D - 色塗り / Painting

Time limit : 2sec / Memory limit : 256MB

Problem Statement

N white circles are drawn in a line on a sheet of paper.

You will repeat the following operation as long as there exists a white circle that is not adjacent to a black circle.

- Operation: Consider all white circles that are not adjacent to a black circle. Choose one from them uniformly at random, then paint it black.

Write a program that finds the expected number of black circles when the process is terminated.

Input

Input is given from Standard Input in the following format:

```
N
```

The only line contains a integer $N(1 \leqq N \leqq 100,000)$, denoting the number of the circles.

Partial Points

Partial points may be awarded in this problem:

- 40 points will be awarded for passing the test set where $N \leqq 1,000$.

Output

Print the expected number of black circles after the process, in a single line.

Write to Standard Output. Be sure to print a newline at the end of the output.

Your answer will be considered correct if the absolute or relative error from the judge's answer is at most 10^{-7}.

Sample Input 1

```
3
```

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Sample Output 1

```
1.6666666666666666667
```

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In the first operation, the middle circle will be chosen with probability $1/3$, and a circle at either end will be chosen with probability $2/3$.

If the middle circle is chosen and painted black, there will no longer exist a circle without an adjacent black circle, thus the process will terminate with 1 black circle.

If a circle at either end is chosen, the circle at the other end will be painted in the next operation, then the process will terminate with 2 black circle.

Therefore, the expected number of black circles is $1 \times 1/3 + 2 \times 2/3 = 5/3$.

Sample Input 2

```
4
```

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Sample Output 2

```
2.00000000000000
```

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The process will always end with 2 circles painted black.

Sample Input 3

```
1000
```

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Sample Output 3

```
432.6293554568
```

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Sample Input 4

```
100000
```

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Sample Output 4

```
43233.53283524467
```

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