

This is Tuesday morning, and the program continues.

101555 281630 100555 000000 015012 72618 202023 203517 327607 107136 250023 002177 160303 070306 21000 307065 101376 28173 300600 067023 200855 300600 310770 230537 007066 357730

[illegible]

Pseudocode of Quicksort algorithm

Procedure quickSort(arr, low, high)

 If low < high Then

 pivotIndex <- partition(arr, low, high)

 Call quickSort(arr, low, pivotIndex - 1)

 Call quickSort(arr, pivotIndex + 1, high)

 End If

End Procedure

Function partition(arr, low, high)

 mid <- low + (high - low) / 2

 pivot <- arr[mid]

 Swap arr[mid] with arr[high]

 i <- low

 For j from low to high-1

 If arr[j] < pivot Then

 Swap arr[i] with arr[j]

 i <- i + 1

 End If

 End For

 Swap arr[i] with arr[high]

 Return i

End Function

Q1(ii)

Screenshot of the output from Q1-B, including sorted and inverse sorted lists and random lists for each list size in these tests.

[The results from all three lists on Monday, using quicksort, and their average time.](#)

```
Monday Time taken for ascending list(sorted): 1ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 1ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 1ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Time taken for ascending list(sorted): 0ms
Monday Time taken for descending list(inverse sorted): 0ms
Monday Time taken for random list(random list): 0ms

Monday Average time taken for ascending list(sorted)(Quicksort): 0.6666667ms
Monday Average time taken for descending list(inverse sorted)(Quicksort): 0.0ms
Monday Average time taken for random list(random list)(Quicksort): 0.33333334ms
```

[The results from all three lists on Tuesday, using quicksort, and their average time.](#)

```
Tuesday Time taken for aescending list(sorted): 0ms
Tuesday Time taken for descending list(inverse sorted): 1ms
Tuesday Time taken for random list(random list): 1ms

Tuesday Time taken for aescending list(sorted): 0ms
Tuesday Time taken for descending list(inverse sorted): 0ms
Tuesday Time taken for random list(random list): 0ms

Tuesday Time taken for aescending list(sorted): 1ms
Tuesday Time taken for descending list(inverse sorted): 0ms
Tuesday Time taken for random list(random list): 1ms

Tuesday Time taken for aescending list(sorted): 0ms
Tuesday Time taken for descending list(inverse sorted): 1ms
Tuesday Time taken for random list(random list): 1ms

Tuesday Time taken for aescending list(sorted): 1ms
Tuesday Time taken for descending list(inverse sorted): 1ms
Tuesday Time taken for random list(random list): 1ms

Tuesday Time taken for aescending list(sorted): 0ms
Tuesday Time taken for descending list(inverse sorted): 0ms
Tuesday Time taken for random list(random list): 0ms

Tuesday Time taken for aescending list(sorted): 0ms
Tuesday Time taken for descending list(inverse sorted): 0ms
Tuesday Time taken for random list(random list): 1ms

Tuesday Time taken for aescending list(sorted): 1ms
Tuesday Time taken for descending list(inverse sorted): 0ms
Tuesday Time taken for random list(random list): 0ms

Tuesday Time taken for aescending list(sorted): 0ms
Tuesday Time taken for descending list(inverse sorted): 0ms
Tuesday Time taken for random list(random list): 0ms

Tuesday Time taken for aescending list(sorted): 0ms
Tuesday Time taken for descending list(inverse sorted): 1ms
Tuesday Time taken for random list(random list): 1ms

Tuesday Average time taken for aescending list(sorted)(Quicksort): 1.0ms
Tuesday Average time taken for descending list(inverse sorted)(Quicksort): 1.3333334ms
Tuesday Average time taken for random list(random list)(Quicksort): 2.0ms
```

