May- 1st exam

Product manufacturing

A company has to produce IOT products of different models,
Each product requires cpus,memories and boards. After production of models, some spare equipments may be left.
In these, cpus and memories can be sold as spare parts but boards cannot be sold.
Due to manufacturing constraints maximum 3 models can be produced.
Each product can be sold at the cost of its model.
Given N different models.
D cpus with price d each.
E memories with price e each.
F boards.

Input:-
T number of testcases, followed by testcases,
Each test case consists of
D total number of cpus available.
E total number of memories available.
F total number of boards available.
N number of models followed by N lines consisting of
a_i, b_i, c_i and p_i where a_i is the number of cpus,b_i number of memories, c_i number of boards
required for producing one unit of that model and p_i is the selling price of the one unit of that model.

Output:-
Print the testcase number followed by the Maximum profit that can be made.

Note:- Maximum profit can also be attained without any production that is by just selling its components.

Constraints:-
$1 \le N \le 8$, $1 \le D,E,F \le 100$, $1 \le d,e \le 10$, $1 \le a_i,b_i,c_i \le 5$, $1 \le p_i \le 100$

Complexity

Simply question is :
     we need to choose up to 3 out of 8 (0-3)products,
Answer = Value of products+ remaining CPU*CPU_COST+remaining MEMORY*MEM_COST

Lets try to calculate complexity for brute force approach.

1.We need to choose max 3 out of 8 products, so for that complexity is 8c3=56

2. (taking product-1 out of chosen products from 0 to MAX possible if we take only this product)*(taking product-1 out of chosen products from 0 to MAX possible if we take only this product)*(taking product-1 out of chosen products from 0 to MAX possible if we take only this product) = (100*100*100)

So final complexity is = 8c3*100*100*100 < 10^9.

3. So If complexity is less than 10^9 we can freely go ahead

Input:

7

2 2 2 1 1
1
2 2 2 6

5 10 10 1 1
2
2 1 1 8
1 1 1 6

10 10 10 2 1
1
1 2 2 3

4 6 4 2 1
4
2 4 2 9
1 3 1 7
2 1 1 8
1 2 2 6

40 80 60 1 3
7
3 2 2 56
5 4 2 12
3 5 3 65
1 2 5 78
5 5 2 85
4 2 3 76
5 5 1 48

```
100 100 100  6 10
8
3 3 1 74
2 3 1 41
3 2 1 64
2 2 3 68
2 2 2 71
2 3 2 66
2 3 3 84
3 3 1 48


1
100 100 100 1 1
8
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
```

Output:

#1 6
#2 35
#3 30
#4 21
#5 1338
#6 3550
#7 200

Product_BruteForce.java

Time taken including input reding.
#1 time = 0.002
#2 time = 0.002
#3 time = 0.001
#4 time = 0.003
#5 time = 0.064
#6 time = 0.203
#7 time = 0.001

Precautions to take care:

1.Question asked is we need to choose up to 3 out of 8 products, means we can choose no product also and sell all individual components.

2. When choosing a product we need to check whether the component I am spending for this product worth more than if I sell individual products, if not ignore product completely

3.When we apply 3 for loops to generate 8c3 combination, we need to consider N<3 also

4. Always calculate time roughly before selecting approach as explained above.