

Trigonometric optimization

Many problems arising in practical applications may be stated as *optimization problems*. Usually it is necessary to maximize or minimize so called *criterion function* taking into account some *constraints*.

Let's consider a trigonometric optimization problem. It is necessary to maximize or to minimize criterion function $F_1(x) + F_2(y) + F_3(z)$ with constraint $x + y + z = S$, where x, y, z – variables, S – parameter, x, y, z, S - natural numbers. Each of the functions F_1, F_2 and F_3 is a trigonometric function *sin* or *cos*.

You need to write a program which solves the *trigonometric optimization* problem.

Input

The first line of the input data contains integer T ($1 \leq T \leq 65$) - the number of testcases. Then the descriptions of T testcases follow.

The description of each testcase consists of 5 lines. The first line describes function F_1 and contains either *sin* or *cos*. The second and the third lines describe functions F_2 and F_3 respectively and have the same format as the first line. Next, the fourth line contains either *min* or *max*. If the line contains *min* than it is necessary to minimize *criterion function*, otherwise it is necessary to maximize *criterion function*. Finally, the fifth line contains parameter S value ($3 \leq S \leq 1\,000\,000$).

Output

For each testcase you should output one line into the output data. This line should contain one real number – the found value of the *criterion function*. Absolute error of your answer must not exceed 10^{-10} .

Example

Input:

```
1
sin
cos
sin
max
10
```

Output:

```
2.7787651403
```