Titania

Time Limit: 2.0s **Memory Limit:** 256M

Şehmettin Ltd. Co. is in the interstellar titanium transportation business. They rent spaceships that can carry $\mathbf{K}\ \mathbf{m}^3$ of titanium. The company only produces rectangular prism shaped titanium blocks of size $\mathbf{X} \times \mathbf{Y} \times \mathbf{Z}$. So, to transport titanium, you may need to cut the titanium block multiple times.

In one move you can cut the titanium block either from width, length or height into 2 titanium blocks. The dimensions of newly created titanium blocks must be integers (e.g. a $[5 \times 6 \times 7]$ block might be cut into $[5 \times 2 \times 7]$ and $[5 \times 4 \times 7]$ sized 2 blocks, but it cannot be cut into $[5 \times 1.5 \times 7]$ and $[5 \times 4.5 \times 7]$ sized 2 blocks). However, titanium is a hard metal to cut; therefore, the cost of cutting the titanium block is the square of cut surface area (e.g. if a $[5 \times 6 \times 7]$ sized block is cut into $[5 \times 2 \times 7]$ and $[5 \times 4 \times 7]$ sized 2 blocks its cutting cost will be $(5 \times 7)^2 = 1225$).

Your job as an employee of Şehmettin Ltd. Co. is to find the minimum total cost of cutting titanium blocks for given $\mathbf{X}$, $\mathbf{Y}$, $\mathbf{Z}$ and $\mathbf{K}$ values.

The ship can transport multiple titanium blocks but the total volume of the blocks should be $\mathbf{K}$*.(e.g. if the initial block is* $[2 \times 2 \times 2]$ *sized and if* $\mathbf{K}$ *is 5, the ship can either transport 1* $[2 \times 2 \times 1]$ *block with a* $[1 \times 1 \times 1]$ *block or it can transport 5* $[1 \times 1 \times 1]$ *blocks)*

The remaining $(\mathbf{X} \times \mathbf{Y} \times \mathbf{Z} - \mathbf{K})\ \mathbf{m}^3$ *of titanium does not necessarily form a single rectangular prism.*

Input

- The first line contains $\mathbf{1}$ integer, $\mathbf{T}$:
  - $1 \leq \mathbf{T} \leq 10^4$, The number of test cases.
- Each one of the $\mathbf{T}$ consecutive lines contains $\mathbf{4}$ integers, $\mathbf{X},\ \mathbf{Y},\ \mathbf{Z},\ \mathbf{K}$:
  - $1 \leq \mathbf{X},\ \mathbf{Y},\ \mathbf{Z} \leq 10$, dimensions of the titanium block.
  - $0 \leq \mathbf{K} \leq min(50,\ \mathbf{X} \times \mathbf{Y} \times \mathbf{Z})$, how many $\mathbf{m}^3$ of titanium the spaceship can carry.

Output

For each $\mathbf{X},\ \mathbf{Y},\ \mathbf{Z}$ and $\mathbf{K}$, print the minimum total cost needed to cut the titanium block, in order to make it possible to transport exactly $\mathbf{K}\ \mathbf{m}^3$ of titanium.

Example

Input:

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

Output:

```
21
16
10
```

Explanation:

First Case:

- The block whose dimension is **2 2 2** can be cut into two pieces. (**2 2 2** -> **1 2 2** and **1 2 2**). The cost of that move will be **16**.
- The block whose dimension is **1 2 2** can be cut into two pieces. (**1 2 2** -> **1 1 2** and **1 1 2**). The cost of that move will be **4**.
- Then, the block whose dimension is **1 1 2** can be cut into two pieces. (**1 1 2** -> **1 1 1** and **1 1 1**). The cost of that move will be **1**.
- To solve this optimally we will use a block of **1 2 2** with a block of **1 1 1**.($(1 \times 2 \times 2 + 1 \times 1 \times 1 = 5 = \mathbf{K})$)

The total cost will be **21**.

Third Case:

- The block whose dimension is **1 3 3** can be cut like following: **1 3 3** -> **1 3 1** and **1 3 2**. The cost of this move will be **9**.
- The block whose dimension is **1 3 1** can be cut like following: **1 3 1** -> **1 1 1** and **1 2 1**. The cost of this move will be **1** .
- To solve this we will need a block of **1 1 1**.($(1 \times 1 \times 1 = 1 = \mathbf{K})$)

In the end, we can acquire **1 1 1** cube. The total cost will be **10**.