Análisis de Algoritmos - Secciones 01 y 02
Taller Ex-Aula (Labo 6) - Ciclo 02/2023

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INDICACIONES:
Debe resolver cada uno de los siguientes problemas teniendo en consideración lo siguiente:

- Debe escribir un código solución para cada problema.
- Los códigos deben ser escritos exclusivamente en C++.
- Está prohibido el uso de clases, de vector, y de smart pointers.
- Cada problema debe ser resuelto utilizando Programación Dinámica (DP). No se permitirá otro tipo de solución.
- En realación a lo anterior, se espera que cada solución sea altamente eficiente.
- Para cada problema debe elaborar un pequeño reporte escrito con las siguientes secciones:
  - Análisis del problema: identificación de caso de DP a aplicar, los distintos elementos del planteamiento y como se acoplan al caso de DP identificado.
  - Pseudocódigo de la solución.
  - Ejecución manual de un caso ejemplo (que debe ser diseñado por el equipo de trabajo).
  - Explicación del código C++ elaborado.

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Problema 1

Description

In the Armouricles Supermarket chain, the board of directors has decided since time immemorial to always try to place products on shelves in such a way that customers will buy what they want them to buy. Does this really work? Who's to say? I don't know, but what I do know is that it can't be Gregory.
Who's Gregory? You say. Well, he's a newly hired staff member in one of the stores that belong to this prestigious company, and today he has a curious task, he's in charge of placing jam jars on aisle 7.
The jam has been prepared using both strawberries and blueberries, such that each jar has a certain proportion of these two ingredients, some have more strawberry in them and some have more blueberry. Now, the board of directors members are particular fans of strawberries, and they want people to prioritize buying the jars that have more strawberry inside, so one question was really important to answer: how do we make people buy these jars?
They consulted with the marketing department and after some research it was concluded that people buy a product when there are a lot of them placed consecutively in a row, how curious! And well, this is Gregory's task, he must place the jars in a row trying to leave together as most as possible the ones that have more straberry in them.

Input

The first line of the input contains an integer T, the number of test cases. For each test case there is a line with an integer N, the number of jam jars that Gregory has placed in a row on the shelf, followed by a line containing N integers,how much more of less of strawberry each jar contains compared to how much blueberry it contains.

Output

For each test case you must output a single line containing the maximum amount of strawberry in a row on the shelf, so Gregory can use this information in determining which configuration to use to complete his assignment.

Problema 2

Description

Oh! Hello! I didn't see you there, how are you? I'm fine, thank you for asking. Oh! I know! Let's talk about pokemon! Did you know a pokemon has several stats that define their strength in batlle? No? Well, now you know :$\hat{)}$
I know! Let me show you my Dragapult. What do you mean what is that? A pokemon of course! Here, look, pretty cool, isn't it? Well... no! It is not T_T... Hey! Where are you going? Here, let me explain, look, see? No? Come on, man! Keep up! Here, you see? Its speed, man! It's so slow, nyoron u.u
Why are you looking at me like that? Did I say something funny? Oh, I know! You want to tell me something, don't you! Of course!! Vitamins!!! How didn't I see that earlier, you're a genius!! Yes, if we feed him vitamins its speed might improve, let's do that! Go get me some!
Wait! Stop! We're not finished here. Did you think I wouldn't notice? That you're hiding something from me... don't worry! I already know! A stat has a gauge that serves as a limit on how many vitamins it can receive, so we have to be careful now, we mustn't excede this gauge, easy right? Just count the vitamins and how much they fill the gauge and feed it less that its limit, right? Yeah, yeah...
WRONG! Come on, man! Take this seriouly! Have you forgotten that there are a lot of different vitamins in this world? Please, like there was only going to be one, Jesus, dude, get it together, here, take this, look, see? This a list of all the possible vitamins for the speed stat of a pokemon and how much they increase it, see? You see it, right? What do you mean what? The solution, silly! The solution to our problem... to all of our problems....

Input

Here, I'll give you several test cases, one for each pokemon we're going to optimize. What? Why are you giving me that look? What do you mean there's more than one? Of course there's more than one? What? Did you think I only have a Dragapult? No, silly! Now, let's continue, for each pokemon there will be first a line containing an integer G, the gauge the pokemon has for its speed stat. Then I'll give you another line containing an integer V, how many possible vitamins we have to analyze, you understand? We **HAVE** to analyze. Lastly, I'll give you a line with V integers, how much each vitamin boosts the speed stat. And don't worry about quantities!! I have all the vitamins you can ever need!! I might inject some into you later. What? I didn't say anything, you're crazy, dude, you're hearing things.

Output

WOOHOOO!!!! Here we go!!! Let's get to work man! For each pokemon, you must output a single line containing the minimum amount of vitamins we can use to boost its speed... you must.... you.... *must*...

Problema 3

Description

Congratulations! You have been hired by Steven Spielberg to be his new assistant in the production of his new movie: "E.T. 4: The Revenge of the Risen"; and Mr. Spielberg doesn't lose any time, he has already given you your first mission: you must cast all the actors for the movie.
Now, Mr. Spielberg is a man of prestige, so he wants his actor to be prestigious, otherwise his fellow Academy members might think he has lost his touch, and you wouldn't want that, would you? So you must prioritize hiring prestigious actors.
However!! Prestigious actors are not cheap! They ask for a lot of money for a role, and as every movie in Hollywood does, your movie has a budget, and you cannot excede it. See? Working in the film industry is hard, but you made your choice, so suck it up buckaroo!

Input

The input consists of several test cases. Each test case begins a line containing an integer B, the budget for the film, and an integer N, the number of actors to be considered for roles in the film. Then there is a line with N integers, the salary each actor asks for. Take into consideration that an actor can be offered several roles in the film, since the script seems to suggest the story revolves around an adventure in the Multiverse (or something like that).

Output

For each test case you must output a single line containing the mnimum amount of actors you can hire considering that you have been told the the whole budget must be spent.