

# problem 4

## Go Ballistic

3 points

### Introduction

Ballistics (gr. βάλλειν /BALL•ein/, "throw") is the science of mechanics that deals with the flight, behavior, and effects of projectiles. You can calculate the distance that an angry bird (or golf ball or other object) will travel if it is thrown (launched, catapulted, spit, etc.) from a fixed location over a flat surface using the following formula:

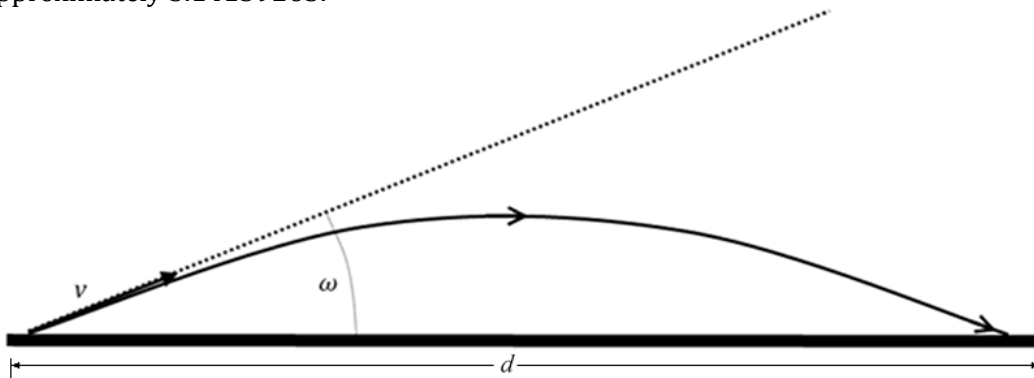
$$d = v^2 \times \sin( 2\omega ) / g$$

Here  $v$  is the initial (thrown) velocity,  $\omega$  is the angle above horizontal (i.e. the ground), and  $g$  is the acceleration of gravity. The acceleration of gravity at the Earth's surface is approximately  $9.80665 \text{ m/s}^2$ .

For this program we'll assume that air resistance and the curvature of the Earth are insignificant. Also, we'll measure in units of meters, seconds, and degrees. Your language's  $\sin()$  function probably expects angles in radians instead of degrees. If so, you can convert degrees to radians using this formula:

$$\text{radians} = \pi \times \text{degrees} / 180$$

Here  $\pi$  is approximately 3.14159265.



### Input

The input will be two floating-point numbers, each on a separate line. The first is the initial velocity of a projectile in meters per second and the second is the launch angle in degrees.

```
63.9
65
```

### Output

The program must print the distance in meters that the projectile travels before striking the ground. The answer must match the expected value within +/- 1 meter.

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318.9591
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