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[Instructions](#)[Scoreboard](#)[My score](#)[Friends](#)[Everyone](#)**Problems**[25: Progress Pie](#)[30: Lazy Loading](#)**[45: Fighting the Zombie](#)****Resources**[Editorial](#)[Past Rounds](#)[Update Registration](#)[FAQ](#)[Terms and Conditions](#)**Facebook Hacker Cup 2017 Qualification Round****Fighting the Zombie****45 points****"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.  $XdY$  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  $XdY+Z$  or  $XdY-Z$  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**

$$1 \leq T \leq 1,000$$

$$1 \leq H \leq 10,000$$

$$2 \leq S \leq 10$$

Additionally, the following constraints will hold for each spell:

$$1 \leq X \leq 20$$

$$Y \in \{4, 6, 8, 10, 12, 20\}$$

$$1 \leq Z \leq 10,000, \text{ if } Z \text{ is specified.}$$

$X$ ,  $Y$ , 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
```

Example output · [Download](#)

```
Case #1: 1.000000
Case #2: 0.998520
Case #3: 0.250000
```

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40 3  
10d4 5d8 2d20  
10 4  
1d10 1d10+1 1d10+2 1d10+3



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