# Programming Assignment #1 - CS325

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# Pseudocode

<u>**Brute Force:**</u>

```
BruteForce(arr)
  count = 0
  for i in 0 to arr.length
    for j in i to arr.length
        if arr[i] > arr[j]:
        count++
  return count
```

<u>**Naive Divide and Conquer:**</u>

```
NaiveDivideAndConquer(arr)
  count = 0
  if len(arr) < 2:
    return count
  middle = length(list_in)/2
  left = arr[:middle] // slice off half of the array
  right = arr[middle:]
  // count inversions between left and right halves
  for i in range(0,len(left)):
    for j in range(0,len(right)):
      if left[i] > right[j]:
          count++
  // and count internal inversions recursively
  count += NaiveDivideAndConquer(left)
  count += NaiveDivideAndConquer(right)
  return count
```

<u>**Merge and Count:**</u>

```
MergeAndCount(arr,0)
  results = []
  // base case
  if len(x) < 2:
    return x, count
  middle =len(x)/2
  // recursive calls
  left, count = MergeAndCount(x[:middle],count)
  right, count = MergeAndCount(x[middle:],count)
  i, j = 0, 0
  while i < length(left) and j < length(right):
    if left[i] > right[j]:
      results.append(right[j])
      count += length(left) - i
      j++
    else:
      results.append(left[i])
      i++
    results += left[i:]
    results += right[j:]
    return results, count
```

## Correctness Proof

## Asymptotic Analysis of Run Time

### Brute Force:

It has two for loops of size n duh

### Naive Divide and Conquer:

T(n) = this class is difficult

### Merge and Count:

T(n) = wow such recursion

## Testing

Results and shit

## Extrapolation and Interpretation

- Largest input item solvable in an hour:
- Slope of lines in log-log plot:
- Discrepancy between actual and asymptotic: