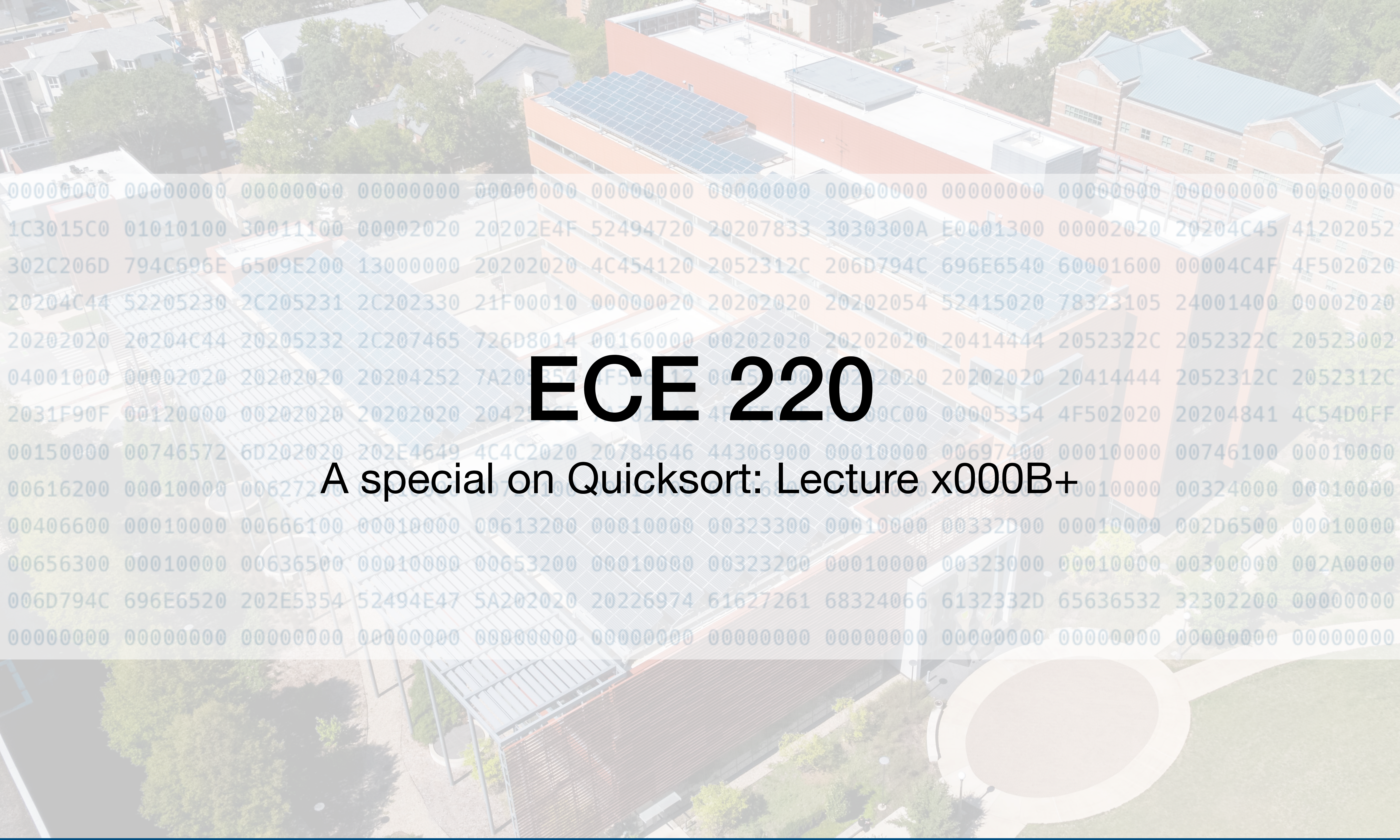

ECE 220

A special on Quicksort: Lecture x000B+

Quick sort

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- Main point: understand one variety and understand it well.

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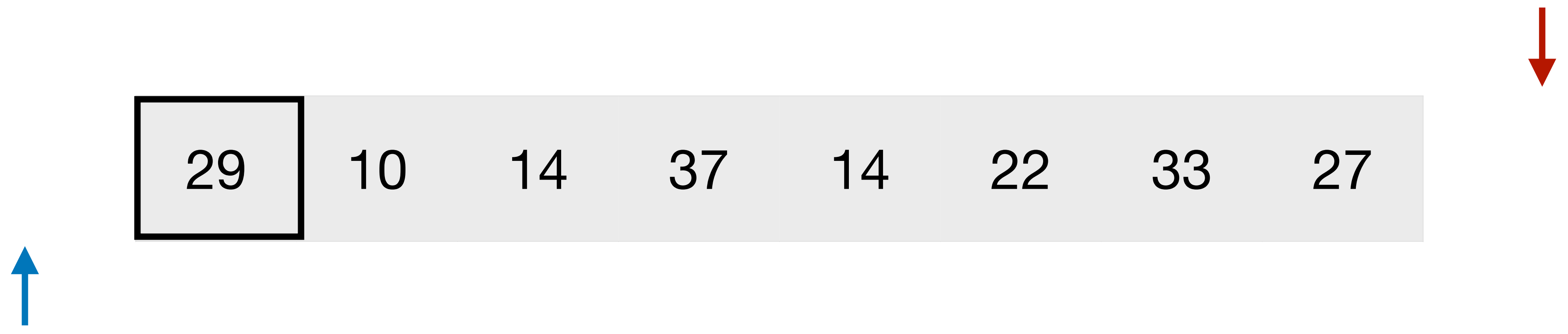

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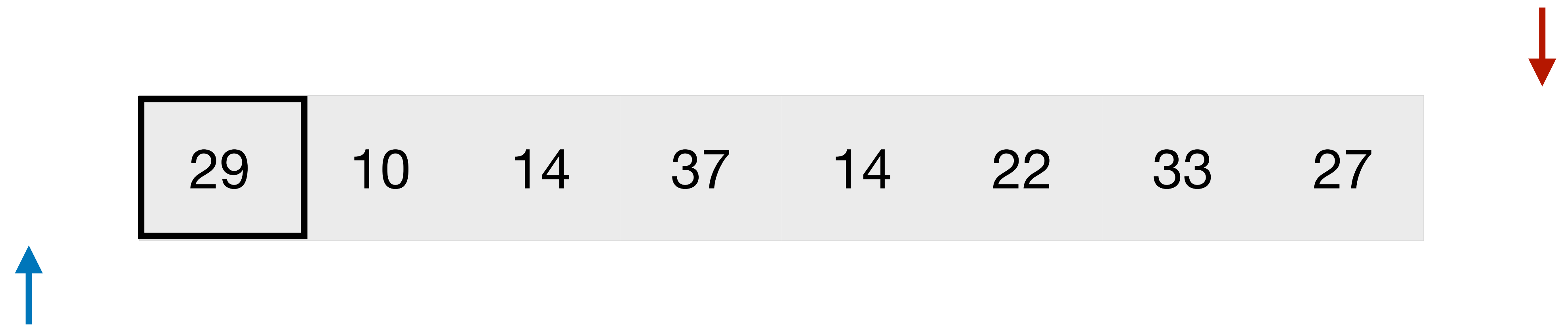

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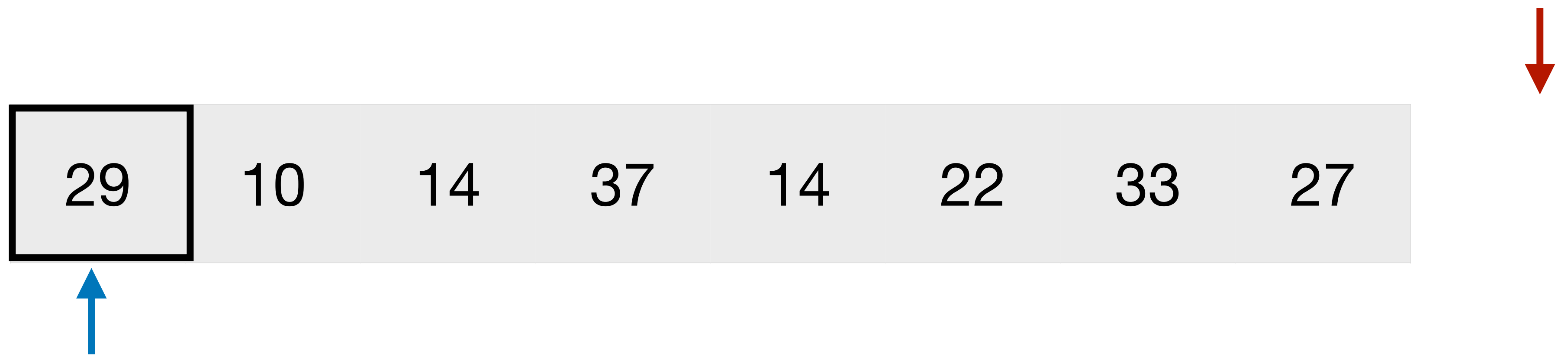

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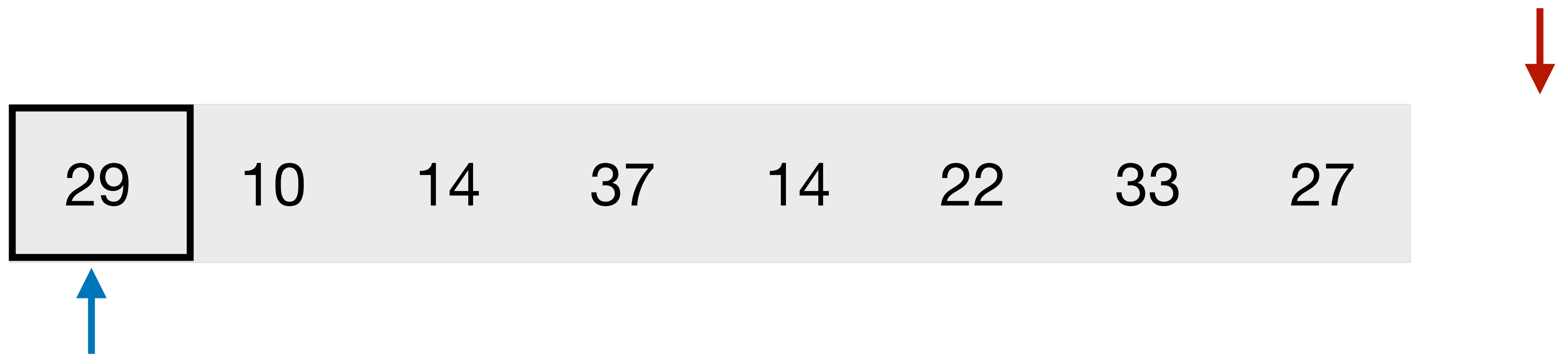

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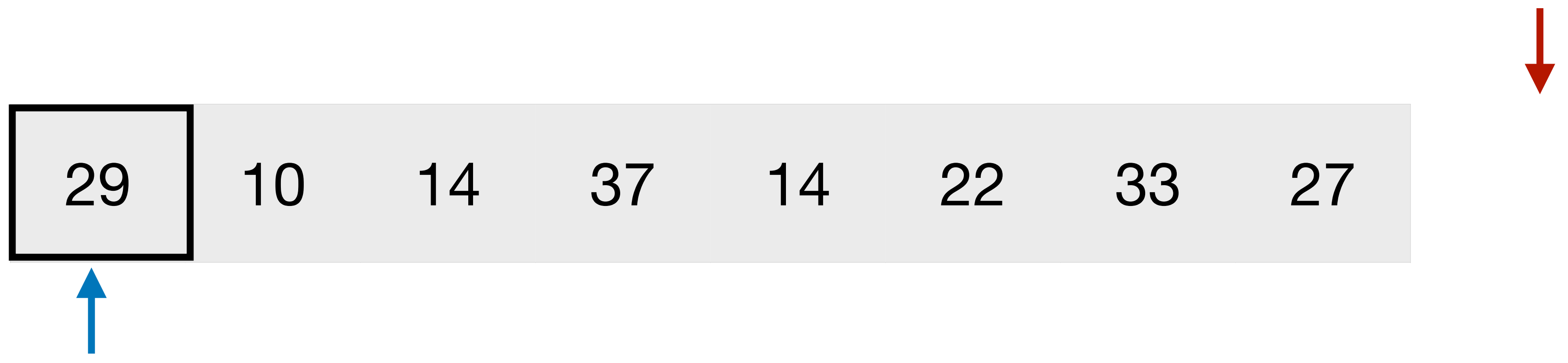

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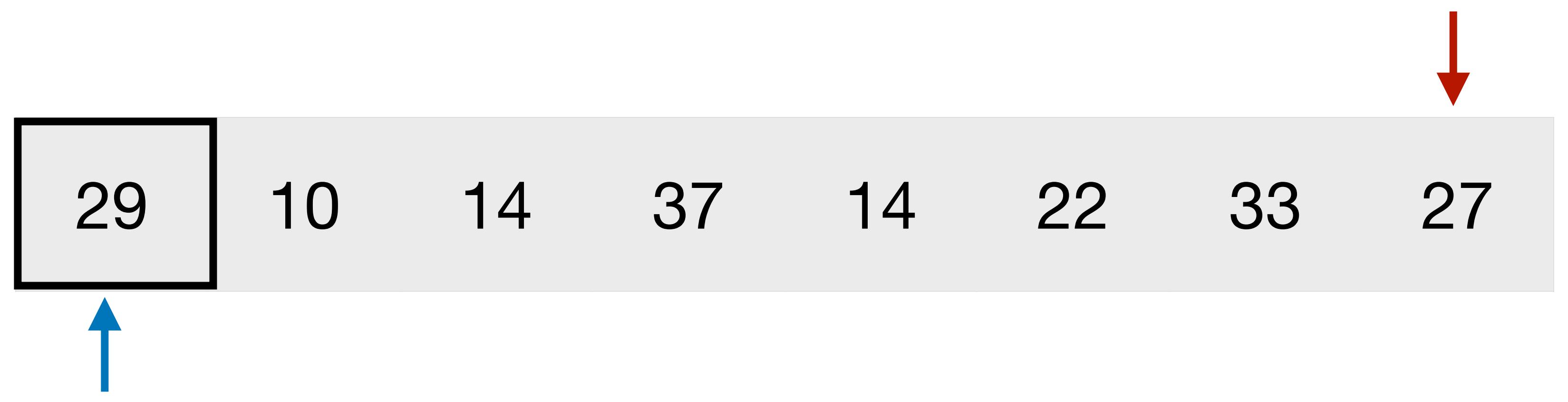

