

CPRIME - Prime Number Theorem

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[Vietnamese \(/problems/CPRIME/vn/\)](/problems/CPRIME/vn/)

In number theory, the Prime Number Theorem describes the asymptotic distribution of prime numbers. Let $\pi(x)$ be the number of prime numbers not greater than x . The Prime Number Theorem states that:

$$\pi(x) \sim \frac{x}{\ln x}.$$

Your task is to write a program to verify how well the Prime Number Theorem can estimate $\pi(x)$. To be more precise, for a given x , you have to calculate the percent error $|\pi(x) - x/\ln x| / \pi(x) \%$.

Input

The input contains several test cases (no more than 1000). Each test case contains a value of x ($2 \leq x \leq 10^8$) given in one line. A number 0 terminates the input.

Output

For each value of x , output the percent error of the estimation of $\pi(x)$, rounded to 1 decimal digit.

Example



Input:

```
10000000
2
3
5
1234567
0
```

Output:

```
6.6
188.5
36.5
3.6
7.7
```

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scolar_fuad (/users/scolar_fuad): 2019-05-09 16:12:45

Ac in first go use bitwisw seive to avoid TLE and keep cumulative sum of prime numbers



crackeree (/users/crackeree): 2018-12-29 23:14:40

first attempt :)
0.32 sec



shishir_09 (/users/shishir_09): 2017-12-12 22:32:41

A sieve of 1e8 + Precalc made the problem AC just right now :D



sas1905 (/users/sas1905): 2017-06-26 02:08:11

Bitwise sieve + Binary search.



rohit9934 (/users/rohit9934): 2017-06-19 20:32:41

Don't know the point of using bitwise sieve over traditional sieve when bitwise is using 390M (0.36 s) in the judge.

Bitwise sieve is designed for tackling masochistic memory constraints.



sandeep_4141 (/users/sandeep_4141): 2017-05-30 16:59:50

Only Bitwise sieve can save you :)



Shubham Jadhav (/users/shubhamjadhav): 2017-05-14 20:05:32

sieve with 1e8 works in C++ :)



raghav_7050 (/users/raghav_7050): 2017-01-31 02:41:20

bitwise sieve + vector and a lil pre-comp. ----> piece of cake !!



spartax (/users/spartax): 2016-12-11 07:15:27

very nice problem. Use bitset and upper_bound



himanshu_0896 (/users/himanshu_0896): 2016-11-29 14:56:47

How to deal with $10^7 \leq x \leq 10^8$?

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segment=placement:wwwspojcom;
utm_source=wwwspojcom)

Added by: Duc (/users/paulmcvn)
Date: 2008-12-11
Time limit: 1.812s
Source limit: 50000B
Memory limit: 1536MB
Cluster: Cube (Intel G860) (/clusters/)
Languages: All except: ERL JS-RHINO
NODEJS PERL6 VB.NET
Resource: © VNOI (http://vnoi.info)

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