

难度：1星：省三必会。2星：省二尽可能会，省一必会。3星：省一尽可能会。4星：国2以上要会

题目：

答案二分：<https://hydro.ac/d/shallowdream/p/33> 模版

求阶乘：<https://www.lanqiao.cn/problems/2145/learning/> 2星

数列分段：<https://www.luogu.com.cn/problem/P1182> 2星

深秋的苹果：<https://www.lanqiao.cn/problems/6279/learning> 3星

成绩统计：<https://www.lanqiao.cn/problems/19705/learning/> 3星

## 二分答案

暴力做法，枚举所有数字是否能达到某个值。

```
1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N=1e5+10;
5  int a[N];
6  int main(){
7      ll n,k;
8      cin>>n>>k;
9      for(int i=1;i<=n;i++){
10         cin>>a[i];
11     }
12     for(int i=1;i<=k+N;i++){
13         ll x=k;
14         for(int j=1;j<=n;j++){
15             if(a[j]<i){
16                 x=x-(i-a[j]);
17             }
18             if(x<0){
19                 cout<<i-1;
20                 return 0;
21             }
22         }
23     }
24 }
```

```
1  import java.util.Scanner;
2
3  public class Main {
4      static final int N = 100010;
5      static int[] a = new int[N];
6
7      public static void main(String[] args) {
8          Scanner sc = new Scanner(System.in);
9          long n, k;
10         n = sc.nextLong();
11         k = sc.nextLong();
12
13         for (int i = 1; i <= n; i++) {
```

```

14         a[i] = sc.nextInt();
15     }
16
17     for (int i = 1; i <= k + N; i++) {
18         long x = k;
19         for (int j = 1; j <= n; j++) {
20             if (a[j] < i) {
21                 x -= (i - a[j]);
22             }
23             if (x < 0) {
24                 System.out.println(i - 1);
25                 return;
26             }
27         }
28     }
29 }
30 }
31

```

```

1  N = 10**5 + 10
2  a = [0] * N
3
4  def main():
5      n, k = map(int, input().split())
6      a[1:n+1] = map(int, input().split())
7
8      for i in range(1, k + N + 1):
9          x = k
10         for j in range(1, n + 1):
11             if a[j] < i:
12                 x -= (i - a[j])
13             if x < 0:
14                 print(i - 1)
15                 return
16
17 if __name__ == "__main__":
18     main()
19

```

通过我们的暴力代码，可以发现，随着  $i$  变大，每次  $j$  循环中，消耗的  $x$  是变多的。

因此便具有一个单调性函数，即可拓展为二分，便是单调性（二段性），舍去不需要的一半。

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N=1e5+10;
5  int a[N];
6  ll n,k;
7  bool check(ll mid){
8      ll x=k;
9      for(int i=1;i<=n;i++){
10         if(a[i]<mid){
11             x=x-(mid-a[i]);
12         }
13         if(x<0){
14             return false;

```

```

15     }
16 }
17 return true;
18 }
19 int main(){
20     cin>>n>>k;
21     for(int i=1;i<=n;i++){
22         cin>>a[i];
23     }
24     ll l=1,r=(ll)1e14;
25     while(l<r){
26         ll mid=l+r+1>>1;
27         if(check(mid)) l=mid;
28         else r=mid-1;
29     }
30     cout<<l;
31 }

```

## 数列分段

暴力枚举每一段的最小值，每一段的和你是不能超过这个值的。看看能分成多少段。

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N=1e5+10;
5  ll a[N];
6  ll n,m;
7  int main(){
8      cin>>n>>m;
9      for(int i=1;i<=n;i++) cin>>a[i];
10     ll ans=0;
11     for(int i=1;i<=10000;i++){
12         int cnt=1;
13         ll sum=0;
14         for(int j=1;j<=n;j++){
15             if(a[j]>i){
16                 cnt=-1;
17                 break;
18             }
19             if(sum+a[j]<=i){
20                 sum=sum+a[j];
21             }else{
22                 sum=a[j];
23                 cnt++;
24             }
25         }
26         if(cnt!=-1){
27             if(cnt<=m){
28                 cout<<i;
29                 break;
30             }
31         }
32     }
33 }