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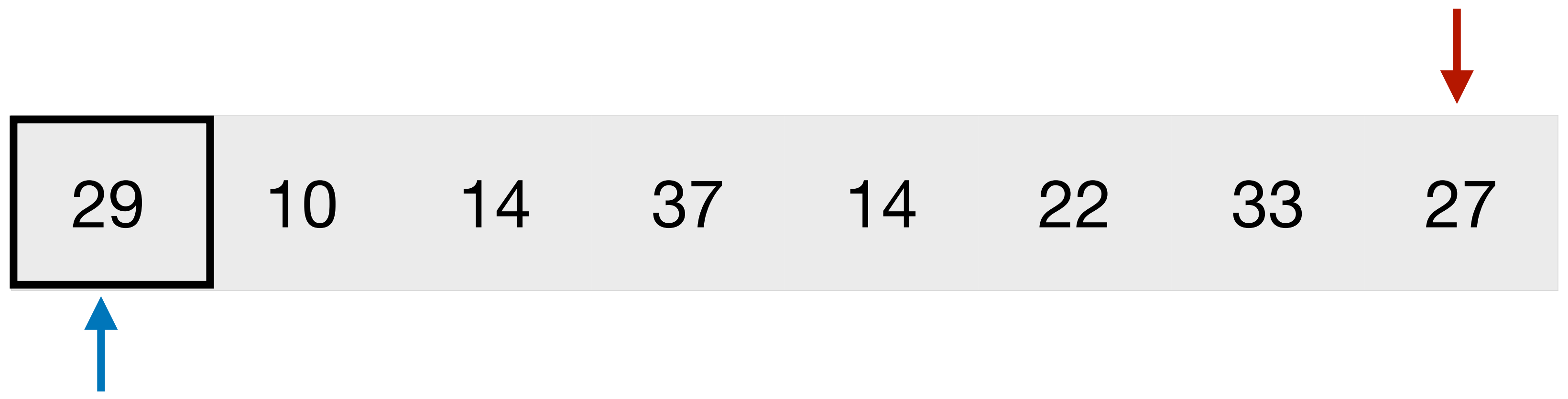

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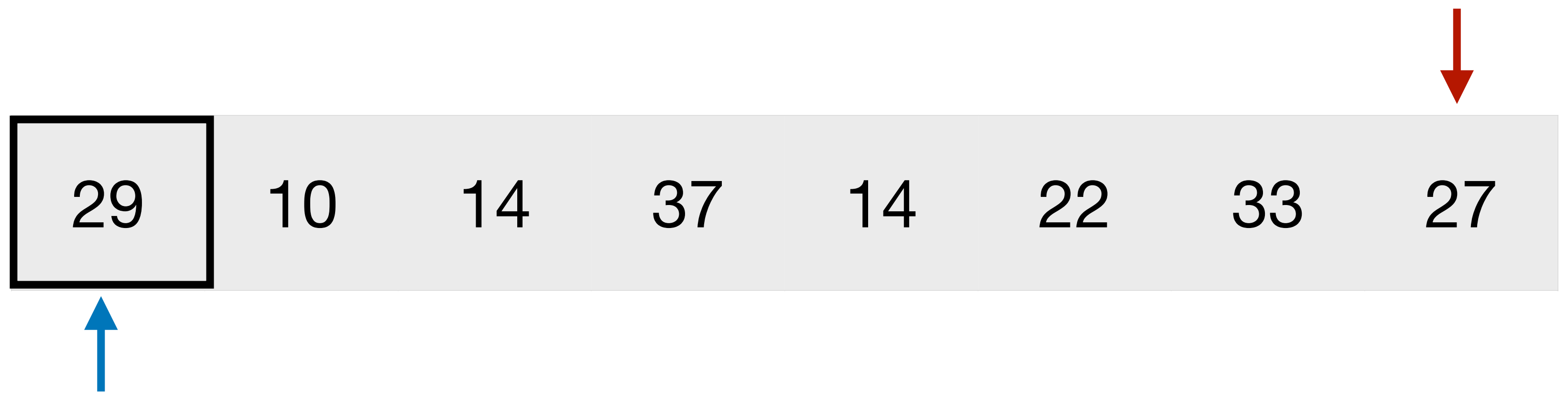

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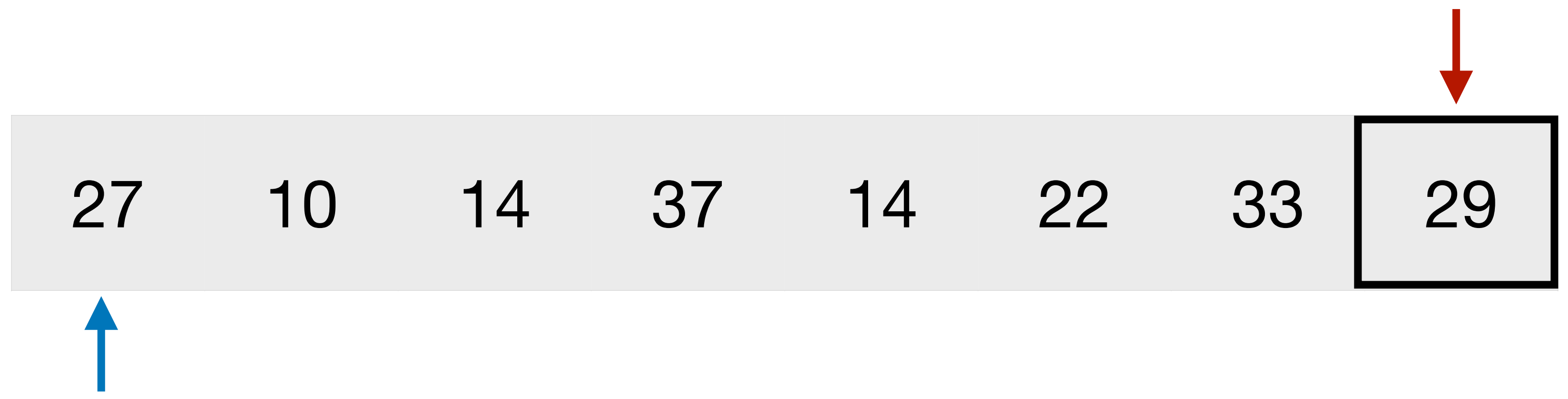

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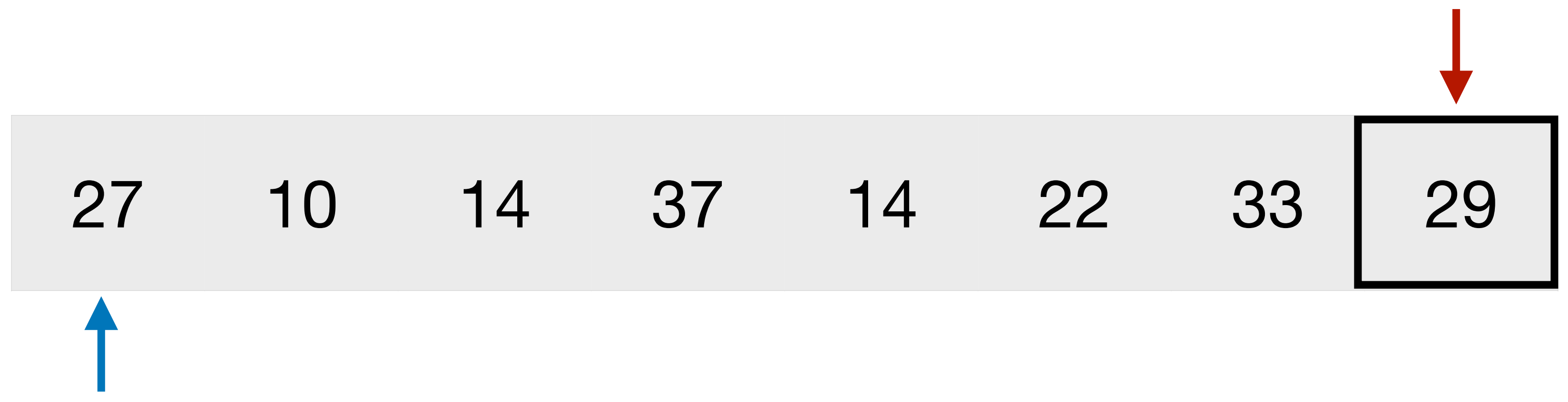

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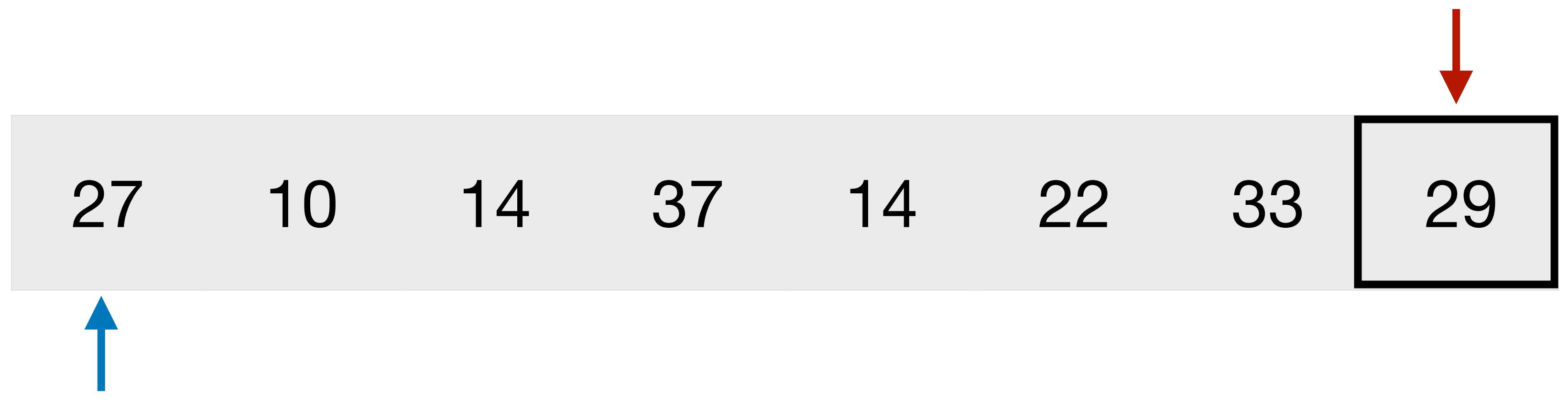

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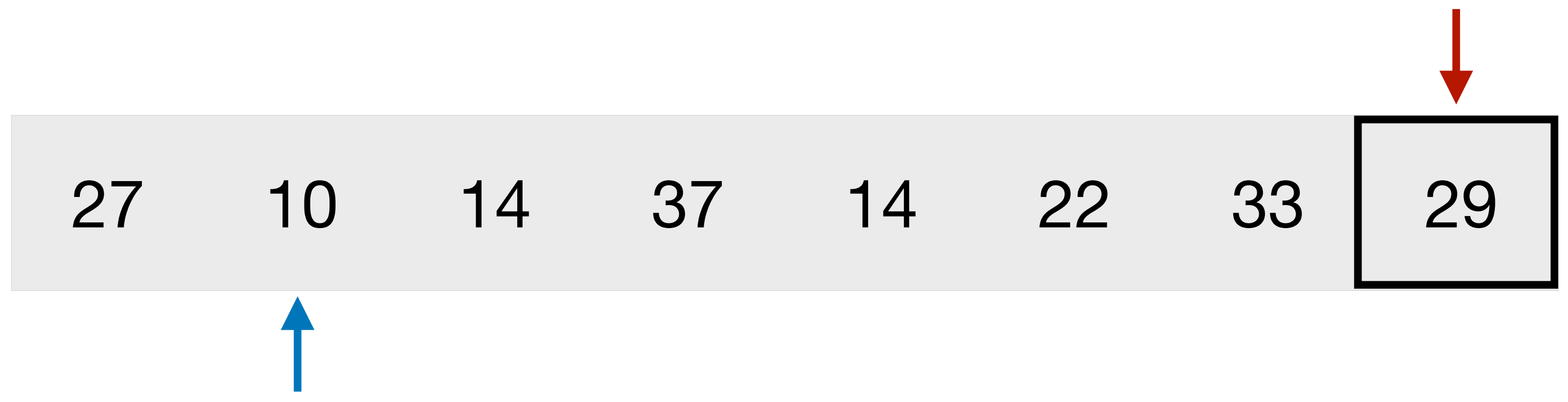

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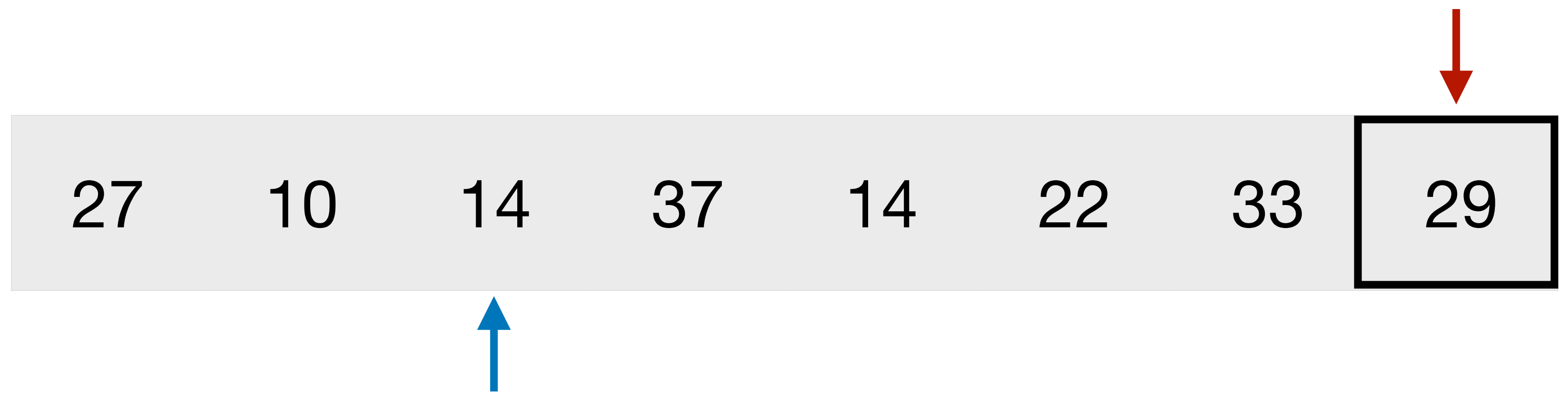

