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Week 6: One-Dimensional Arrays

1. Check pair with difference k

Problem statement:

Given an array A of sorted integers and another non negative integer k, find if there exists 2 indices i and j such that $A[i] - A[j] = k$, $i \neq j$.

Input Format

1. First line is number of test cases T. Following T lines contain:
2. N, followed by N integers of the array
3. The non-negative integer k

Output format

Print 1 if such a pair exists and 0 if it doesn't.

Example

Input:

```
1
3 1 3 5
4
```

Output:

```
1
```

Program:

```
1 #include<stdio.h>
2 int main()
3 {
4     int t;
5     scanf("%d",&t);
6     while(t-->0)
7     {
8         int n;
9         scanf("%d",&n);
10        int arr[n];
11        for(int i=0;i<n;i++)
12        {
13            scanf("%d",&arr[i]);
14        }
15        int k;
16        scanf("%d",&k);
17        int flag=0;
18        for(int i=0;i<n;i++)
19        {
20            for(int j=i+1;j<n;j++)
21            {
22                if(arr[i]-arr[j]==k||arr[j]-arr[i]==k)
23                {
24                    flag=1;
25                    break;
26                }
27            }
28            if(flag)
29            {
30                break;
31            }
32        }
33        printf("%d\n",flag);
34    }
35    return 0;
36 }
```

Test cases:

	Input	Expected	Got	
✓	1 3 1 3 5 4	1	1	✓
✓	1 3 1 3 5 99	0	0	✓

Passed all tests! ✓

2. Chocolates

Problem statement:

Sam loves chocolates and starts buying them on the 1st day of the year. Each day of the year, x , is numbered from 1 to Y . On days when x is odd, Sam will buy x chocolates; on days when x is even, Sam will not purchase any chocolates.

Complete the code in the editor so that for each day N_i (where $1 \leq x \leq N \leq Y$) in array arr , the number of chocolates Sam purchased (during days 1 through N) is printed on a new line. This is a function-only challenge, so input is handled for you by the locked stub code in the editor.

Input Format

The program takes an array of integers as a parameter.

The locked code in the editor handles reading the following input from `stdin`, assembling it into an array of integers (arr), and calling `calculate(arr)`.

The first line of input contains an integer, T (the number of test cases). Each line i of the T subsequent lines describes the i th test case as an integer, N_i (the number of days).

Constraints

$$1 \leq T \leq 2 \times 10^5$$

$$1 \leq N \leq 2 \times 10^6$$

$$1 \leq x \leq N \leq Y$$

Output Format

For each test case, T_i in arr , your `calculate` method should print the total number of chocolates Sam purchased by day N_i on a new line.

Sample Input 0

```
3
1
2
3
```

Sample Output 0

```
1
1
4
```

Program:

```

1 #include<stdio.h>
2 int main()
3 {
4     int t;
5     scanf("%d",&t);
6     while(t-->0)
7     {
8         int n,c=0;
9         scanf("%d",&n);
10        for(int i=0;i<=n;i++)
11        {
12            if(i%2!=0)
13            {
14                c=c+i;
15            }
16        }
17        printf("%d\n",c);
18    }
19 }

```

Test cases:

	Input	Expected	Got	
✓	3	1	1	✓
	1	1	1	
	2	4	4	
	3			
✓	10	1296	1296	✓
	71	2500	2500	
	100	1849	1849	
	86	729	729	
	54	400	400	
	40	25	25	
	9	1521	1521	
	77	25	25	
	9	49	49	
	13	2401	2401	
	98			

Passed all tests! ✓

3. Footballs scores

Problem statement:

The number of goals achieved by two football teams in matches in a league is given in the form of two lists. Consider:

- Football team A, has played three matches, and has scored { 1 , 2 , 3 } goals in each match respectively.
- Football team B, has played two matches, and has scored { 2, 4 } goals in each match respectively.
- Your task is to compute, for each match of team B, the total number of matches of team A, where team A has scored less than or equal to the number of goals scored by team B in that match.
- In the above case:
- For 2 goals scored by team B in its first match, team A has 2 matches with scores 1 and 2.
- For 4 goals scored by team B in its second match, team A has 3 matches with scores 1, 2 and 3.

Hence, the answer: {2, 3}.

Complete the code in the editor below. The program must return an array of m positive integers, one for each maxes[i] representing the total number of elements nums[j] satisfying $\text{nums}[j] \leq \text{maxes}[i]$ where $0 \leq j < n$ and $0 \leq i < m$, in the given order.

It has the following:

nums[nums[0],...nums[n-1]]: first array of positive integers

maxes[maxes[0],...maxes[n-1]]: second array of positive integers

Constraints

- $2 \leq n, m \leq 105$
- $1 \leq \text{nums}[j] \leq 109$, where $0 \leq j < n$.
- $1 \leq \text{maxes}[i] \leq 109$, where $0 \leq i < m$.

Sample Input 0

```
4
1
4
2
4
2
3
5
```

Sample Output 0

```
2
4
```

Program:

```

1  #include<stdio.h>
2  int main()
3  {
4      int s1,s2,a;
5      scanf("%d",&s1);
6      int ta[s1];
7      for(int i=0;i<s1;i++)
8      {
9          scanf("%d",&ta[i]);
10     }
11     scanf("%d",&s2);
12     int tb[s2];
13     for(int i=0;i<s2;i++)
14     {
15         scanf("%d",&tb[i]);
16     }
17     for(int j=0;j<s2;j++)
18     {
19         a=0;
20         for(int i=0;i<s1;i++)
21         {
22             if(tb[j]>=ta[i])
23                 a++;
24         }
25         printf("%d\n",a);
26     }
27 }
28 }

```

Test cases:

	Input	Expected	Got	
✓	4 1 4 2 4 2 3 5	2 4	2 4	✓
✓	5 2 10 5 4 8 4 3 1 7 8	1 0 3 4	1 0 3 4	✓

Passed all tests! ✓