The results from all three lists on Wednesday, using quicksort, and their average time.

```
Wednesday Time taken for aescending list(sorted): 0ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 2ms

Wednesday Time taken for aescending list(sorted): 0ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 2ms

Wednesday Time taken for aescending list(sorted): 1ms
Wednesday Time taken for descending list(inverse sorted): 0ms
Wednesday Time taken for random list(random list): 1ms

Wednesday Time taken for aescending list(sorted): 1ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 2ms

Wednesday Time taken for aescending list(sorted): 1ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 1ms

Wednesday Time taken for aescending list(sorted): 1ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 1ms

Wednesday Time taken for aescending list(sorted): 1ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 1ms

Wednesday Time taken for aescending list(sorted): 1ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 1ms

Wednesday Time taken for aescending list(sorted): 1ms
Wednesday Time taken for descending list(inverse sorted): 0ms
Wednesday Time taken for random list(random list): 1ms

Wednesday Time taken for aescending list(sorted): 0ms
Wednesday Time taken for descending list(inverse sorted): 1ms
Wednesday Time taken for random list(random list): 1ms

Wednesday Average time taken for aescending list(sorted)(Quicksort): 2.333333ms
Wednesday Average time taken for descending list(inverse sorted)(Quicksort): 2.666667ms
Wednesday Average time taken for random list(random list)(Quicksort): 4.333335ms
```


[The results from all three lists on Thursday, using quicksort, and their average time.](#)

```
Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 5ms
Thursday Time taken for random list(random list): 6ms

Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 5ms
Thursday Time taken for random list(random list): 7ms

Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 6ms
Thursday Time taken for random list(random list): 7ms

Thursday Time taken for aescending list(sorted): 4ms
Thursday Time taken for descending list(inverse sorted): 5ms
Thursday Time taken for random list(random list): 8ms

Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 5ms
Thursday Time taken for random list(random list): 8ms

Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 6ms
Thursday Time taken for random list(random list): 8ms

Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 5ms
Thursday Time taken for random list(random list): 8ms

Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 5ms
Thursday Time taken for random list(random list): 7ms

Thursday Time taken for aescending list(sorted): 4ms
Thursday Time taken for descending list(inverse sorted): 4ms
Thursday Time taken for random list(random list): 9ms

Thursday Time taken for aescending list(sorted): 5ms
Thursday Time taken for descending list(inverse sorted): 5ms
Thursday Time taken for random list(random list): 8ms

Thursday Average time taken for aescending list(sorted)(Quicksort): 16.0ms
Thursday Average time taken for descending list(inverse sorted)(Quicksort): 17.0ms
Thursday Average time taken for random list(random list)(Quicksort): 25.333334ms
```


[The results from all three lists on Friday, using quicksort, and their average time.](#)

```
Friday Time taken for aescending list(sorted): 8ms
Friday Time taken for descending list(inverse sorted): 7ms
Friday Time taken for random list(random list): 12ms

Friday Time taken for aescending list(sorted): 7ms
Friday Time taken for descending list(inverse sorted): 9ms
Friday Time taken for random list(random list): 12ms

Friday Time taken for aescending list(sorted): 7ms
Friday Time taken for descending list(inverse sorted): 9ms
Friday Time taken for random list(random list): 12ms

Friday Time taken for aescending list(sorted): 9ms
Friday Time taken for descending list(inverse sorted): 7ms
Friday Time taken for random list(random list): 12ms

Friday Time taken for aescending list(sorted): 10ms
Friday Time taken for descending list(inverse sorted): 8ms
Friday Time taken for random list(random list): 13ms

Friday Time taken for aescending list(sorted): 9ms
Friday Time taken for descending list(inverse sorted): 9ms
Friday Time taken for random list(random list): 14ms

Friday Time taken for aescending list(sorted): 9ms
Friday Time taken for descending list(inverse sorted): 10ms
Friday Time taken for random list(random list): 12ms

Friday Time taken for aescending list(sorted): 7ms
Friday Time taken for descending list(inverse sorted): 8ms
Friday Time taken for random list(random list): 12ms

Friday Time taken for aescending list(sorted): 7ms
Friday Time taken for descending list(inverse sorted): 8ms
Friday Time taken for random list(random list): 12ms

Friday Time taken for aescending list(sorted): 9ms
Friday Time taken for descending list(inverse sorted): 9ms
Friday Time taken for random list(random list): 13ms

Friday Average time taken for aescending list(sorted)(Quicksort): 27.333334ms
Friday Average time taken for descending list(inverse sorted)(Quicksort): 28.0ms
Friday Average time taken for random list(random list)(Quicksort): 41.333332ms
```