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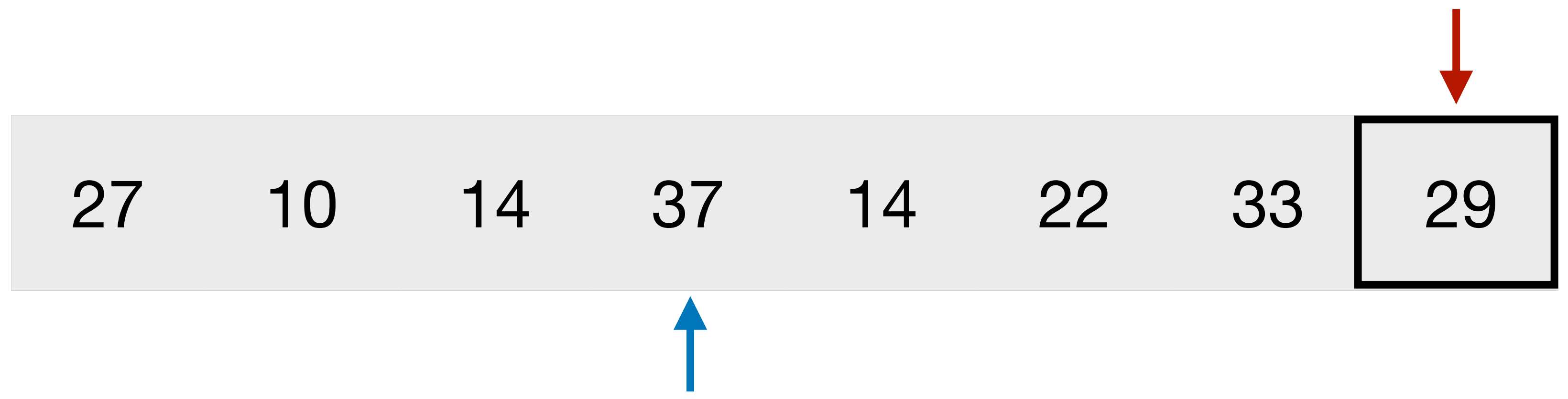

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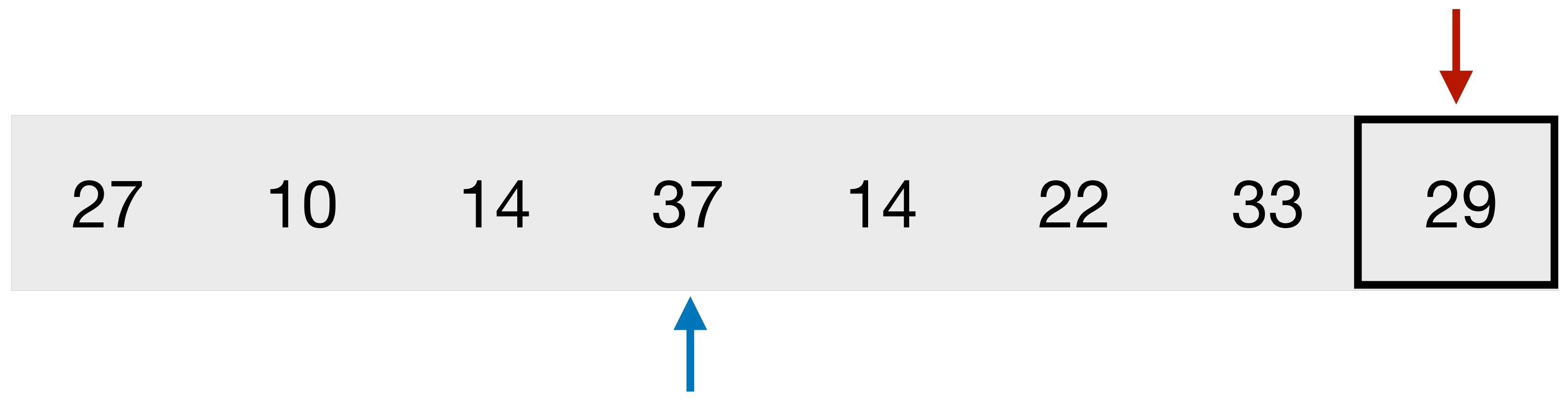

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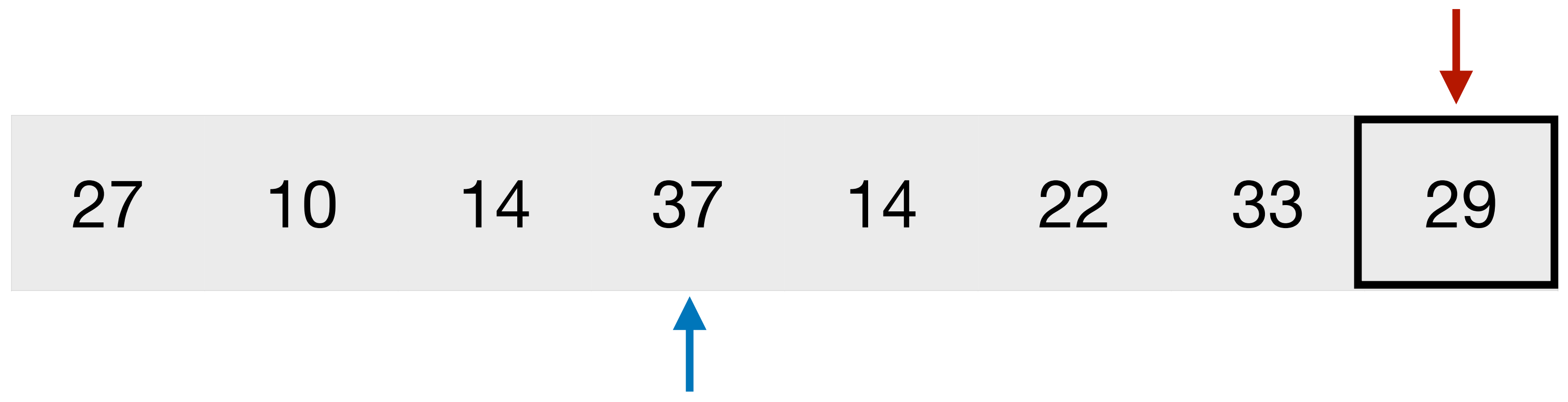

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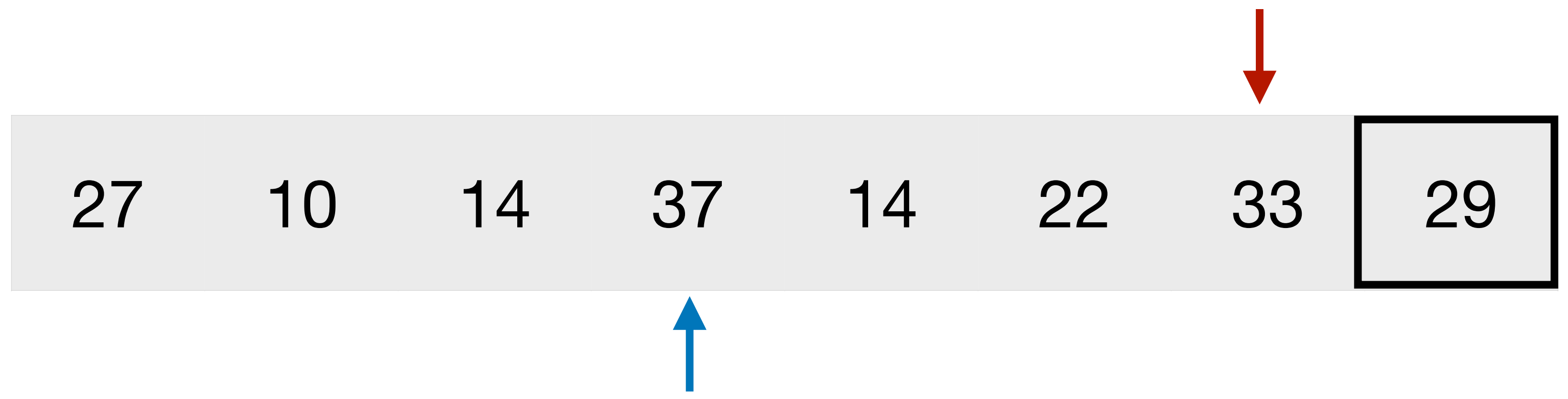

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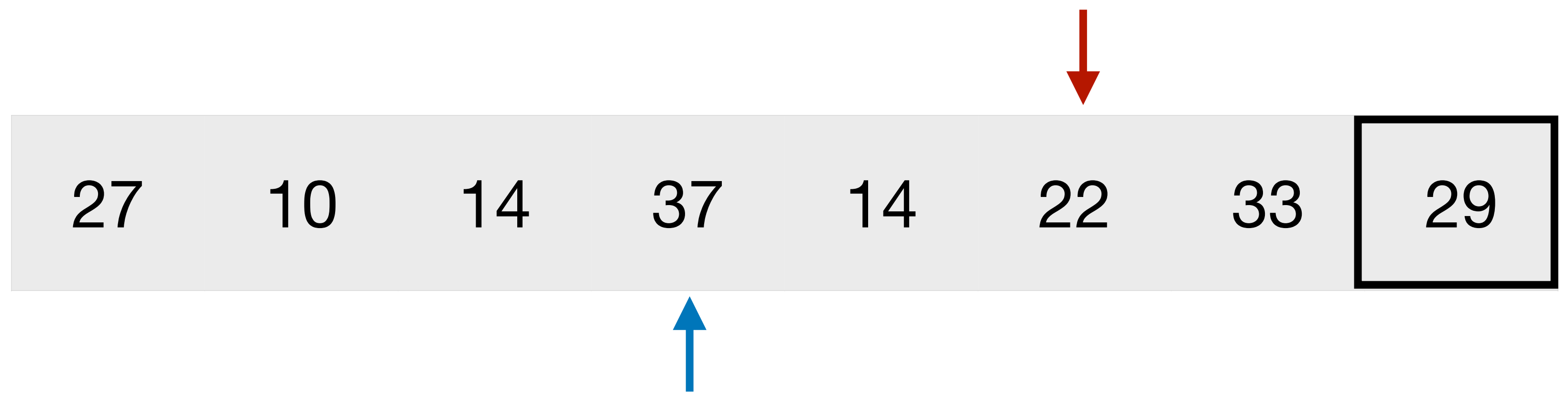

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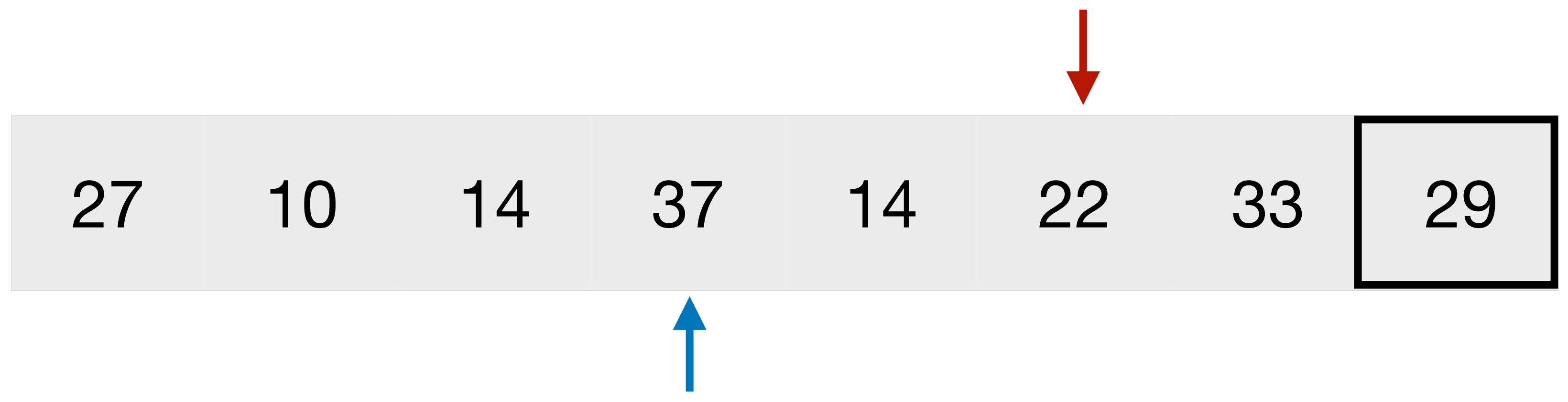

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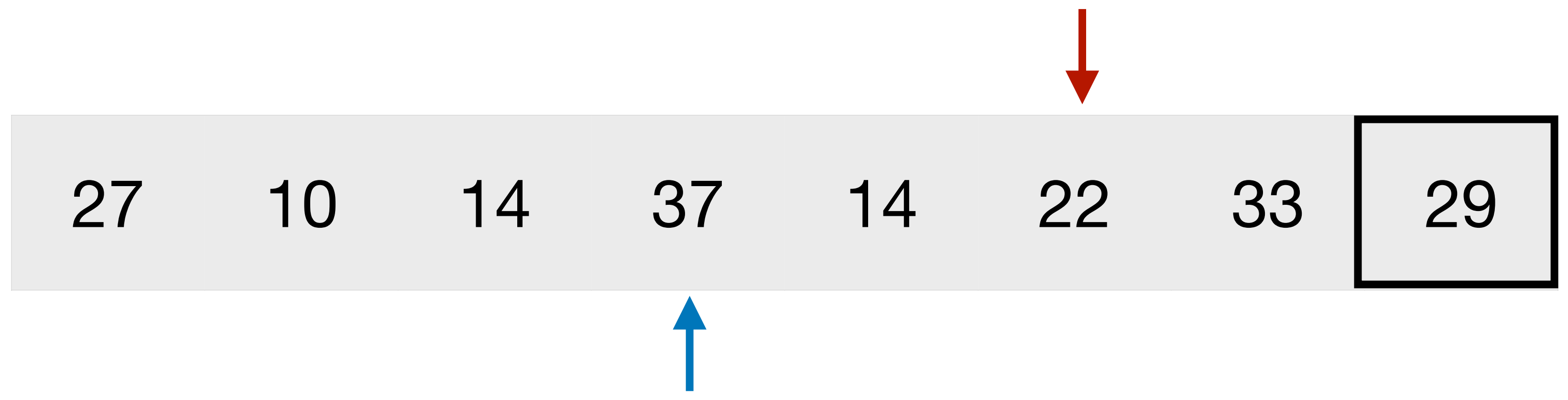

