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

二分

整数二分（利用lowerbound+upperbound解题）：

模板：https://www.lanqiao.cn/problems/18492/learning/

最大通过数：https://www.lanqiao.cn/problems/3346/learning/ 2星

第k小的和：https://www.lanqiao.cn/problems/17098/learning/ 4星

123：https://www.lanqiao.cn/problems/1591/learning/ 4星

二分模版

```cpp
#include <iostream>

using namespace std;

const int N = 1e5 + 10;

int n, q;
int a[N];

int main()
{
    cin >> n >> q;

    for(int i = 1; i <= n; i ++) cin >> a[i];

    while(q --)
    {
        int t, l, r, x;
        cin >> t >> l >> r >> x;
        if(t == 1)
        {
            while(l < r)
            {
                int mid = l + r >> 1;
                if(a[mid] >= x) r = mid;
                else l = mid + 1;
            }
            if(a[l] != x) cout << -1 << endl;
            else cout << l << endl;
        }
        else if(t == 2)
        {
            while(l < r)
            {
                int mid = l + r + 1 >> 1;
                if(a[mid] <= x) l = mid;
                else r = mid - 1;
            }
            if(a[l] != x) cout << -1 << endl;
```

```
            else cout << l << endl;
        }
        else if(t == 3)
        {
            while(l < r)
            {
                int mid = l + r >> 1;
                if(a[mid] >= x) r = mid;
                else l = mid + 1;
            }
            if(a[l] < x) cout << -1 << endl;
            else cout << l << endl;
        }
        else
        {
            while(l < r)
            {
                int mid = l + r >> 1;
                if(a[mid] > x) r = mid;
                else l = mid + 1;
            }
            if(a[l] <= x) cout << -1 << endl;
            else cout << l << endl;
        }
    }
    return 0;
}
```

```
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.io.PrintWriter;
import java.util.StringTokenizer;

public class Main {

    public static void main(String[] args) {
        int t=1;
        while(t-->0) solve();

        out.flush();
    }
    static int N=(int)(1e5+10);
    static int a[]=new int[N];
    static int n;
    static int getL(int a[],int l,int r,int x){
      while(l<r){
        int mid=l+r>>1;
        if(x<=a[mid]){
          r=mid;
        }else{
          l=mid+1;
        }
      }
      if(a[l]!=x) return -1;
      return l;
    }
```

```
    static int getR(int a[],int l,int r,int x){
      while(l<r){
        int mid=l+r+1>>1;
        if(x<a[mid]){
          r=mid-1;
        }else{
          l=mid;
        }
      }
      if(a[l]!=x) return -1;
      return l;
    }
    static int lower_bound(int a[],int l,int r,int x){
      if(a[r]<x) return -1;
      while(l<r){
        int mid=l+r>>1;
        if(x<=a[mid]){
          r=mid;
        }else{
          l=mid+1;
        }
      }
      return l;
    }
    static int upper_bound(int a[],int l,int r,int x){
      if(a[r]<=x) return -1;
      while(l<r){
        int mid=l+r>>1;
        if(x<a[mid]){
          r=mid;
        }else{
          l=mid+1;
        }
      }
      return l;
    }
    static void solve(){
      n=in.nextInt();
      int q=in.nextInt();
      for(int i=1;i<=n;i++){
        a[i]=in.nextInt();
      }
      while(q-->0){
        int op=in.nextInt();
        int l=in.nextInt();
        int r=in.nextInt();
        int x=in.nextInt();
        if(op==1){
          out.println(getL(a,l,r,x));
        }else if(op==2){
          out.println(getR(a,l,r,x));
        }else if(op==3){
          out.println(lower_bound(a,l,r,x));
        }else{
          out.println(upper_bound(a,l,r,x));
        }
      }
    }
```

```
    static FastReader in = new FastReader();
    static PrintWriter out=new PrintWriter(System.out);
    static class FastReader{
        static BufferedReader br;
        static StringTokenizer st;
        FastReader(){
            br=new BufferedReader(new InputStreamReader(System.in));
        }
        String next(){
            String str="";
            while(st==null||!st.hasMoreElements()){
                try {
                    str=br.readLine();
                } catch (IOException e) {
                    throw new RuntimeException(e);
                }
                st=new StringTokenizer(str);
            }
            return st.nextToken();
        }
        int nextInt(){
            return Integer.parseInt(next());
        }
        double nextDouble(){
            return Double.parseDouble(next());
        }
        long nextLong(){
            return Long.parseLong(next());
        }
    }
}
```

```
def main():
    import sys
    input = sys.stdin.read
    data = input().split()

    idx = 0
    n = int(data[idx])
    q = int(data[idx + 1])
    idx += 2

    a = [0] * (n + 1)
    for i in range(1, n + 1):
        a[i] = int(data[idx])
        idx += 1

    for _ in range(q):
        t = int(data[idx])
        l = int(data[idx + 1])
        r = int(data[idx + 2])
        x = int(data[idx + 3])
        idx += 4

        if t == 1:
            while l < r:
                mid = (l + r) // 2
```

```
                if a[mid] >= x:
                    r = mid
                else:
                    l = mid + 1
            if a[l] != x:
                print(-1)
            else:
                print(l)
        elif t == 2:
            while l < r:
                mid = (l + r + 1) // 2
                if a[mid] <= x:
                    l = mid
                else:
                    r = mid - 1
            if a[l] != x:
                print(-1)
            else:
                print(l)
        elif t == 3:
            while l < r:
                mid = (l + r) // 2
                if a[mid] >= x:
                    r = mid
                else:
                    l = mid + 1
            if a[l] < x:
                print(-1)
            else:
                print(l)
        elif t == 4:
            while l < r:
                mid = (l + r) // 2
                if a[mid] > x:
                    r = mid
                else:
                    l = mid + 1
            if a[l] <= x:
                print(-1)
            else:
                print(l)

if __name__ == "__main__":
    main()
```