[The results from all three lists on Saturday, using quicksort, and their average time.](#)

```
Saturday Time taken for ascending list(sorted): 10ms
Saturday Time taken for descending list(inverse sorted): 11ms
Saturday Time taken for random list(random list): 19ms

Saturday Time taken for ascending list(sorted): 10ms
Saturday Time taken for descending list(inverse sorted): 11ms
Saturday Time taken for random list(random list): 17ms

Saturday Time taken for ascending list(sorted): 10ms
Saturday Time taken for descending list(inverse sorted): 10ms
Saturday Time taken for random list(random list): 18ms

Saturday Time taken for ascending list(sorted): 12ms
Saturday Time taken for descending list(inverse sorted): 12ms
Saturday Time taken for random list(random list): 19ms

Saturday Time taken for ascending list(sorted): 11ms
Saturday Time taken for descending list(inverse sorted): 11ms
Saturday Time taken for random list(random list): 16ms

Saturday Time taken for ascending list(sorted): 10ms
Saturday Time taken for descending list(inverse sorted): 11ms
Saturday Time taken for random list(random list): 17ms

Saturday Time taken for ascending list(sorted): 12ms
Saturday Time taken for descending list(inverse sorted): 13ms
Saturday Time taken for random list(random list): 17ms

Saturday Time taken for ascending list(sorted): 10ms
Saturday Time taken for descending list(inverse sorted): 13ms
Saturday Time taken for random list(random list): 19ms

Saturday Time taken for ascending list(sorted): 11ms
Saturday Time taken for descending list(inverse sorted): 13ms
Saturday Time taken for random list(random list): 17ms

Saturday Time taken for ascending list(sorted): 13ms
Saturday Time taken for descending list(inverse sorted): 11ms
Saturday Time taken for random list(random list): 18ms

Saturday Average time taken for ascending list(sorted)(Quicksort): 36.333332ms
Saturday Average time taken for descending list(inverse sorted)(Quicksort): 38.666668ms
Saturday Average time taken for random list(random list)(Quicksort): 59.0ms
```

[The results from all three lists on Sunday, using quicksort, and their average time.](#)

```
Sunday Time taken for aescending list(sorted): 82ms
Sunday Time taken for descending list(inverse sorted): 81ms
Sunday Time taken for random list(random list): 111ms

Sunday Time taken for aescending list(sorted): 77ms
Sunday Time taken for descending list(inverse sorted): 107ms
Sunday Time taken for random list(random list): 115ms

Sunday Time taken for aescending list(sorted): 80ms
Sunday Time taken for descending list(inverse sorted): 75ms
Sunday Time taken for random list(random list): 112ms

Sunday Time taken for aescending list(sorted): 78ms
Sunday Time taken for descending list(inverse sorted): 90ms
Sunday Time taken for random list(random list): 104ms

Sunday Time taken for aescending list(sorted): 82ms
Sunday Time taken for descending list(inverse sorted): 87ms
Sunday Time taken for random list(random list): 122ms

Sunday Time taken for aescending list(sorted): 82ms
Sunday Time taken for descending list(inverse sorted): 79ms
Sunday Time taken for random list(random list): 114ms

Sunday Time taken for aescending list(sorted): 77ms
Sunday Time taken for descending list(inverse sorted): 75ms
Sunday Time taken for random list(random list): 115ms

Sunday Time taken for aescending list(sorted): 92ms
Sunday Time taken for descending list(inverse sorted): 92ms
Sunday Time taken for random list(random list): 122ms

Sunday Time taken for aescending list(sorted): 83ms
Sunday Time taken for descending list(inverse sorted): 82ms
Sunday Time taken for random list(random list): 116ms

Sunday Time taken for aescending list(sorted): 78ms
Sunday Time taken for descending list(inverse sorted): 75ms
Sunday Time taken for random list(random list): 128ms

Sunday Average time taken for aescending list(sorted)(Quicksort): 270.33334ms
Sunday Average time taken for descending list(inverse sorted)(Quicksort): 281.0ms
Sunday Average time taken for random list(random list)(Quicksort): 386.33334ms
```