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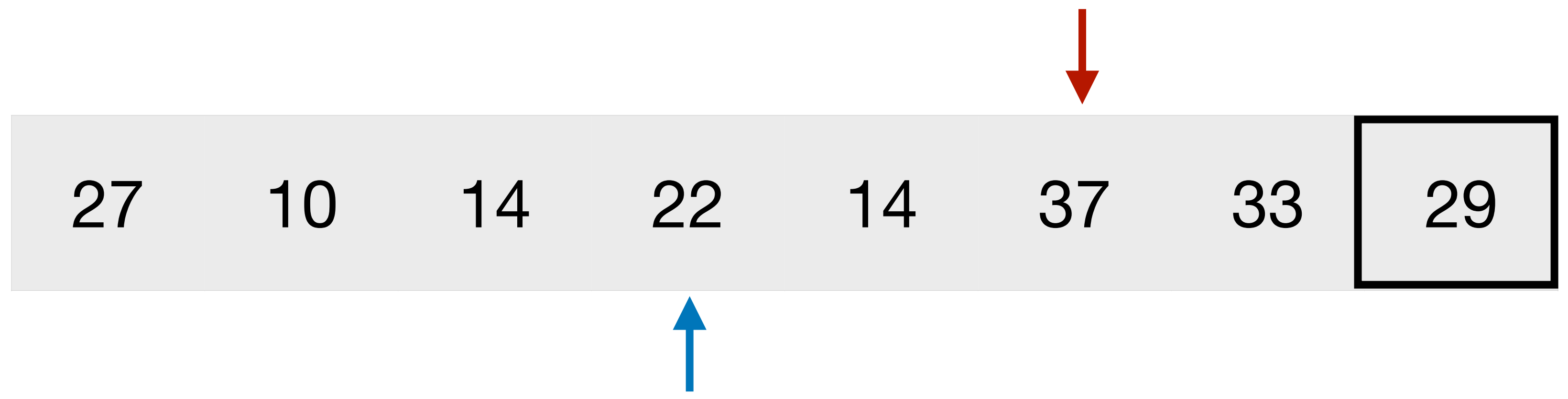

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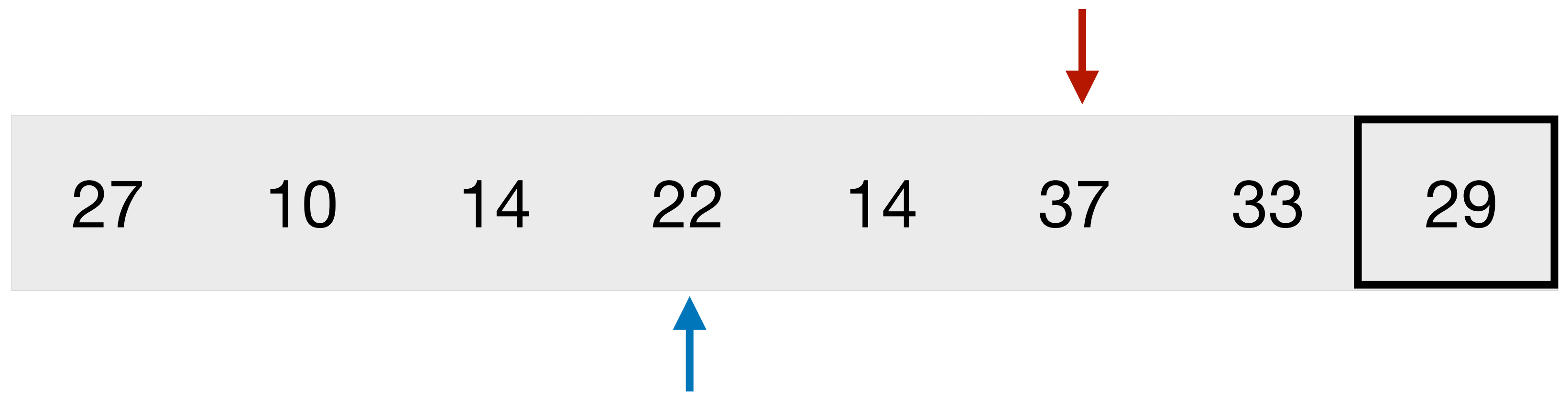

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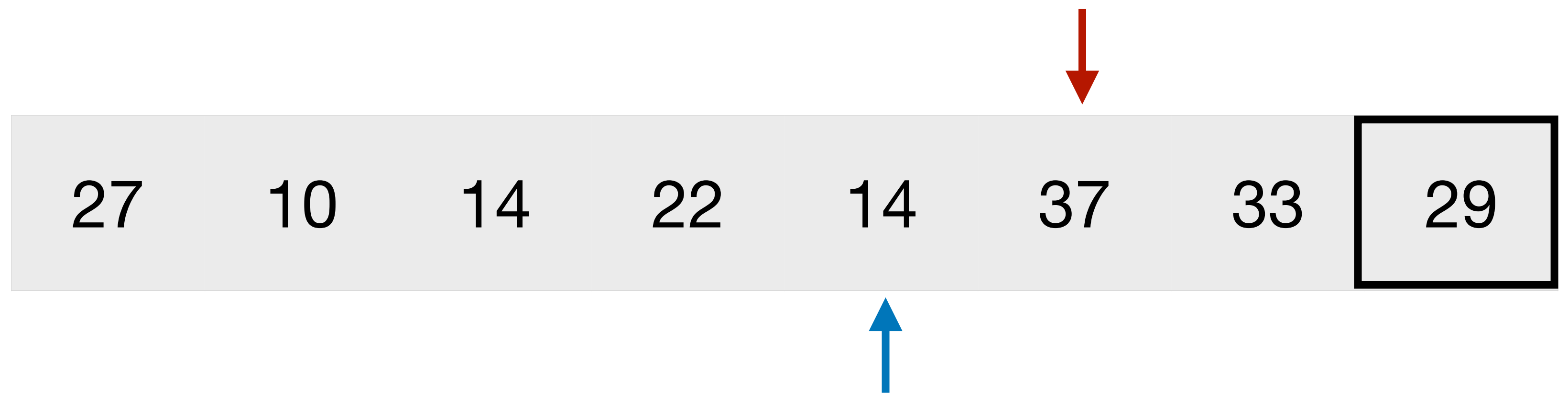

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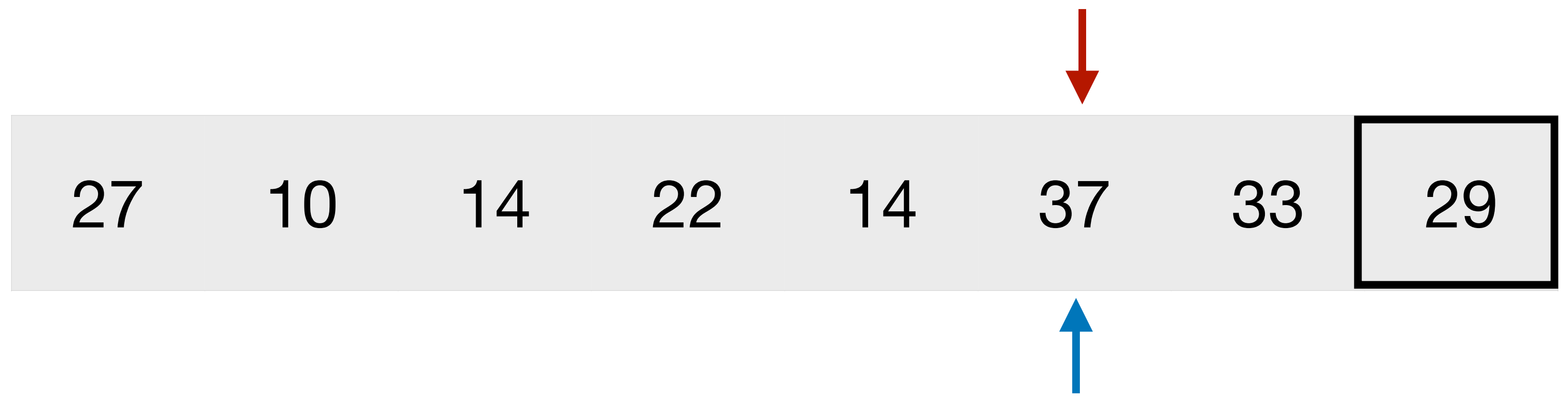

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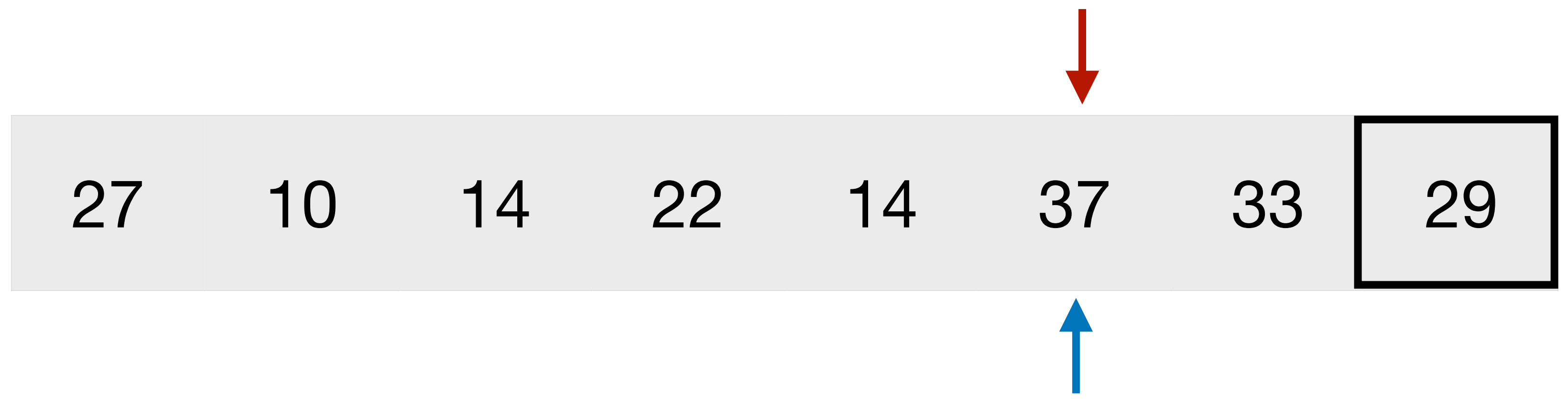

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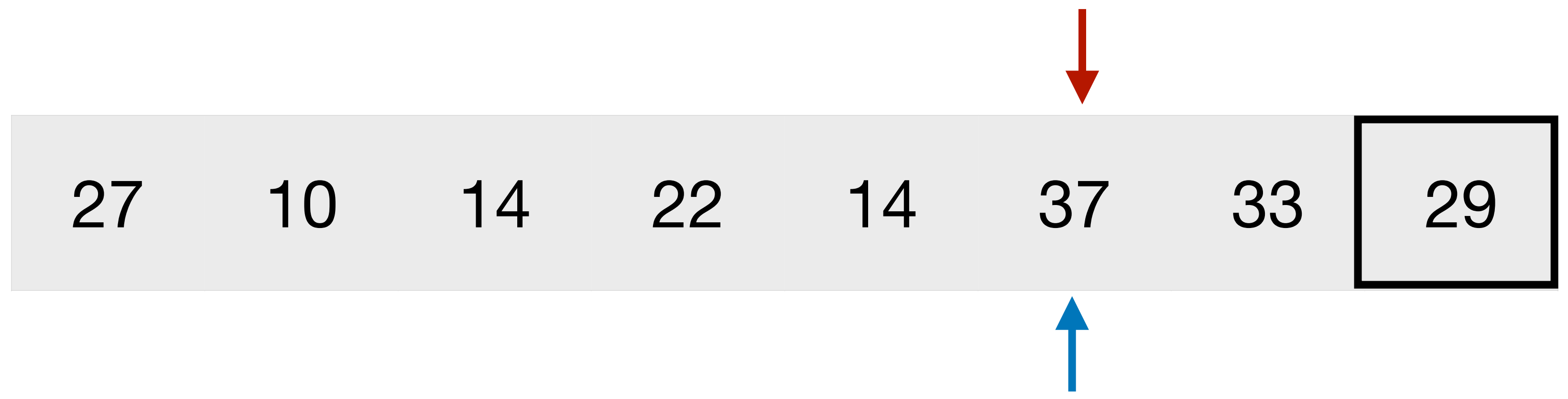

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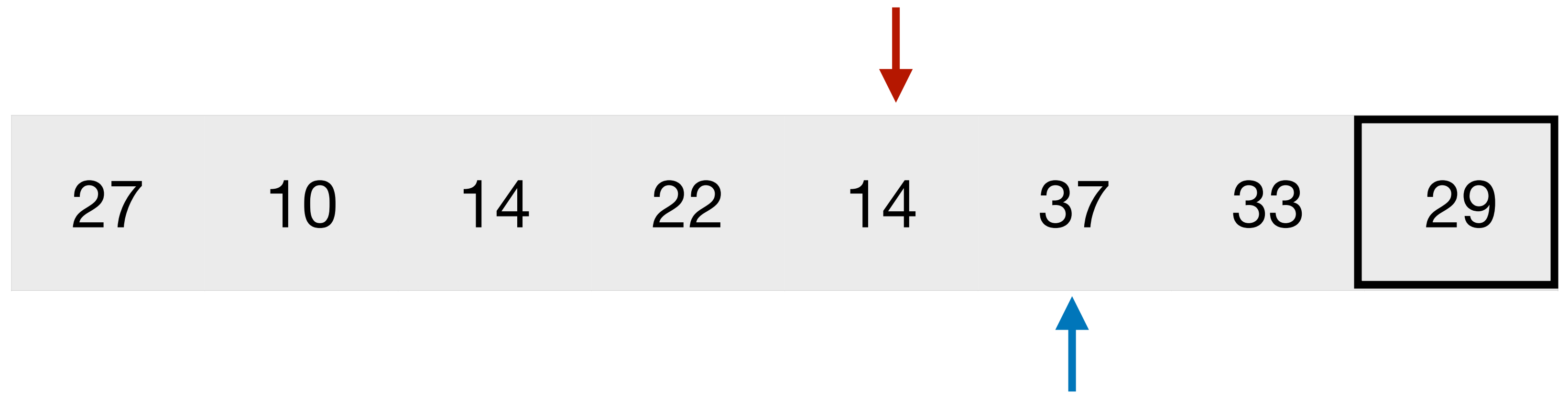

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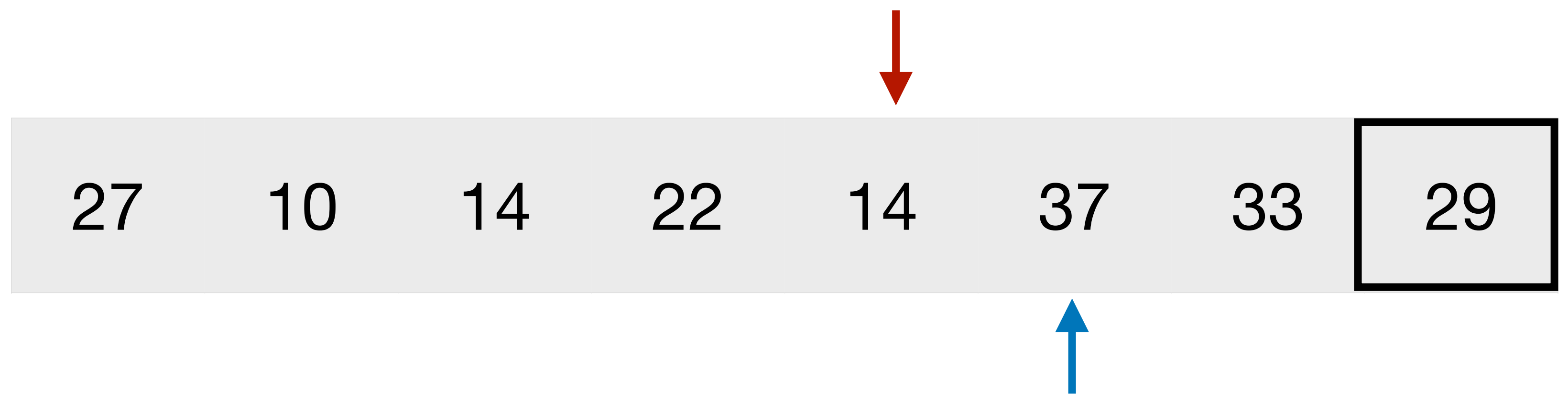

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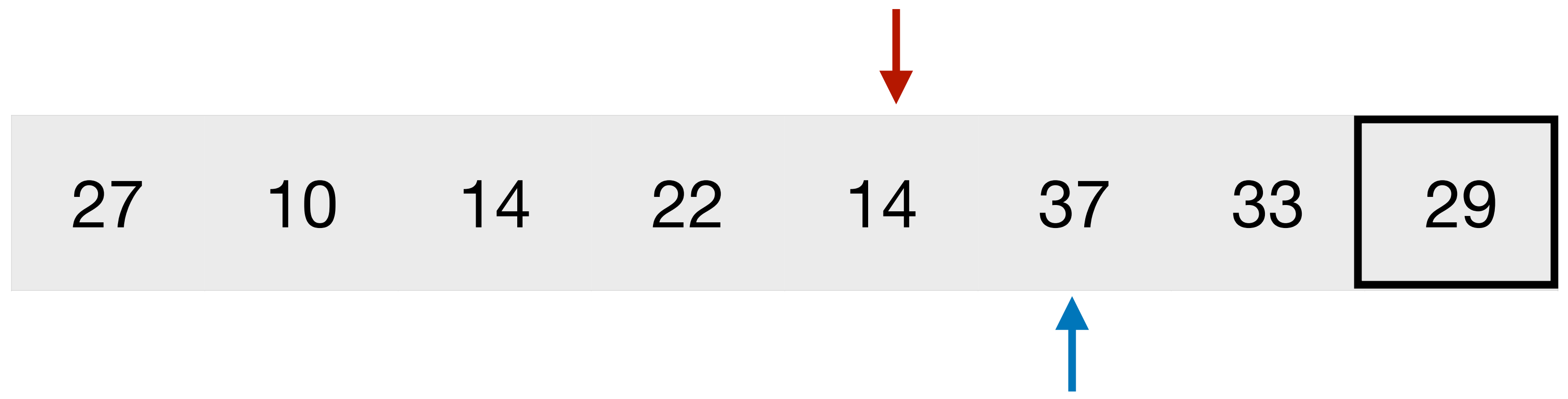

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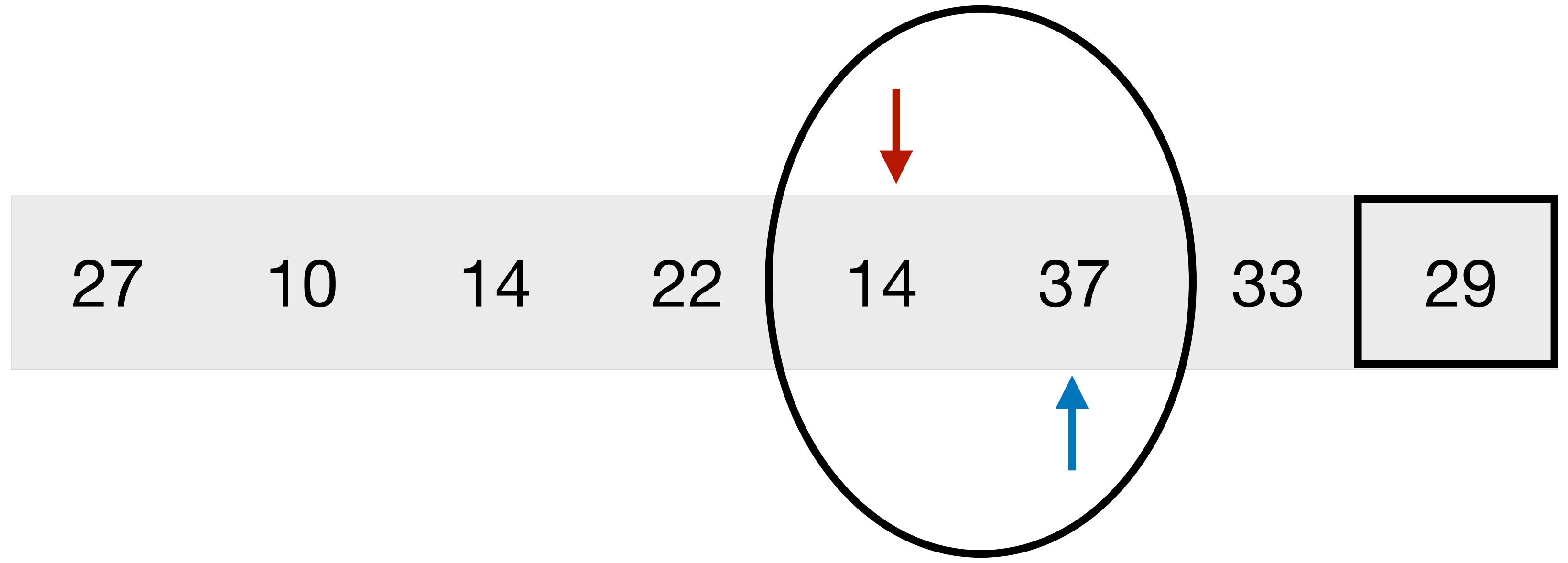

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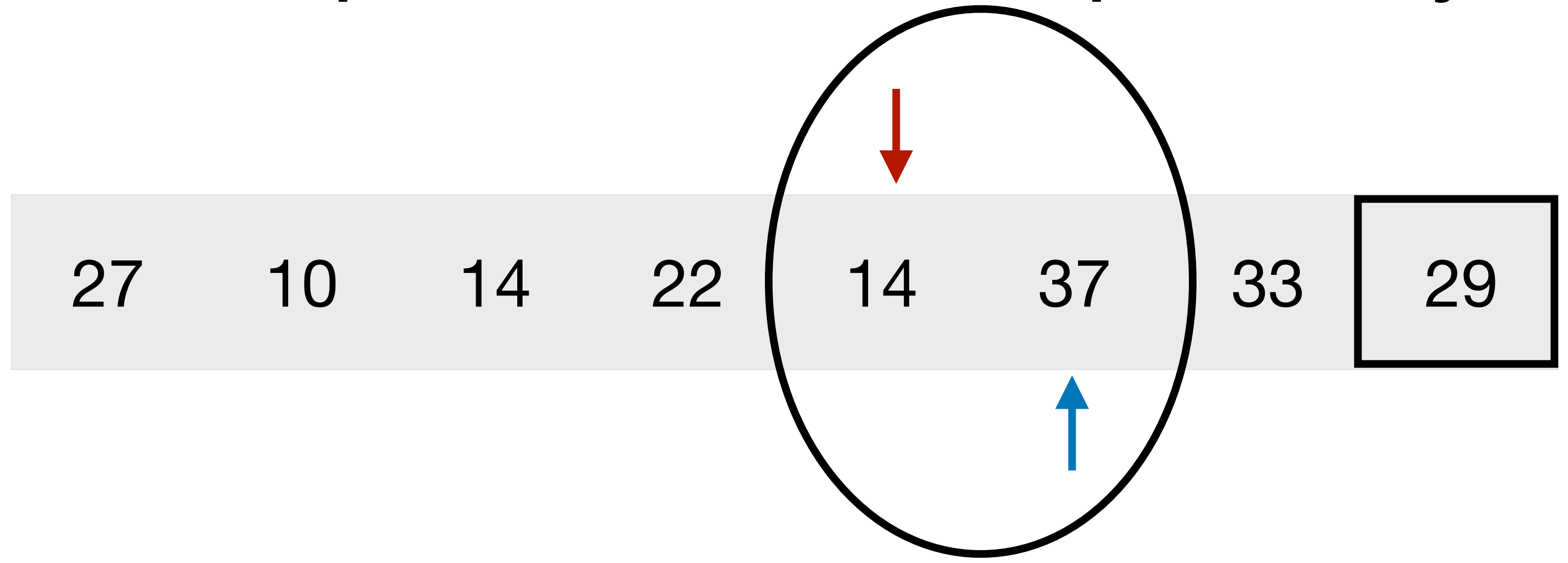
If pointers cross; split array & recurse on each.



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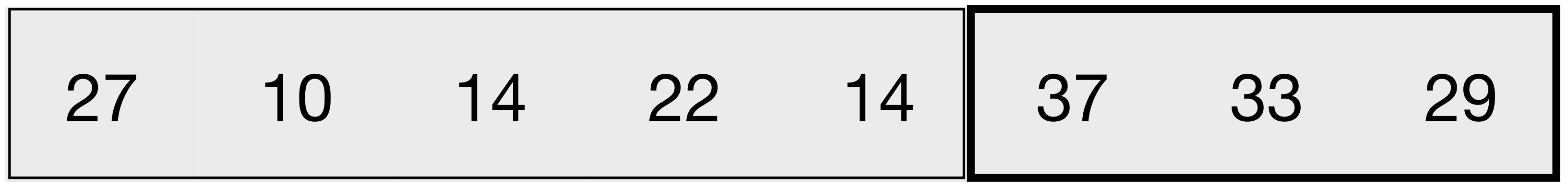

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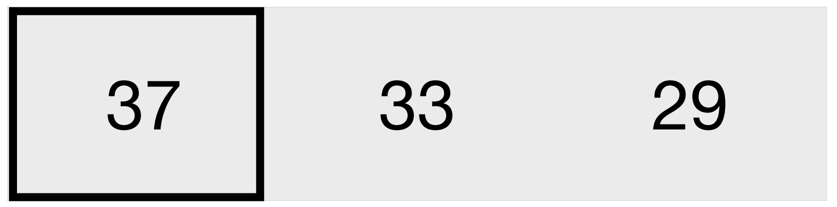

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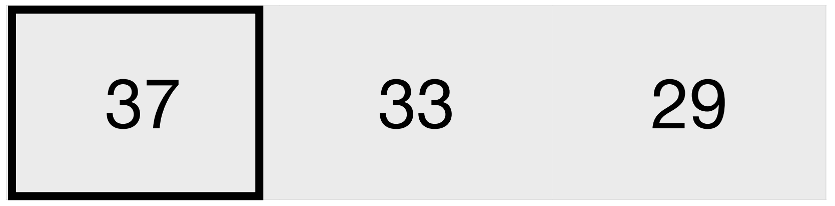

