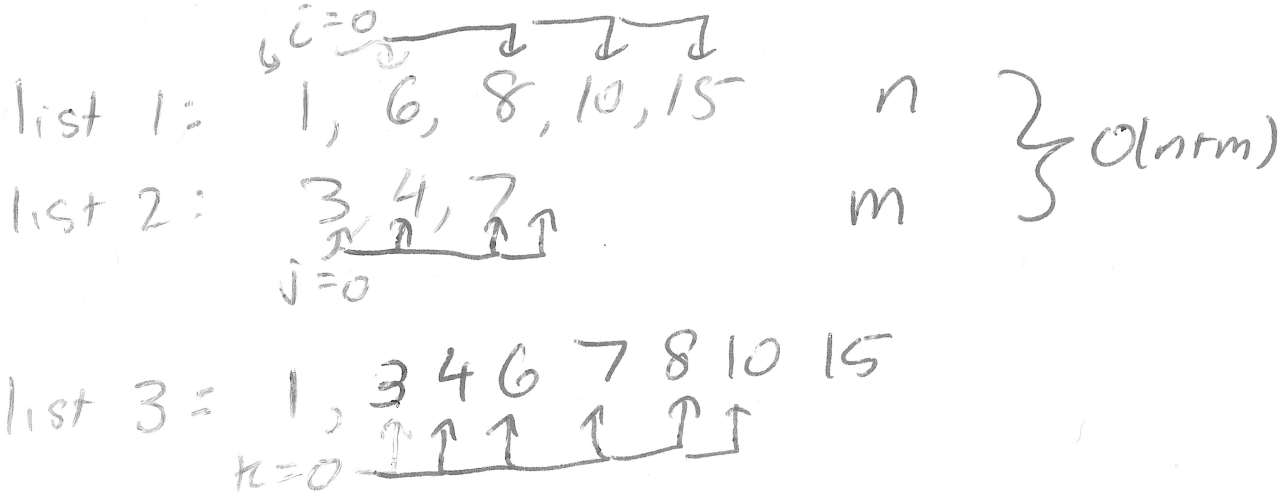
COP 3502 10/18/23

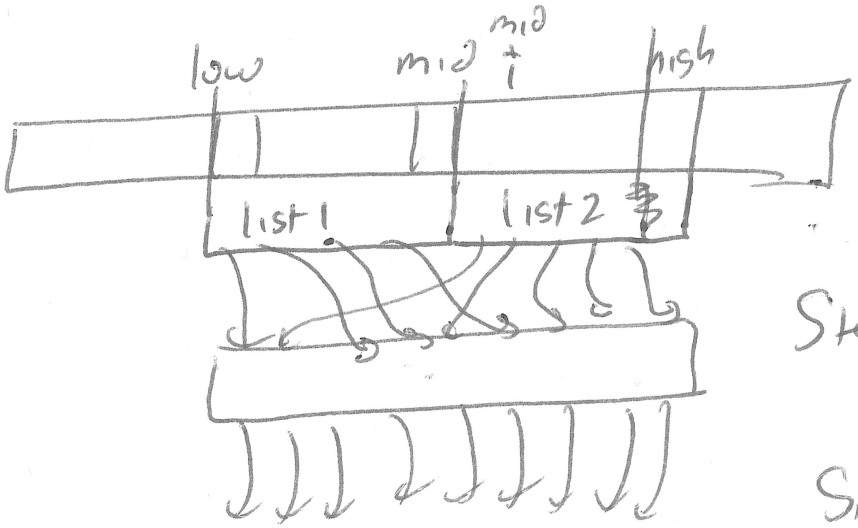
Merge Sort → O(nlgn) best, avg, worst

Merge Algorithm

Input : 2 sorted lists

Output : a single sorted list with all item from the 2 input lists





Step1 merge into tmp array

Step2 Copy back into orig array

Step 3 free temp

Merge Sort


```
void sort (int* arr, int n) {
    mergesort (arr, 0, n-1);
}
void mergesort (int* arr, int low, int high) {
    if ( low >= high) return;
    int mid = (low+high)/2;
    mergesort (arr, low, mid);
    mergesort (arr, mid+1, high);
    merge (arr, low, mid, high);
}
```

$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{2}\right) + O(n)$$

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

Master Thm $A=2, B=2, k=1 \Rightarrow O(n \log n)$

~~MS(0,0) MS(1,1)~~
~~MS(0,1) MS(2,3)~~
~~MS(0,3)~~
MS(0,7)

~~M(4,5) M(6,7)~~
~~M(4,7)~~
M(0,7)