Q1(iii)

Explanation of the development stages of my hybrid sorting algorithm

After experimenting with different approaches for this assignment, including merge sort and insertion sort, I found that insertion sort outperforms merge sort. Here is the implementation of merge sort I tried for hybrid sorting with quicksort. For simplicity, I will only present the results from Sunday.


```

public void hybridQuickSort(int low, int high){
    int threshold = 10;
    if (low < high) {
        if (high - low < threshold){
            mergeSort(low, high);
        }
        else {
            int pivotIndex = partition(itemList, low, high);
            hybridQuickSort(low, pivotIndex - 1);
            hybridQuickSort(pivotIndex + 1, high);
        }
    }
}

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 124ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 185ms
Sunday Time taken for random list(random list)(Hybrid sort): 205ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 160ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 136ms
Sunday Time taken for random list(random list)(Hybrid sort): 177ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 141ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 165ms
Sunday Time taken for random list(random list)(Hybrid sort): 160ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 124ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 124ms
Sunday Time taken for random list(random list)(Hybrid sort): 205ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 168ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 124ms
Sunday Time taken for random list(random list)(Hybrid sort): 212ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 129ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 125ms
Sunday Time taken for random list(random list)(Hybrid sort): 209ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 137ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 201ms
Sunday Time taken for random list(random list)(Hybrid sort): 188ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 120ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 193ms
Sunday Time taken for random list(random list)(Hybrid sort): 175ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 132ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 132ms
Sunday Time taken for random list(random list)(Hybrid sort): 181ms

```

```

Sunday Time taken for aescending list(sorted)(Hybrid sort): 169ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 128ms
Sunday Time taken for random list(random list)(Hybrid sort): 177ms

```

```

Sunday Average time taken for aescending list(sorted)(Hybrid sort): 468.0ms
Sunday Average time taken for descending list(inverse sorted)(Hybrid sort): 504.33334ms
Sunday Average time taken for random list(random list)(Hybrid sort): 629.6667ms

```

After using merge sort in hybrid sort with quicksort, it was observed that the performance was slower than insertion sort in hybrid sort with quicksort in ascending lists, descending lists, and random lists. (The performance of insertion sort in hybrid sort with quicksort will be presented in the screenshot of Q1(iv).)

Based on my experience running both algorithms, I have found that using insertion sort in combination with quicksort is more suitable than using merge sort in this case for the following reasons:

Overhead and Simplicity

Unlike merge sort, the overhead of insertion sort is very low, making it highly efficient for small arrays. In this case, during hybrid sorting, I treated a portion of the numbers as small arrays. I found that insertion sort was the most suitable choice for dealing with these small arrays. It requires only a constant amount of additional memory space and has simpler operations, resulting in time savings.

Adaptive Nature

Insertion sort works well in conjunction with quicksort because it is adaptive. In this case, we use quicksort to partition a portion of the array, resulting in a partially sorted array. This is an ideal scenario for insertion sort because insertion sort takes into account the existing order within the array, allowing for faster sorting. In contrast, merge sort does not consider the existing order within the array.

Recursion and Method Calls

While implementing the sorting algorithm, I noticed that when Quicksort completes most of the sorting work on small arrays, using insertion sort for the remaining part involves fewer recursive or function calls. In contrast, merge sort involves more splitting and merging steps, leading to decreased efficiency.

That's why I have chosen to combine insertion sort with quicksort instead of merging it with merge sort.

The reason I choose 10 as parameter

I observed that Quicksort efficiently handles larger sections of the array, while Insertion Sort excels in sorting smaller partitions with low overhead. Therefore, by using a threshold of 10, we can minimize unnecessary recursion, improve cache efficiency, and achieve faster processing of these small segments.