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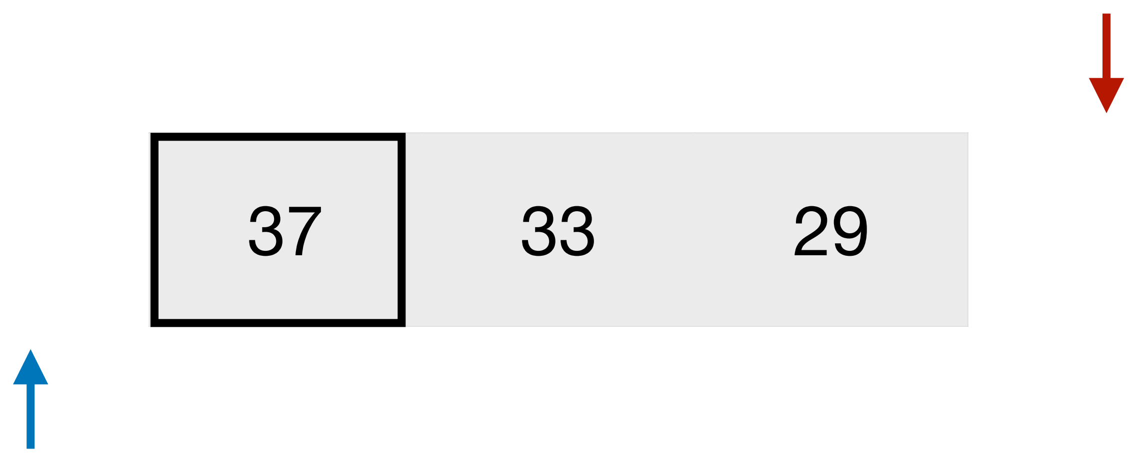

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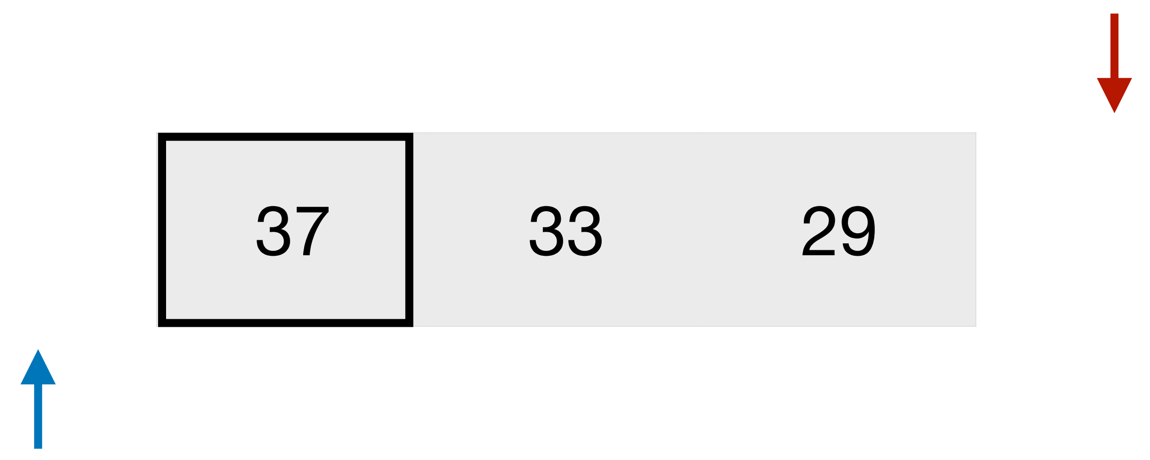

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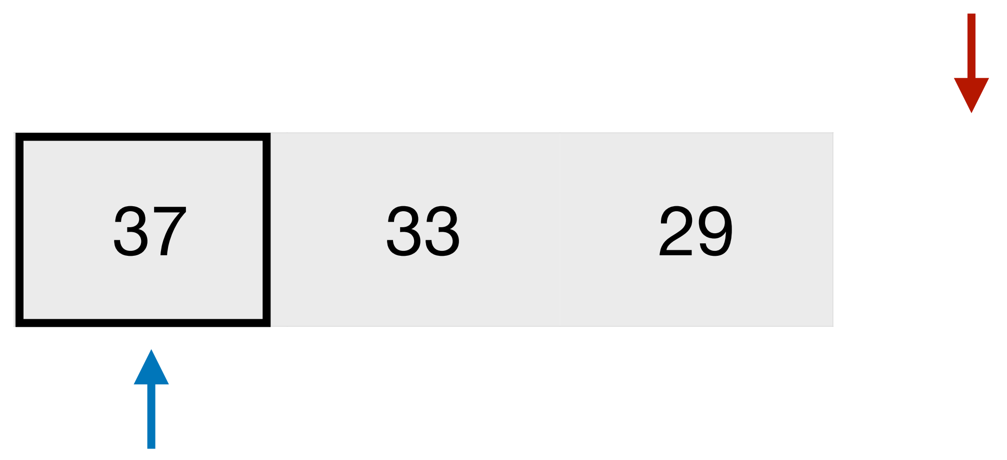

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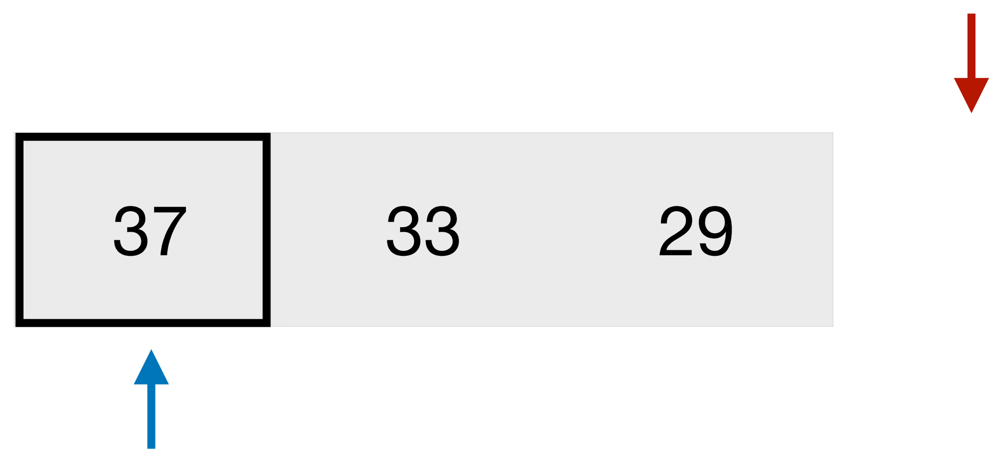

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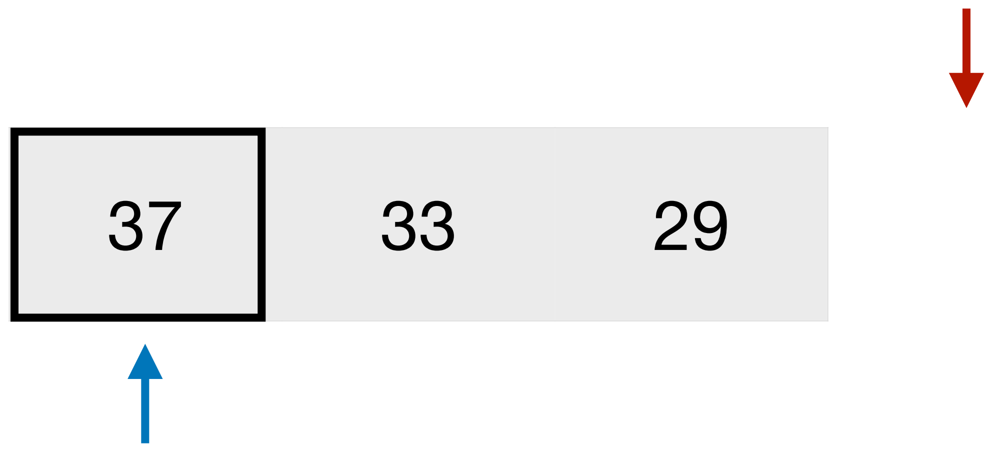

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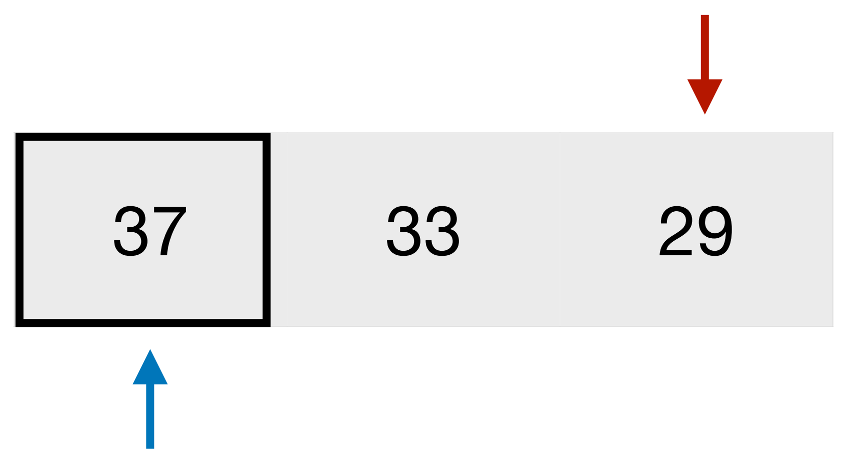

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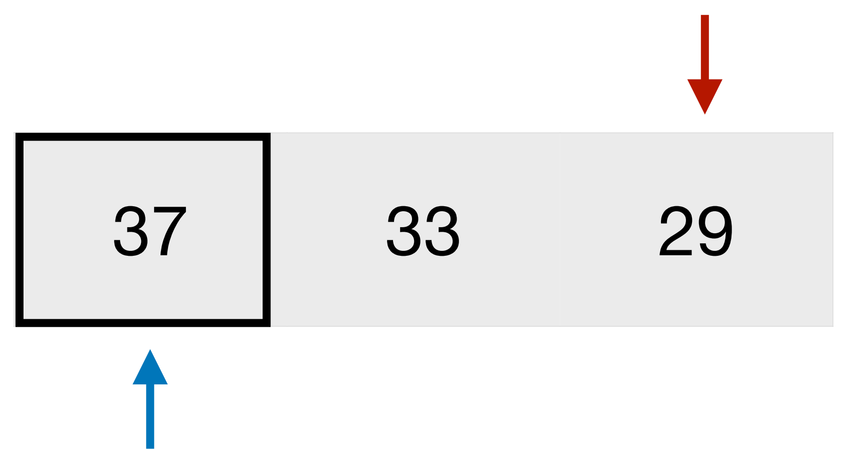

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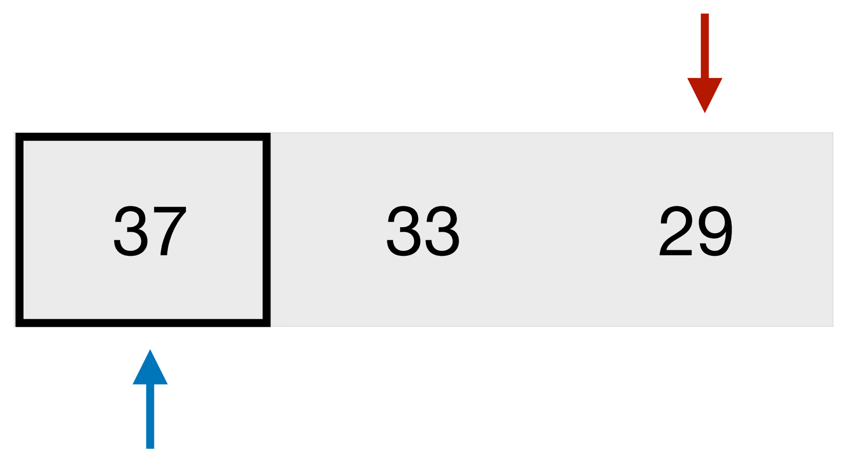

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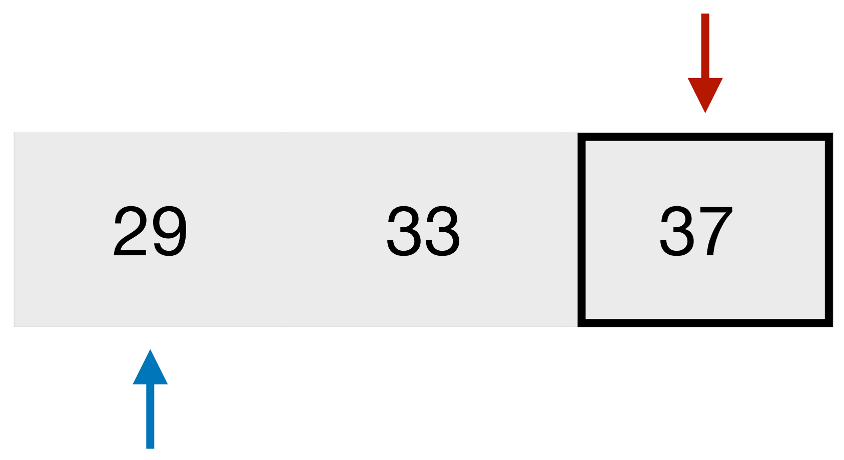

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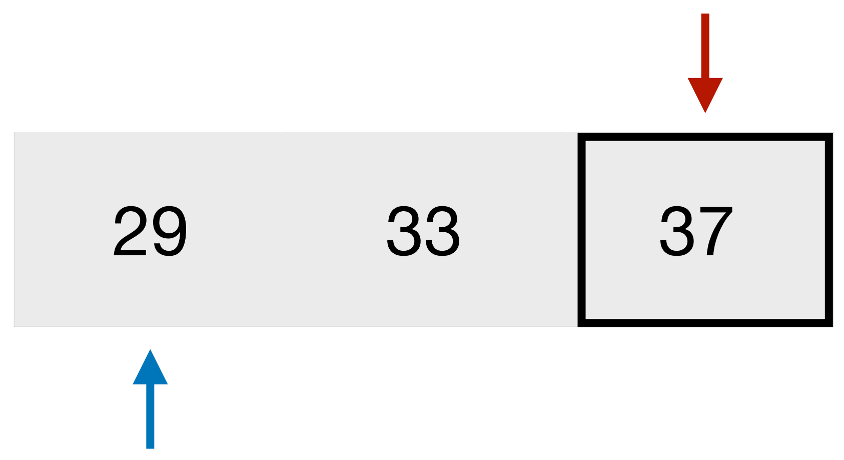

