Book Allocation Problem
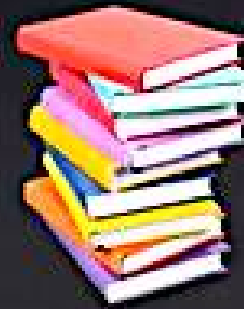
There are N books, each ith book has A[i] number of pages.

You have to allocate books to M number of students so that the maximum number of pages allocated to a student is minimum.

- Each book should be allocated to a student.
- Each student has to be allocated at least one book.
- Allotment should be in contiguous order.

Calculate and return that minimum possible number.

Return -1 if a valid assignment is not possible.

Book Allocation or Allocate Books

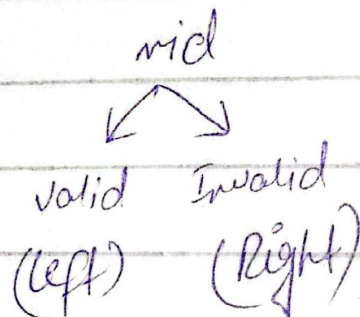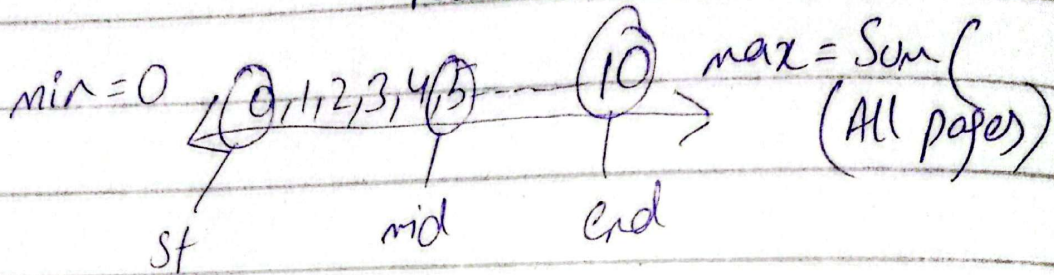$$arr = [2, 1, 3, 4] \qquad N = 4$$

Two Students

Students > Pages ↓ Invalid

S1 = 2	S2 = ⑧
S1 = 3	S2 = ⑦
S1 = ⑥	S2 = 4

Find min possible max pages

↳ Answer

Possible

min = 0 ⓪, 1, 2, 3, 4 ⑤ --- ⑩ → max = Sum (All pages)

St   mid   end

mid

↙ ↘

Valid   Invalid
(Left)   (Right)

```
St = 0, end = Sum(arr)
while(st <= end) {
    mid = (St + (e-S/2))
    if(IsValid(mid))  ____ Valid
        ans = mid
        end = mid-1
    else  ____ Invalid
        St = mid+1
```

Checking Validity

| 2 | 1 | 3 | 4 | |

n=4
m=2 | mid=5 | contiguous

Invalid

st=1   pages 2+1 = 3

st=2   pages = 3

st=3   pages = 4

Additional

       Max-Allowed pages

```
boo Isvalid (arr[], n, m, mid){
    int st=1 , pages = 0
    for( i=0; i<n; i++){
        if ( pages + arr[i] <= allowed-pages ){
                pages + = arr[i]
        else {
            st++
            pages = arr[i]
        }
    }
}
```

st > m ——> Invalid → false

st <= m ——> Valid → True

Corner case

| 1 | 6 | 2 | — Max-Allowed = 5

```
if (arr[i] > max_allowed pages){
    return false
```