```

```

1  import java.util.Scanner;
2
3  public class Main {
4      static final int N = 100010;
5      static long[] a = new long[N];
6      static long n, m;
7
8      public static void main(String[] args) {
9          Scanner sc = new Scanner(System.in);
10         n = sc.nextLong();
11         m = sc.nextLong();
12
13         for (int i = 1; i <= n; i++) {
14             a[i] = sc.nextLong();
15         }
16
17         for (int i = 1; i <= 10000; i++) {
18             int cnt = 1;
19             long sum = 0;
20             boolean valid = true;
21
22             for (int j = 1; j <= n; j++) {
23                 if (a[j] > i) {
24                     valid = false;
25                     break;
26                 }
27                 if (sum + a[j] <= i) {
28                     sum += a[j];
29                 } else {
30                     sum = a[j];
31                     cnt++;
32                 }
33             }
34
35             if (valid && cnt <= m) {
36                 System.out.println(i);
37                 break;
38             }
39         }
40     }
41 }
42

```

```

1  def main():
2      n, m = map(int, input().split())
3      a = [0] + list(map(int, input().split())) # 1-based index
4
5      for i in range(1, 10001):
6          cnt = 1
7          total = 0
8          valid = True
9
10         for j in range(1, n + 1):
11             if a[j] > i:
12                 valid = False
13                 break
14             if total + a[j] <= i:

```

```

15         total += a[j]
16     else:
17         total = a[j]
18         cnt += 1
19
20     if valid and cnt <= m:
21         print(i)
22         break
23
24 if __name__ == "__main__":
25     main()
26

```

## 二分

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N=1e5+10;
5  ll a[N];
6  ll n,m;
7  bool check(ll mid){
8      int cnt=1;
9      ll sum=0;
10     for(int j=1;j<=n;j++){
11         if(a[j]>mid){
12             return false;
13         }
14         if(sum+a[j]<=mid){
15             sum=sum+a[j];
16         }else{
17             sum=a[j];
18             cnt++;
19         }
20     }
21     return cnt<=m;
22 }
23 int main(){
24     cin>>n>>m;
25     for(int i=1;i<=n;i++) cin>>a[i];
26     ll ans=0;
27     ll l=1,r=(ll)(1e14);
28     while(l<r){
29         ll mid=l+r>>1;
30         if(check(mid)) r=mid;
31         else l=mid+1;
32     }
33     cout<<l;
34 }

```

```

1  import java.util.Scanner;
2
3  public class Main {
4      static final int N = 100010;
5      static long[] a = new long[N];
6      static long n, m;

```

```

7
8     static boolean check(long mid) {
9         int cnt = 1;
10        long sum = 0;
11
12        for (int j = 1; j <= n; j++) {
13            if (a[j] > mid) {
14                return false;
15            }
16            if (sum + a[j] <= mid) {
17                sum += a[j];
18            } else {
19                sum = a[j];
20                cnt++;
21            }
22        }
23        return cnt <= m;
24    }
25
26    public static void main(String[] args) {
27        Scanner sc = new Scanner(System.in);
28        n = sc.nextLong();
29        m = sc.nextLong();
30
31        for (int i = 1; i <= n; i++) {
32            a[i] = sc.nextLong();
33        }
34
35        long l = 1, r = (long) 1e14;
36        while (l < r) {
37            long mid = (l + r) / 2;
38            if (check(mid)) {
39                r = mid;
40            } else {
41                l = mid + 1;
42            }
43        }
44
45        System.out.println(l);
46    }
47 }
48

```

```

1 def check(mid):
2     cnt = 1
3     total = 0
4
5     for j in range(1, n + 1):
6         if a[j] > mid:
7             return False
8         if total + a[j] <= mid:
9             total += a[j]
10        else:
11            total = a[j]
12            cnt += 1
13
14    return cnt <= m

```

```
15
16 if __name__ == "__main__":
17     n, m = map(int, input().split())
18     a = [0] + list(map(int, input().split())) # 1-based index
19
20     l, r = 1, int(1e14)
21     while l < r:
22         mid = (l + r) // 2
23         if check(mid):
24             r = mid
25         else:
26             l = mid + 1
27
28     print(l)
29
```