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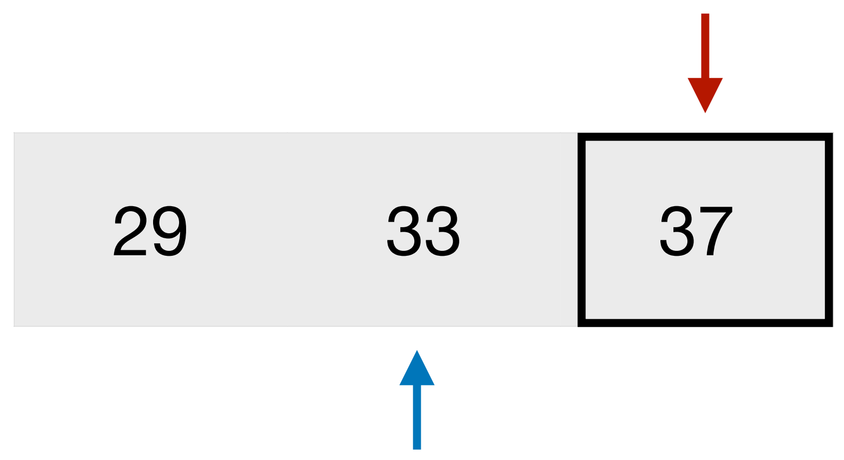

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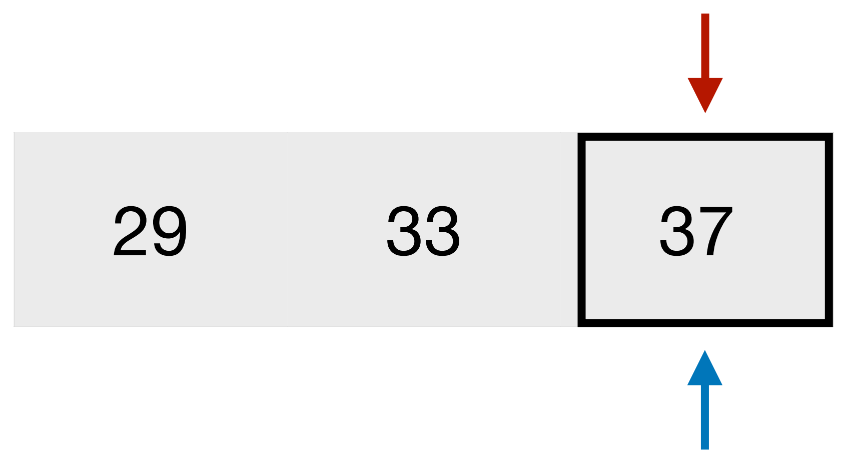

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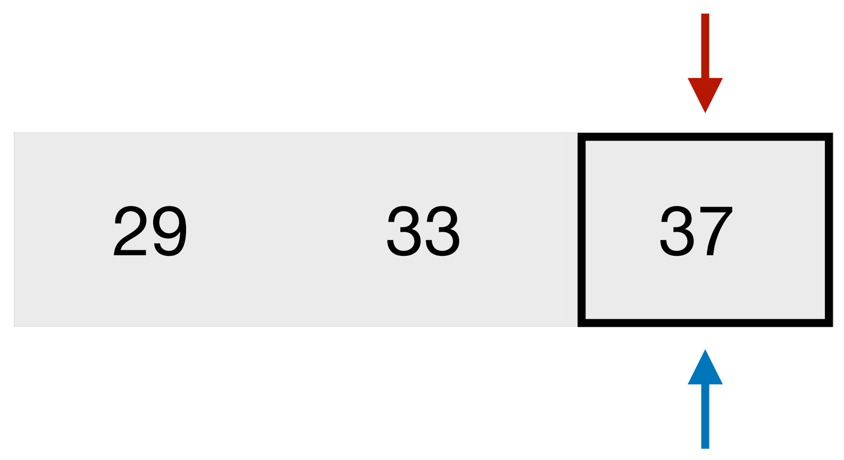

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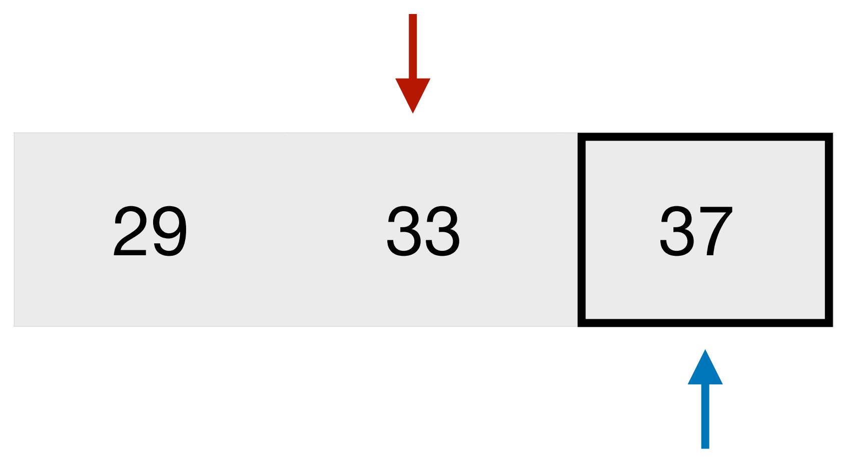

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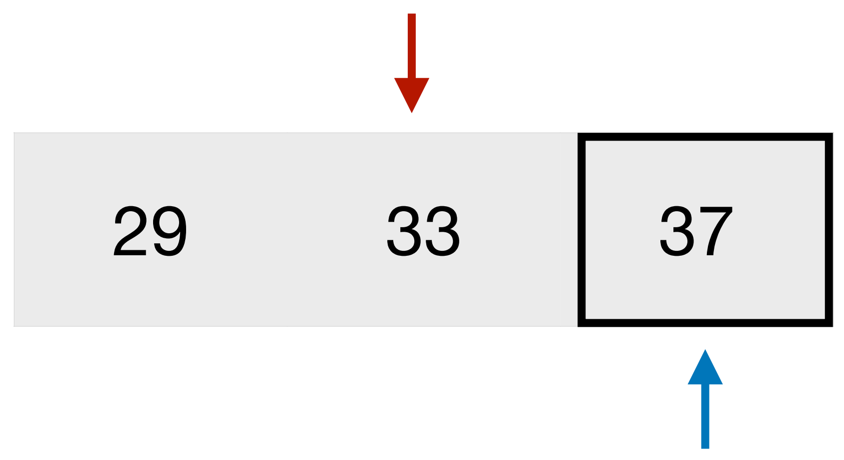

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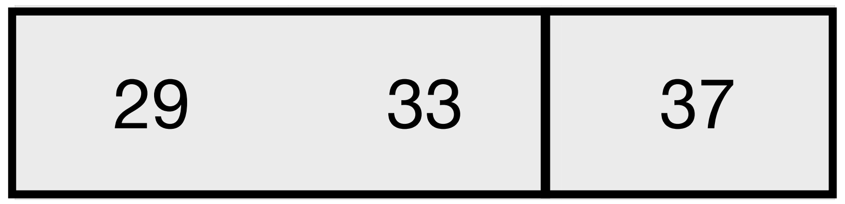

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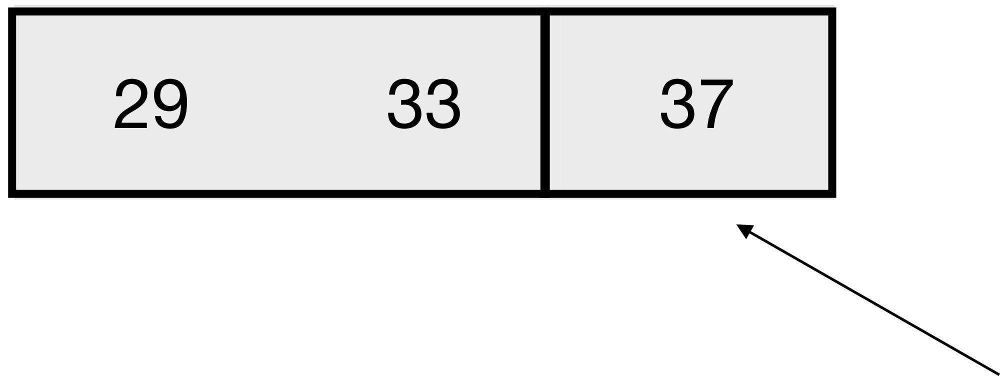

Single element arrays are considered sorted

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Quick sort

29	33

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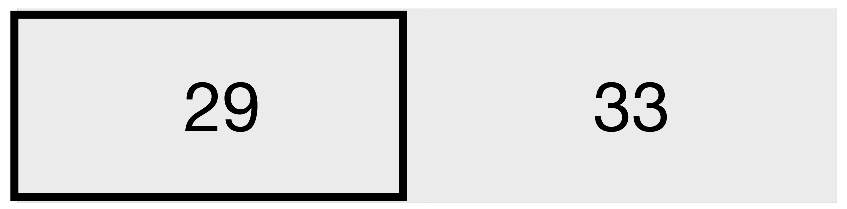

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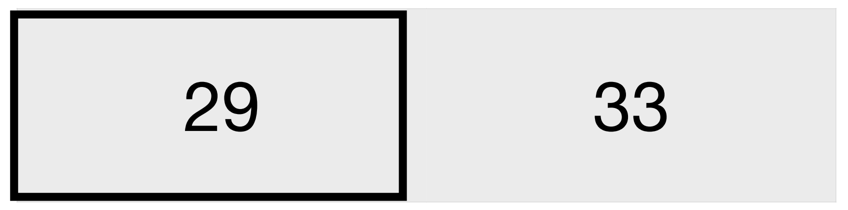

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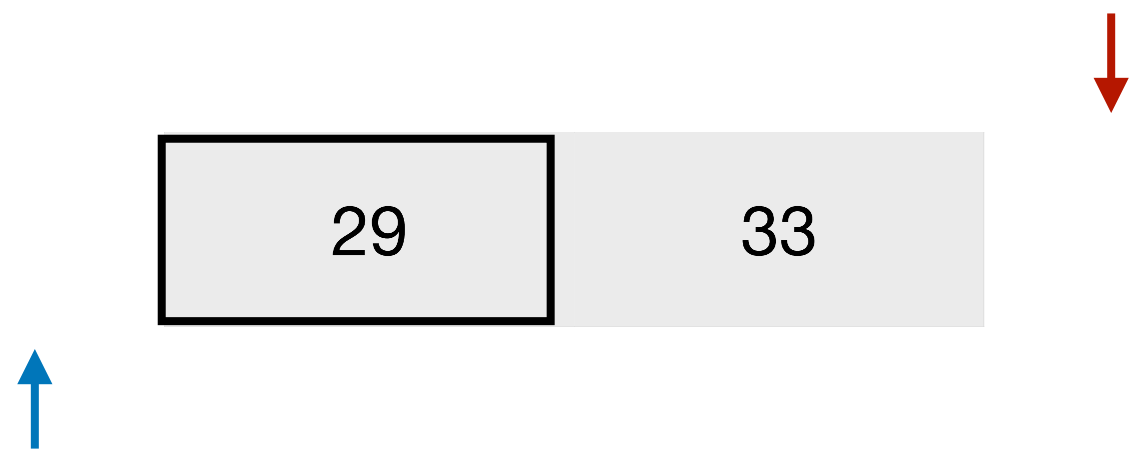

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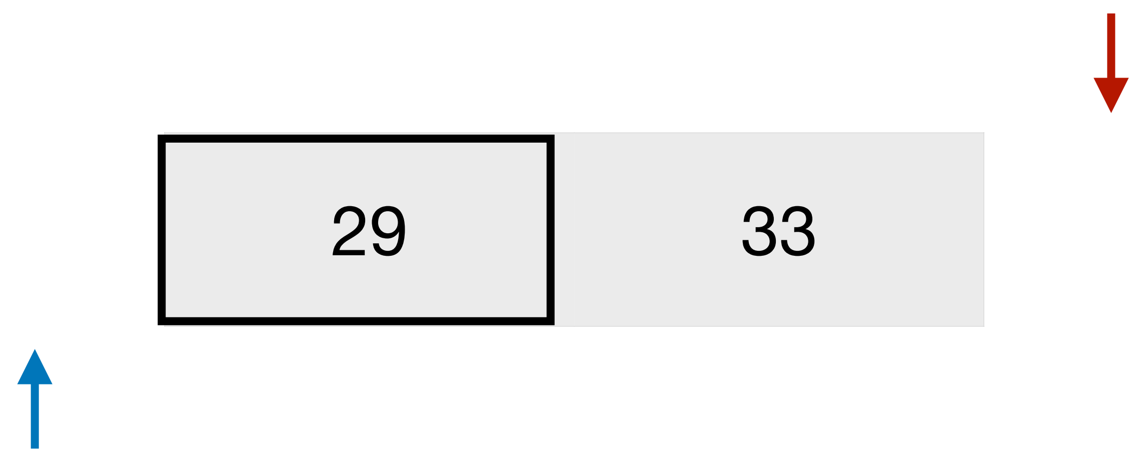

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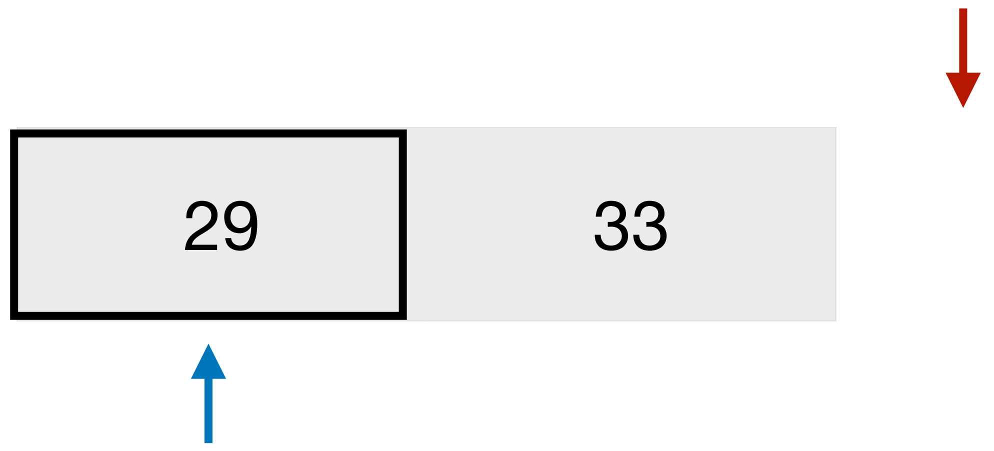

