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Fighting the Zombie — 45 points

Download Input

"Okay, Wizard, cast your spell!"

But which of your many spells to cast? In the ever-popular role-playing game *Dungeons & Dragons*, or *D&D*, you determine a spell's damage by rolling polyhedral dice with 4, 6, 8, 10, 12, or 20 sides. Since there's a lot of dice-rolling involved, players use shorthand to denote which dice should be rolled. **X**d**Y** means "roll a **Y**-sided die **X** times, and sum the rolls". Sometimes, you must add or subtract a value **Z** after you finish rolling, in which case the notation is **X**d**Y**+**Z** or **X**d**Y**-**Z** respectively.

For example, if you roll 2d4+1, you'll end up with a result between 3 and 9 inclusive. If you roll 1d6-3, your result will be between -2 and 3 inclusive.

In *D&D*, wizards are powerful but flimsy spellcasters. As a wizard fighting a zombie, your best strategy is to maximize the chance that you can kill the zombie with a single spell before it has a chance to retaliate. What spell should you cast?

Input

Input begins with an integer **T**, the number of zombies you'll fight. For each zombie, there are two lines. The first contains two integers, **H** and **S**, the minimum amount of damage it takes to defeat the zombie, and the number of spells you have prepared, respectively. The second line contains **S** spell descriptions separated by single spaces. A spell description is simply the amount of damage a spell does in the notation described above.

Output

For each zombie, print a line containing the probability of defeating the zombie if you select your spell optimally.

Absolute and relative errors of up to 1e-6 will be ignored.

Constraints

1 ≤ **T** ≤ 1,000
1 ≤ **H** ≤ 10,000
2 ≤ **S** ≤ 10

Additionally, the following constraints will hold for each spell:

1 ≤ **X** ≤ 20
Y ∈ {4, 6, 8, 10, 12, 20}
1 ≤ **Z** ≤ 10,000, if **Z** is specified.
X, **Y**, and **Z** will be integers with no leading zeros.

Explanation of Sample

In the first case, you can guarantee a kill with the first spell, which must always do at least 2 damage.

In the third case, your first spell is the best. If you roll a 4, you'll do the requisite 8 damage. The second spell requires rolling a 4 on two dice rather than just one, and the third spell requires rolling a 4 on all three dice.

Example input · Download

```
5
2 2
2d4 1d8
10 2
10d6-10 1d6+1
8 3
1d4+4 2d4 3d4-4
40 3
10d4 5d8 2d20
10 4
1d10 1d10+1 1d10+2 1d10+3
```

Example output · Download

```
Case #1: 1.000000
Case #2: 0.998520
Case #3: 0.250000
Case #4: 0.002500
Case #5: 0.400000
```