

Programming Task P2.

/ 20 P

Passwort für Einschreibung: asymptotic**Einreichung:** <https://judge.inf.ethz.ch/team/websubmit.php?cid=28784&problem=ArtGalle>**Art Gallery**

A gang of thieves is robbing an art gallery. They own a truck with a volume of $V \text{ cm}^3$ which they plan to fill with valuable sculptures. There are n sculptures in the gallery, the i -th of which is guarded by a sophisticated alarm system that requires $t_i \geq 0$ minutes to disable. The i -th sculpture has a value $p_i > 0$ on the black market and occupies $v_i > 0 \text{ cm}^3$ in the truck.

The thieves only have T minutes before the police arrives. Your task is to design an algorithm that computes the maximum amount of money M they can make from the heist.

More precisely, your program needs to compute

$$M = \max_{X \subseteq \mathcal{I}} \sum_{i \in X} p_i,$$

where $\mathcal{I} = \{X \subseteq \{1, \dots, n\} : \sum_{i \in X} v_i \leq V \text{ and } \sum_{i \in X} t_i \leq T\}$ contains all the sets of items that have a total volume of at most V and can be stolen in at most T minutes.

Grading You can get up to 20 judge points. To get full points, your program should run in time $\mathcal{O}(n \cdot V \cdot T)$ (with reasonable hidden constants) but slower solutions might get partial points.

Subtask 1: You can get up to 5 points (out of the 20 total points) if your program correctly solves instances in which $n \leq 20$.

Subtask 2: You can get up to 10 points (out of the 20 total points) if your program correctly solves instances in which $T = 1$ and $t_i = 0$ for every $i = 1, \dots, n$.

Instructions For this exercise, we provide a program template as an Eclipse project in your workspace that helps you reading the input and writing the output.

The project also contains data for your local testing and a `Judge.java` program that runs your `Main.java` on all the local tests – just open and run `Judge.java` in the project. The local test data are different and generally smaller than the data that are used in the online judge.

Submit only your `Main.java`.

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The input and output are handled by the template – you should not need the rest of this text.

Input The first line of the input contains the number of test cases.

The first line of each test case contains integers n , V and T , separated by spaces. The next n lines each describe one sculpture. In particular, the i -th of such lines contains the three integers v_i , t_i , and p_i .

Output For each test case, output – on a separate line – an integer corresponding to the maximum amount of money the thieves can make from the heist, i.e., the quantity M .

Example input:

```
1
6 12 20
10 19 100
1 2 30
7 11 55
4 1 16
2 9 20
3 7 43
```

Example output (corresponding to stealing the second, third, and sixth sculpture):

```
128
```

Space for your notes. These will not be graded. Only what was submitted to the judge counts for this exercise.