最大通过数

```
#include<bits/stdc++.h>
using namespace std;
#define int long long
const int N=2e5+5;
int a[N],b[N];
signed main()
{
  ios::sync_with_stdio(0),cin.tie(0),cout.tie(0);
  int n,m,k;
  cin>>n>>m>>k;
```

```
  for(int i=1;i<=n;i++)
  {
    cin>>a[i];
    a[i]+=a[i-1];
  }
  for(int i=1;i<=m;i++)
  {
    cin>>b[i];
    b[i]+=b[i-1];
  }
  int ans=0;
  for(int i=0;i<=n;i++)
  {
    if(a[i]>k)
      break;
    int x=upper_bound(b,b+1+m,k-a[i])-b-1;
    ans=max(i+x,ans);
  }
  cout<<ans;
  return 0;
}
```

```
import java.util.*;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt(), m = sc.nextInt(), k = sc.nextInt();

        long[] a = new long[n + 1];
        long[] b = new long[m + 1];

        for (int i = 1; i <= n; i++) {
            a[i] = sc.nextLong() + a[i - 1];
        }

        for (int i = 1; i <= m; i++) {
            b[i] = sc.nextLong() + b[i - 1];
        }

        int ans = 0;
        for (int i = 0; i <= n; i++) {
            if (a[i] > k) break;
            int x = upperBound(b, k - a[i]) - 1;
            ans = Math.max(i + x, ans);
        }

        System.out.println(ans);
        sc.close();
    }

    private static int upperBound(long[] arr, long key) {
        int left = 0, right = arr.length;
        while (left < right) {
            int mid = (left + right) / 2;
            if (arr[mid] <= key) left = mid + 1;
            else right = mid;
```

```
        }
        return left;
    }
}

```

```python
import bisect

n, m, k = map(int, input().split())
a = [0] + list(map(int, input().split()))
b = [0] + list(map(int, input().split()))

# 前缀和计算
for i in range(1, n + 1):
    a[i] += a[i - 1]
for i in range(1, m + 1):
    b[i] += b[i - 1]

ans = 0
for i in range(n + 1):
    if a[i] > k:
        break
    x = bisect.bisect_right(b, k - a[i]) - 1
    ans = max(i + x, ans)

print(ans)

```