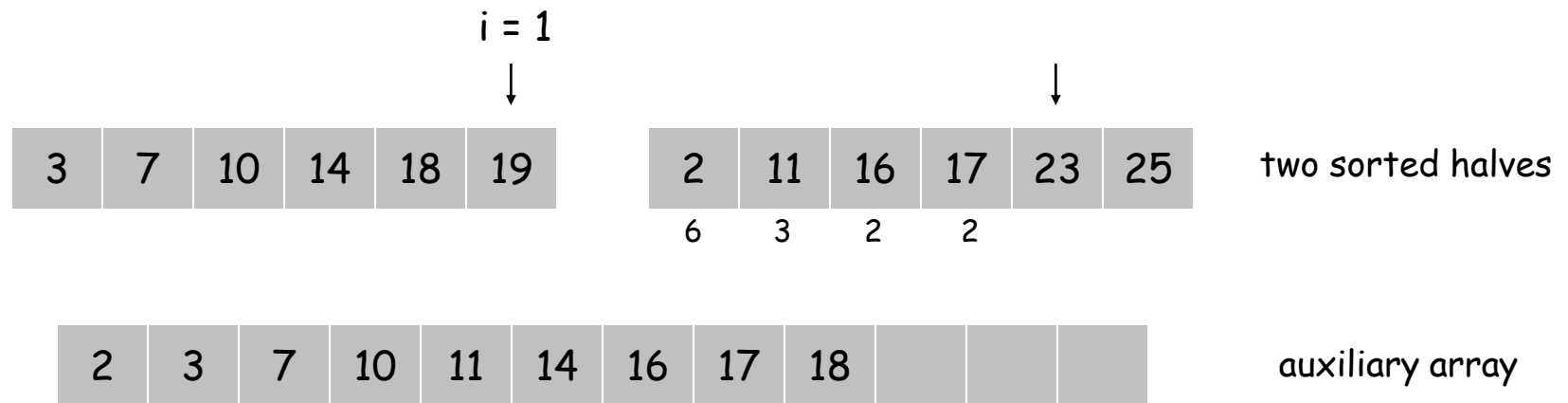


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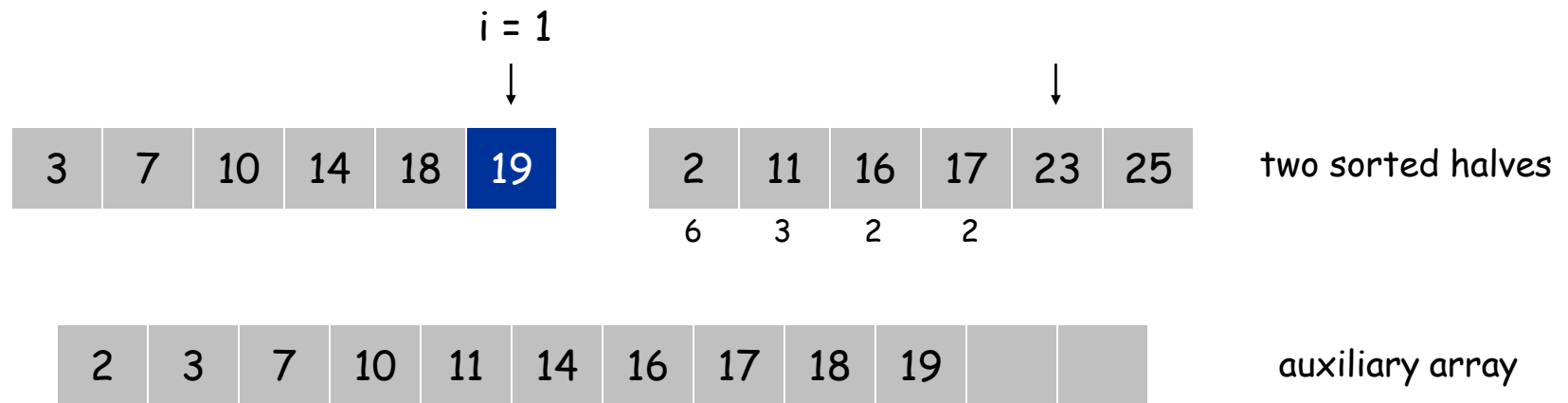