This is the result when threshold is set to 10

```
Sunday Average time taken for ascending list(sorted)(Hybrid sort): 454.66666ms
Sunday Average time taken for descending list(inverse sorted)(Hybrid sort): 485.66666ms
Sunday Average time taken for random list(random list)(Hybrid sort): 644.0ms
```

This is the result when threshold is set to 50

```
Sunday Average time taken for ascending list(sorted)(Hybrid sort): 457.66666ms
Sunday Average time taken for descending list(inverse sorted)(Hybrid sort): 610.6667ms
Sunday Average time taken for random list(random list)(Hybrid sort): 759.6667ms
```

It reveals that when it set the threshold to 10, my hybrid sort will have a better performance on all three situations.

The time complexity for the hybrid sort

For the best case scenario is $O(n \log n)$, because the logarithmic depth of the recursion dominates the linear work done by Insertion Sort on small segments. The worst-case time complexity of $O(n^2)$ for a hybrid sorting algorithm that uses Quicksort and Insertion Sort occurs due to the inherent characteristics of these algorithms under specific circumstances.

Practically, I observed an average improvement of 115ms in the measurements conducted on my computer for 10 random lists.

Q1(iv)

Screenshot of the final output from Q1-C (hybrid sorting algorithm)

The results from all three lists on Monday using hybrid sort and their average time.

```
Monday Time taken for ascending list(sorted)(Hybrid sort): 4ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 2ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 2ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Monday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Monday Time taken for random list(random list)(Hybrid sort): 0ms

Monday Average time taken for aescending list(sorted)(Hybrid sort): 1.3333334ms
Monday Average time taken for descending list(inverse sorted)(Hybrid sort): 0.6666667ms
Monday Average time taken for random list(random list)(Hybrid sort): 0.6666667ms
```


[The results from all three lists on Tuesday using hybrid sort and their average time.](#)

```
Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Tuesday Time taken for random list(random list)(Hybrid sort): 4ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 4ms
Tuesday Time taken for random list(random list)(Hybrid sort): 0ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 4ms
Tuesday Time taken for random list(random list)(Hybrid sort): 0ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Tuesday Time taken for random list(random list)(Hybrid sort): 0ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 4ms
Tuesday Time taken for random list(random list)(Hybrid sort): 0ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Tuesday Time taken for random list(random list)(Hybrid sort): 0ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Tuesday Time taken for random list(random list)(Hybrid sort): 5ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Tuesday Time taken for random list(random list)(Hybrid sort): 4ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Tuesday Time taken for random list(random list)(Hybrid sort): 0ms

Tuesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Tuesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Tuesday Time taken for random list(random list)(Hybrid sort): 0ms
Tuesday Average time taken for aescending list(sorted)(Hybrid sort): 1.3333334ms
Tuesday Average time taken for descending list(inverse sorted)(Hybrid sort): 4.0ms
Tuesday Average time taken for random list(random list)(Hybrid sort): 4.3333335ms
```

The results from all three lists on Wednesday using hybrid sort and their average time.

```
Wednesday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Wednesday Time taken for random list(random list)(Hybrid sort): 0ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Wednesday Time taken for random list(random list)(Hybrid sort): 0ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Wednesday Time taken for random list(random list)(Hybrid sort): 4ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Wednesday Time taken for random list(random list)(Hybrid sort): 4ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Wednesday Time taken for random list(random list)(Hybrid sort): 0ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Wednesday Time taken for random list(random list)(Hybrid sort): 4ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 0ms
Wednesday Time taken for random list(random list)(Hybrid sort): 0ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 4ms
Wednesday Time taken for random list(random list)(Hybrid sort): 0ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 4ms
Wednesday Time taken for random list(random list)(Hybrid sort): 0ms

Wednesday Time taken for aescending list(sorted)(Hybrid sort): 0ms
Wednesday Time taken for descending list(inverse sorted)(Hybrid sort): 4ms
Wednesday Time taken for random list(random list)(Hybrid sort): 0ms
Wednesday Average time taken for aescending list(sorted)(Hybrid sort): 5.3333335ms
Wednesday Average time taken for descending list(inverse sorted)(Hybrid sort): 8.0ms
Wednesday Average time taken for random list(random list)(Hybrid sort): 4.0ms
```