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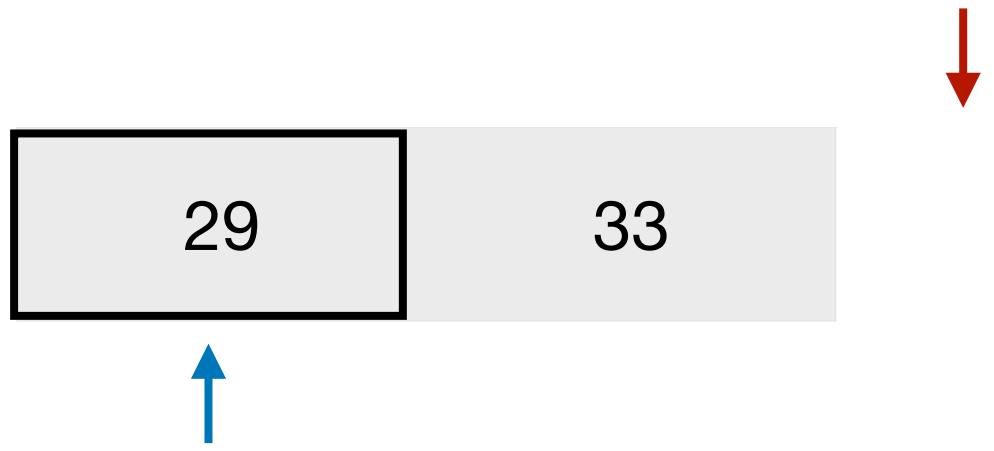

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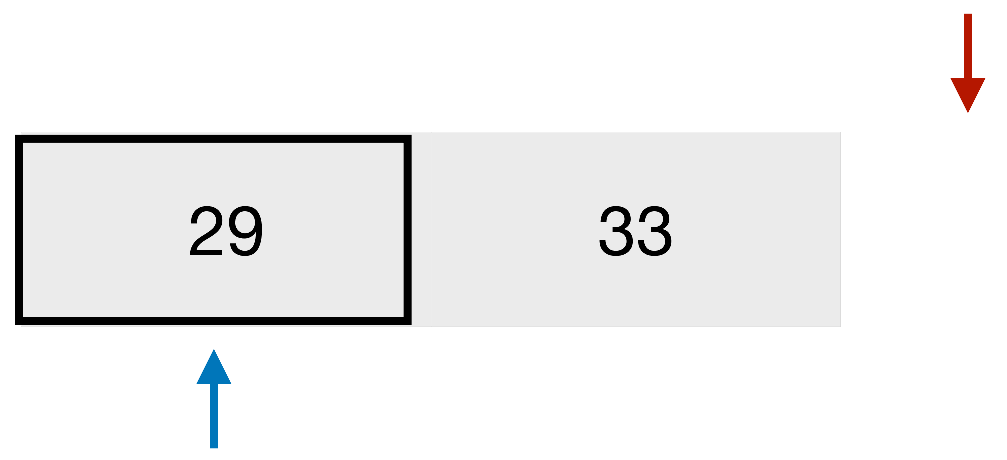

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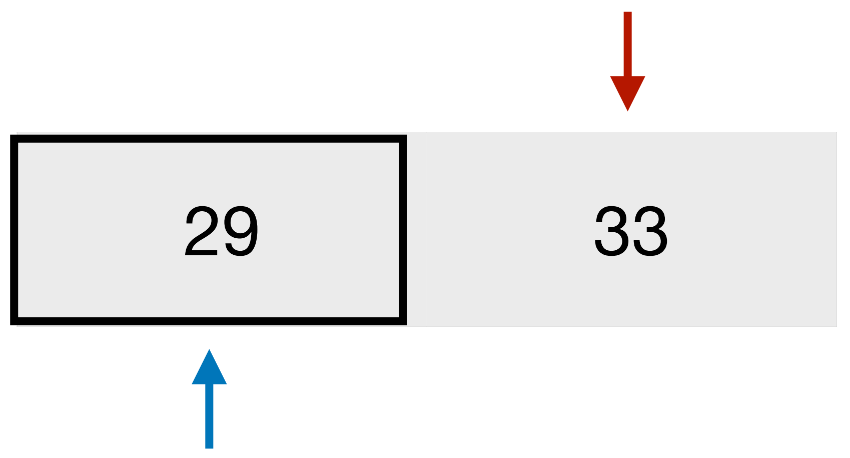

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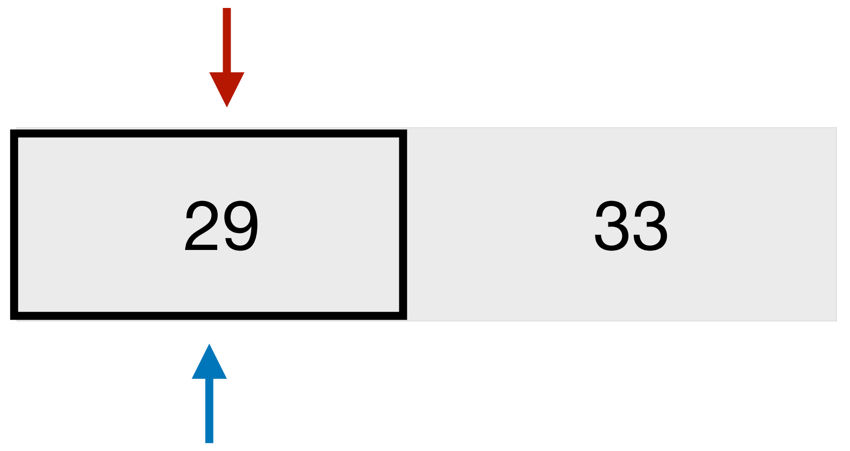

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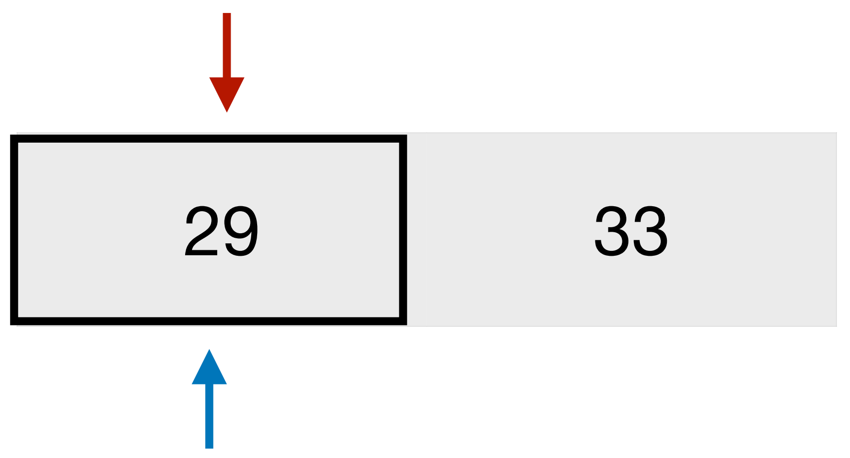

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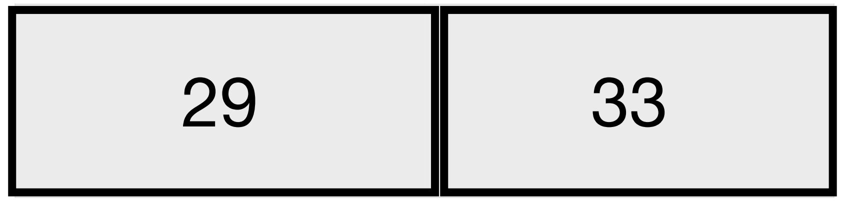

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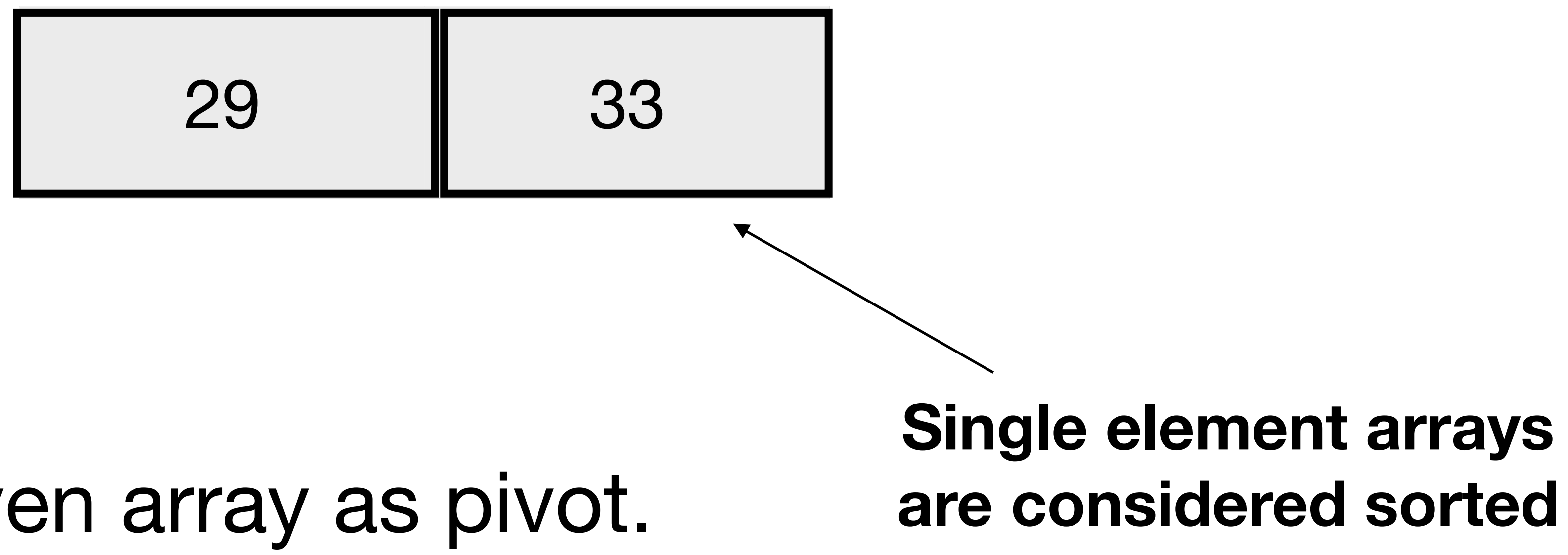

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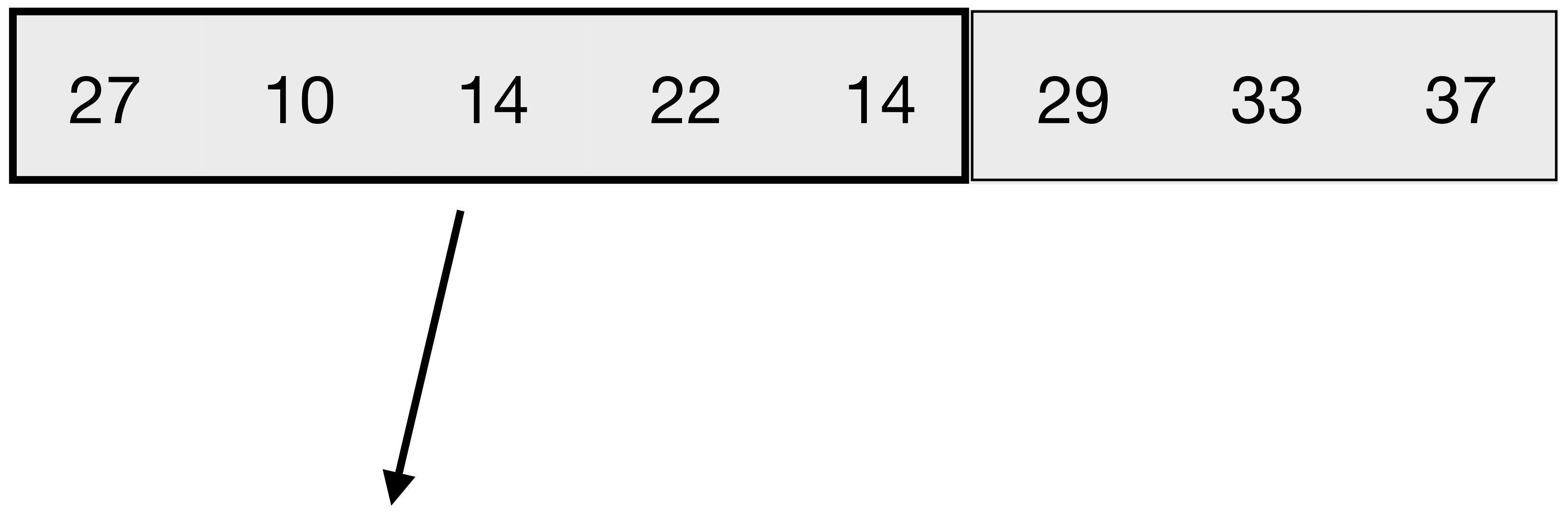
Quick sort

27	10	14	22	14	29	33	37

Repeat on the other array.

Follow the steps on this array yourself.

Quick sort



Repeat on the other array.

Follow the steps on this array yourself.

Implementation

- Need mechanism to keep track of left/right pointers as we repeat on sub arrays — *use a **STACK**!*

- See https://github.com/iabraham/ece220-sp26/blob/main/lec11_0224/advanced/quicksort.c for an iterative version using stack.

- Usually implemented with *recursion:* Topic of next week!

Recursive implementation

```
void Swap(int* one, int* two){
  int temp = *one;
  *one = *two;
  *two = temp;
}

void QuickSort(int arr[], int start, int end){
  if (start < end){
    int split = partition(arr, start, end);
    QuickSort(arr, start, split);
    QuickSort(arr, split + 1, end);
  }
}
```

```
int partition(int arr[], int start, int end){

  int pivotVal = arr[start];
  int i = start - 1;
  int j = end + 1;

  while(1){
    do i++;
    while (arr[i] < pivotVal);

    do j--;
    while (arr[j] > pivotVal);

    if (i >= j)
      return j;

    Swap(&arr[i], &arr[j]);
  }
}
```