Total:  $6 + 3 + 2 + 2$

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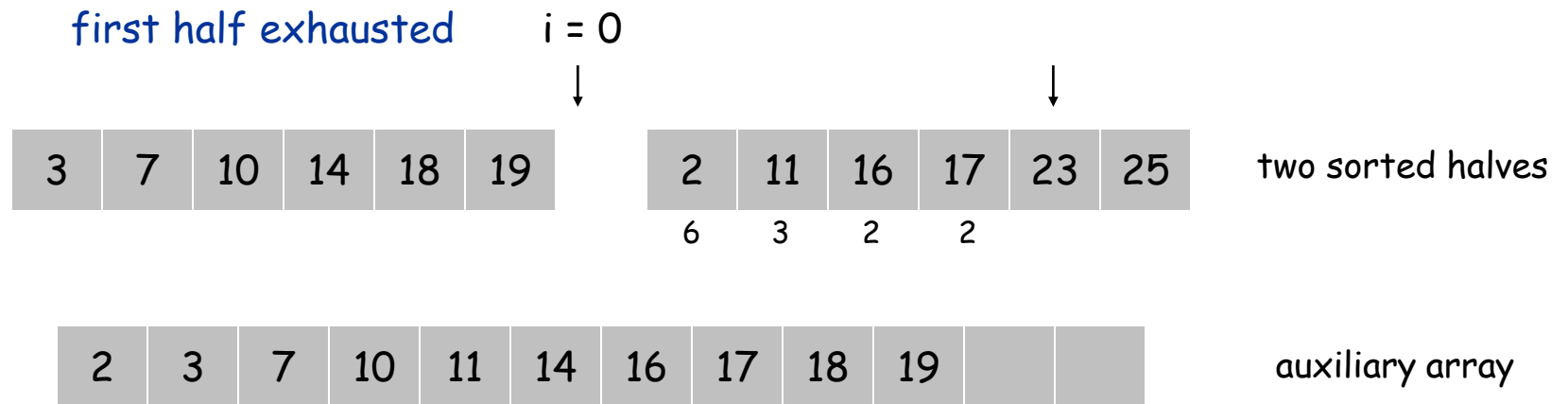


Total:  $6 + 3 + 2 + 2$

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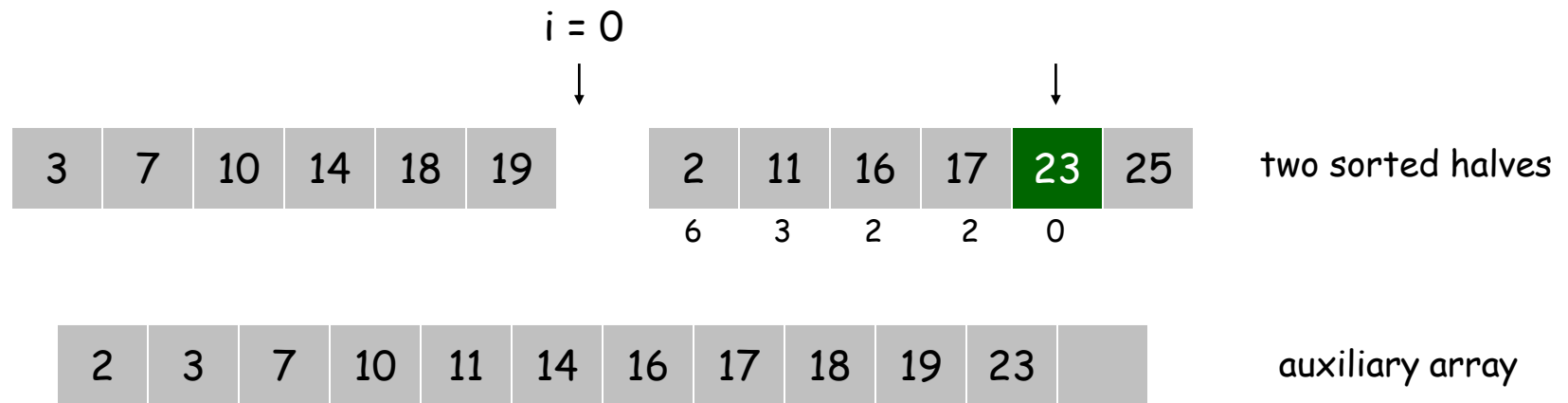


Total:  $6 + 3 + 2 + 2$

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- Given two sorted halves, count number of inversions where  $a_i$  and  $a_j$  are in different halves.
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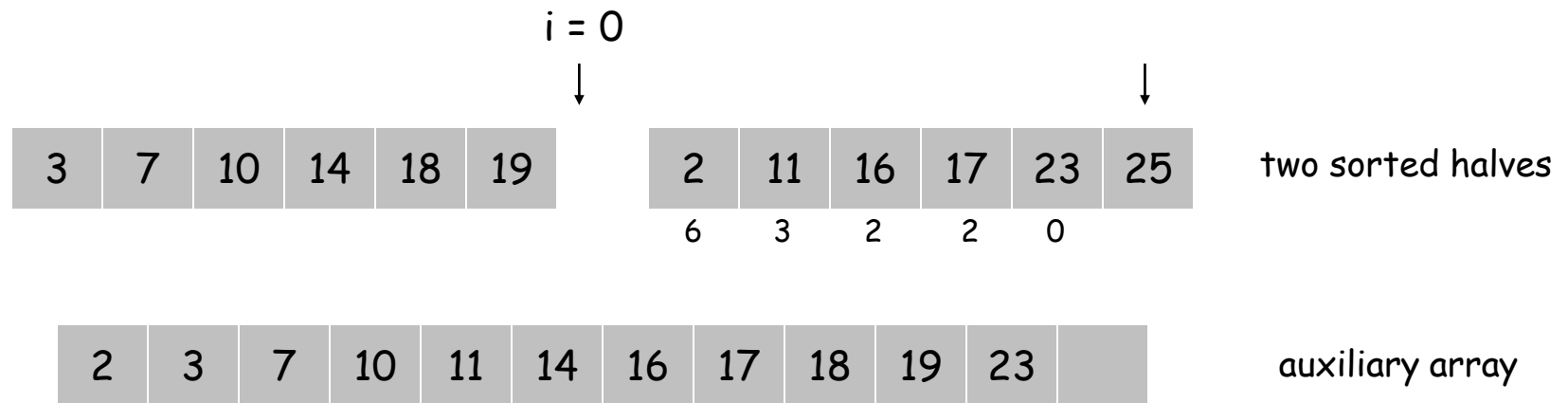


