

**2021/2022 SOUTHERN CALIFORNIA REGIONAL
INTERNATIONAL COLLEGIATE PROGRAMMING CONTEST**

**Problem ?
Exoplanet Lighthouses**

As humanity travels to extraterrestrial bodies, the need to determine one's location on the surface will be critical. Lighthouses offer a simple solution as line-of-sight navigational beacons. An important measurement for lighthouses is geographic range, the maximum visible, line-of-sight distance between an observer and the lighthouse before the lighthouse is obscured by the horizon due to the curvature of the surface. The surface *traveling* distance corresponding to the geographic range is crucial for planning fuel and oxygen supplies to ensure an accurate—and safe—return to base stations.

Your team is to write a program that computes the maximum surface distance visible between an observer and a lighthouse. Your program is to assume that exoplanets are spherical with a known radius.

Input consists of a series of test cases, one test case per line. Each line has three real values separated by whitespace, R , h_1 , and h_2 . R is the radius of the spherical body, h_1 is the height of the observer above the surface R , and h_2 is the height of the lighthouse beacon above the surface R . R is in units of kilometers; h_1 and h_2 are in units of meters. The observer is a point-receiver, which can be a sensor or a human eye, and the beacon is a point-source, such as a lamp, or laser. See Figure 1.

For each test case, print a line with a single floating point value for the maximum surface distance D in kilometers, between the observer and lighthouse. The result must be within one meter of the judges' reference value.

Sample Input

```
6371.0 1.0 27.0
6371.0 1.0 26.99
6371 1.0 1.0
1737.4 1 27
```

Output for the Sample Input

```
22.117714375394343
22.114279232261655
7.139187161948777
11.550070205049764
```

Problem ?
Exoplanet Lighthouses (continued)

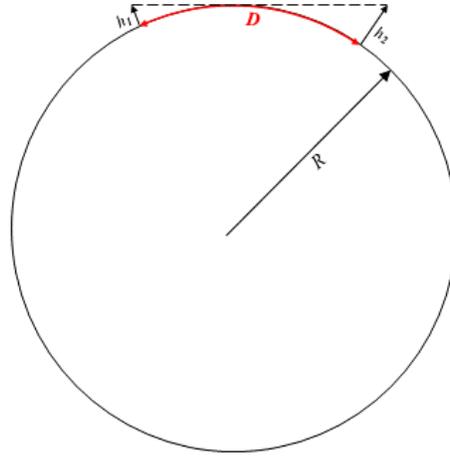


Figure 1. “Line of Sight” between source and receiver on an exoplanet’s surface.