A2 – Millionaire

Congratulations! You were selected to take part in the TV game show *Who Wants to Be a Millionaire*! Like most people, you are somewhat risk-averse, so you might rather take \$250,000 than a 50% chance of winning \$1,000,000. On the other hand, if you happen to already be rich, then you might as well take a chance on the latter. Before appearing on the show, you want to devise a strategy to maximize the expected *happiness* derived from your winnings.

More precisely, if your present net worth is W dollars, then winning v dollars gives you $\ln(1+v/W)$ units of happiness. Thus, the game's *expected happiness* is $\sum_v P(v)\ln(1+v/W)$, where $P(v)$ is the probability that you'll win v dollars, and the summation is taken over all possible values of v. Since happiness units are too abstract, you will be asked to measure the value of the game in dollars. That is, compute D such that a guaranteed payout of D dollars makes you as happy as a chance on the show, assuming optimal play.

On the show, you will be presented with a series of questions on trivia, each associated with a prize value of v_i dollars. Your analysis of past episodes reveals that if you attempt the ith question, your chances of being correct are p_i.

After answering correctly, you may choose to continue or to quit. If you quit, you win the value of the last correctly answered question; otherwise, the game continues and you must attempt the next question. If you correctly answer all the questions, you walk away with the value of the last question.

If you answer a question incorrectly, however, the game ends immediately and you win the value of the last correctly answered question that is labeled as `safe`, or nothing if you never solved a `safe` question.

For example, the game in the first sample input is worth $0.5\ln(1+5000/4000) \approx 0.405$ units of happiness. Getting \$2,000 would likewise grant $\ln(1+2000/4000) \approx 0.405$ happiness.

Input

The first line of input contains two space-separated integers n and W ($1 \leqslant n \leqslant 10^5, 1 \leqslant W \leqslant 10^6$). Line $i+1$ describes the ith question. It starts with a string, which is one of `safe` or `unsafe`, indicating whether the ith question is safe or not. The string is followed by a real number p_i and an integer v_i ($0 \leqslant p_i \leqslant 1, 1 \leqslant v_i < v_{i+1} \leqslant 10^6$).

Output

Print, on a single line, a \$ sign immediately followed by D, rounded and displayed to exactly two decimal places. See the samples for format clarification.

Input and output samples

Input:
1 4000 unsafe 0.5 5000

Output:
\$2000.00

Input:
4 4000 unsafe 1 2000 safe 0.4 5000 unsafe 0.75 10000 safe 0.05 1000000

Output:
\$2316.82

Input:
2 4000 safe 0.003 1 safe 0.03 10

Output:
\$0.00