Facebook Hacker Cup '15 Round 2 P2 - All Critical

Time limit: 25.0s   **Memory limit:** 1G

Facebook Hacker Cup 2015 Round 2

In the game *Theatrhythm Final Fantasy*, you poke a screen with a stick to the beat of various songs. The goal is to poke the screen as accurately as possible. If you hit a note at just the right time, you're awarded a **critical**. Every song is broken into 20 sections, and if you get a **critical** on every note in a section, then you get that section's golden **critical bar**.

You would like to collect all 20 **critical bars** for every song.
Songs vary in difficulty, but each song has a fixed probability p, which is the chance that you manage to secure any one **critical bar** on a single playthrough. The chances are independent, so for any given pair of sections, the probability of getting both **critical bars** in a single playthrough is p^2, and so on. **Critical bars** are saved between playthroughs, so you don't have to win all of the **critical bars** in a single play of the song. You might win the first 10 on one play, and then the last 10 on another.

On average, how many times will you have to play a song to win all 20 **critical bars**?

Input

Input begins with an integer T, the number of songs you'll play. For each song, there is a line containing a floating point number, p, the probability of winning any particular **critical bar** on a single play of the song.

Output

For each song, output the expected number of times you need to play the song before acquiring all 20 **critical bars**, rounded to five decimal points.

Absolute errors of up to 10^{-5} will be ignored.

Constraints

$1 \le T \le 20$
$0.01 \le p \le 1.0$

Sample Input

```
5
0.1
0.12
0.123
0.1234
0.12345
```

Sample Output

```
Case #1: 34.64694
Case #2: 28.64398
Case #3: 27.91171
Case #4: 27.81676
Case #5: 27.80493
```