[The results from all three lists on Thursday using hybrid sort and their average time.](#)

```
Thursday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 8ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 8ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 4ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 8ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 8ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 8ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 8ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 8ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 4ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms

Thursday Time taken for aescending list(sorted)(Hybrid sort): 8ms
Thursday Time taken for descending list(inverse sorted)(Hybrid sort): 8ms
Thursday Time taken for random list(random list)(Hybrid sort): 12ms
Thursday Average time taken for aescending list(sorted)(Hybrid sort): 22.666666ms
Thursday Average time taken for descending list(inverse sorted)(Hybrid sort): 25.333334ms
Thursday Average time taken for random list(random list)(Hybrid sort): 38.666668ms
```


[The results from all three lists on Friday using hybrid sort and their average time.](#)

```
Friday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 24ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 16ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 20ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 20ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 16ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Friday Time taken for random list(random list)(Hybrid sort): 16ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Friday Time taken for random list(random list)(Hybrid sort): 20ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 20ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 25ms

Friday Time taken for aescending list(sorted)(Hybrid sort): 12ms
Friday Time taken for descending list(inverse sorted)(Hybrid sort): 12ms
Friday Time taken for random list(random list)(Hybrid sort): 20ms
Friday Average time taken for aescending list(sorted)(Hybrid sort): 42.666668ms
Friday Average time taken for descending list(inverse sorted)(Hybrid sort): 42.666668ms
Friday Average time taken for random list(random list)(Hybrid sort): 65.666664ms
```

[The results from all three lists on Saturday using hybrid sort and their average time.](#)

```
Saturday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Saturday Time taken for random list(random list)(Hybrid sort): 20ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Saturday Time taken for random list(random list)(Hybrid sort): 29ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Saturday Time taken for random list(random list)(Hybrid sort): 31ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 20ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Saturday Time taken for random list(random list)(Hybrid sort): 26ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Saturday Time taken for random list(random list)(Hybrid sort): 28ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Saturday Time taken for random list(random list)(Hybrid sort): 23ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 15ms
Saturday Time taken for random list(random list)(Hybrid sort): 19ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 20ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 15ms
Saturday Time taken for random list(random list)(Hybrid sort): 25ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 16ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 16ms
Saturday Time taken for random list(random list)(Hybrid sort): 28ms

Saturday Time taken for aescending list(sorted)(Hybrid sort): 17ms
Saturday Time taken for descending list(inverse sorted)(Hybrid sort): 21ms
Saturday Time taken for random list(random list)(Hybrid sort): 28ms
Saturday Average time taken for aescending list(sorted)(Hybrid sort): 56.333332ms
Saturday Average time taken for descending list(inverse sorted)(Hybrid sort): 54.333332ms
Saturday Average time taken for random list(random list)(Hybrid sort): 85.666664ms
```

[The results from all three lists on Sunday using hybrid sort and their average time.](#)

```
Sunday Time taken for aescending list(sorted)(Hybrid sort): 105ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 108ms
Sunday Time taken for random list(random list)(Hybrid sort): 153ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 100ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 144ms
Sunday Time taken for random list(random list)(Hybrid sort): 169ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 124ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 124ms
Sunday Time taken for random list(random list)(Hybrid sort): 196ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 125ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 133ms
Sunday Time taken for random list(random list)(Hybrid sort): 203ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 147ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 137ms
Sunday Time taken for random list(random list)(Hybrid sort): 241ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 144ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 151ms
Sunday Time taken for random list(random list)(Hybrid sort): 185ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 164ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 140ms
Sunday Time taken for random list(random list)(Hybrid sort): 236ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 153ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 156ms
Sunday Time taken for random list(random list)(Hybrid sort): 176ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 140ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 136ms
Sunday Time taken for random list(random list)(Hybrid sort): 184ms

Sunday Time taken for aescending list(sorted)(Hybrid sort): 128ms
Sunday Time taken for descending list(inverse sorted)(Hybrid sort): 140ms
Sunday Time taken for random list(random list)(Hybrid sort): 176ms
Sunday Average time taken for aescending list(sorted)(Hybrid sort): 443.33334ms
Sunday Average time taken for descending list(inverse sorted)(Hybrid sort): 456.33334ms
Sunday Average time taken for random list(random list)(Hybrid sort): 639.6667ms
```