Problem 193: Natural Boost

Difficulty: Easy

Author: Matthew Ward, Huntsville, Alabama, United States

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Problem Background

We all know that Atlas rockets use chemical boosters to burn fuel and generate thrust, but did you know that the Earth also plays a big part in getting to orbit? When a rocket lifts off, it doesn't go straight up; it tilts its nose toward the Earth slightly so that it starts flying sideways. Getting to Orbit is about going so fast parallel to the surface of the Earth that the Earth's surface curves away from you faster than you can fall towards it.

As a result, the closer you are to the equator, the greater the speed boost you get from the rotation of the Earth. The United States takes advantage of this by launching most of its rockets from Cape Canaveral in Florida, Vandenberg Air Force Base in Southern California, and Wollops Island in Virginia.

Problem Description

Lockheed Martin Space is designing a new simulation tool to estimate how much fuel a rocket will need to reach orbit. Your team's job is to design an algorithm that can calculate the rocket's initial lateral speed based on the latitude of the launch site.

For this problem, you can assume that the Earth is a perfect sphere with a radius of 6,370,000 meters which rotates exactly around its north-south axis once every 24 hours (or 86,400 seconds). None of this is actually true in practice - the Earth is squashed and tilted, and days aren't exactly 24 hours long - but we're just getting estimates, so we don't really need exact numbers.

Given the latitude of the launch site in degrees (0° is the equator; 90°is the North Pole), calculate how much velocity will be applied to the rocket simply from the rotation of the Earth.

These equations may help along the way, along with the trigonometric functions provided in the reference materials:

- Radius of a circle, in meters: r
- Time, in seconds: t
- Distance, in meters: x
- Circumference of a circle, in meters: $C = 2\pi r$
- Velocity, in meters per second: $v = {}^{x}/_{t}$

Sample Input

The first line of your program's input, received from the standard input channel, will contain a positive integer representing the number of test cases. Each test case will include a single line containing a decimal value between -90.0 and 90.0 inclusive representing the degrees of latitude of the launch site.

```
5
28.3922
34.7420
-37.9402
5.0500
0.0000
```

Sample Output

For each test case, your program must print a single line containing an integer value, representing the floor of the rocket's velocity due to the rotation of the Earth, in meters per second.

```
407
380
365
461
463
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