Total:  $6 + 3 + 2 + 2 + 0$

# Merge and Count

## Merge and count step.

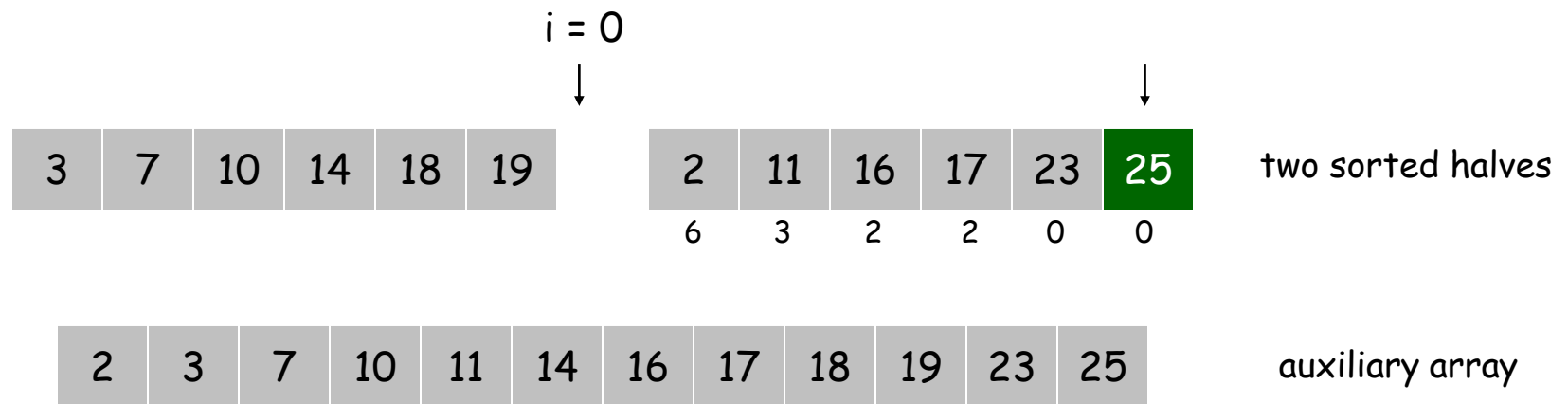
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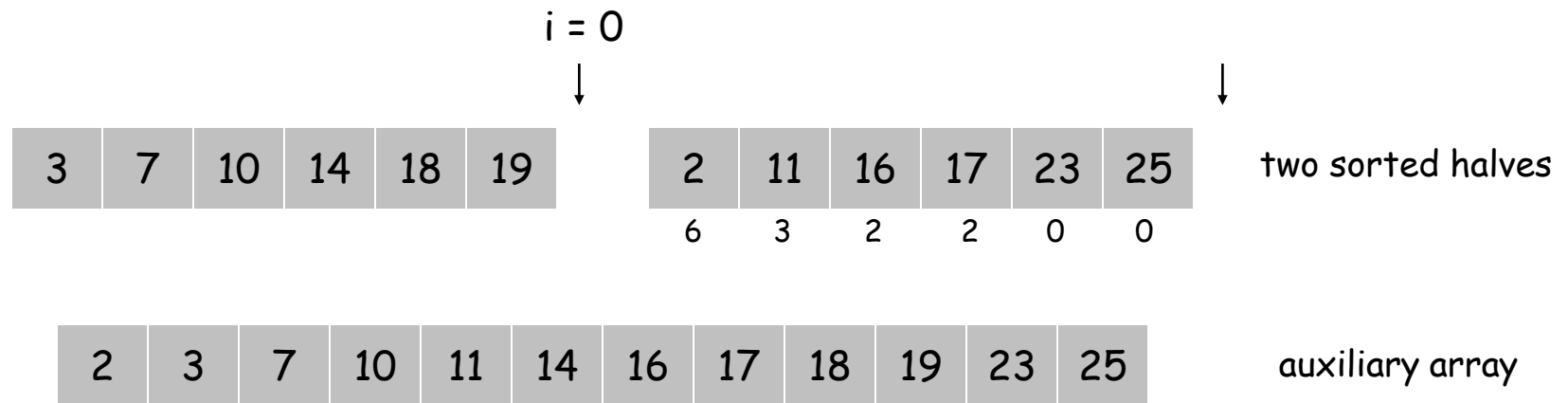
Total:  $6 + 3 + 2 + 2 + 0 + 0$



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Total:  $6 + 3 + 2 + 2 + 0 + 0 = 13$