

# CyberChallenge.IT 2025

## Programming Test

### Emails [80 points]

#### Problem Statement

Giovanni needs to send some emails to Giulia. Once sent, these emails go through  $N$  servers, which forward them in order. So when an email leaves Giovanni's laptop, it goes through the first server, then the second, the third and so on, until it gets to server  $N$ , which finally forwards it to Giulia. These servers, though, act in a weird way:

- each server only forwards emails when the current minute is a multiple of a specific number, let's say  $t$ . For example, if server  $X$  forwards only when the current minute is a multiple of 4, and an email arrives at minute 22, the server will wait until minute 24 to send it
- each server needs some technical time to process and forward the email, so it introduces a delay, specific for the server itself, named  $f$ . In other words when a server sends an email, the next one receives it after  $f$  minutes.

#### Problem Details

You are given the number of servers and their characteristics (the values  $t$  and  $f$  for each server); you are also given the number of sent emails and the minute the email was sent for each of them. You need to compute the sum of all emails' arrival minutes.

Note: each e-mail must be processed independently from the others, as if it was the only one being sent. Different emails do not influence each other's timings or paths in any way.

#### Input

The input consists of 4 lines:

- Line 1:  $N$  and  $M$ , the number of servers and emails, as two space-separated integers
- Line 2:  $N$  space-separated integers, where the  $i$ -th integer represents the value  $t$  for the  $i$ -th server
- Line 3:  $N$  space-separated integers, where the  $i$ -th integer represents the value  $f$  for the  $i$ -th server
- Line 4:  $M$  space-separated integers, where the  $i$ -th integer indicates the minute the  $i$ -th email was sent

#### Output

The output consists of 1 integer, containing the sum of the computed arrival minutes for each emails.

#### Scoring

Your program will be tested on a number of testcases grouped in subtasks. In order to obtain the score associated to a subtask, you need to correctly solve all its testcases.

- **Subtask 1** [20 points]:  $1 \leq N \leq 500, M = 1, 1 \leq t \leq 10, 1 \leq f \leq 10$
- **Subtask 2** [30 points]:  $1 \leq N \leq 10^3, 1 \leq M \leq 100, 1 \leq t \leq 10, 1 \leq f \leq 10$
- **Subtask 3** [30 points]:  $1 \leq N \leq 10^5, 1 \leq M \leq 10^6, 1 \leq t \leq 10, 1 \leq f \leq 100$

**Examples**

INPUT	OUTPUT
4 2 2 7 4 5 1 2 3 4 3 10	43

**Explanation**

There are four servers and two emails:

- The first email leaves Giovanni's laptop at minute 3, and reaches the first server. Here, it needs to wait until minute 4 before it can be forwarded (4 is a multiple of 2, which is the value  $t$  for the first server). It will need 1 minute to be processed, because  $f = 1$  for the first server, so it will reach the second server at minute 5. It will wait until minute 7 to be forwarded, it will need 2 minutes to be processed and will reach server 3 at minute 9. There, it will depart again at minute 12, it will take 3 minutes to be processed and get to server 4 at minute 15. Since 15 is a multiple of 5, it will be forwarded again immediately, and after 4 minutes of processing time, it will finally reach Giulia at minute 19.
- Following the same reasoning, the second email leaves Giovanni's laptop at minute 10 and reaches Giulia at minute 24.
- The output is  $19 + 24 = 43$ .