

Term Project

Algorithm Design (CS)

1192. Ball in a dream

Difficulty: 111

Nathanan P. 5715140

Kamonchanok A. 5817353

Problem

- **Time limit:** 1.0 second
 - **Memory limit:** 64 MB
-

Description

A little boy likes throwing balls in his dreams. He stands on the endless horizontal plane and throws a ball at an angle of a degrees to the plane. The starting speed of the ball is V m/s. The ball flies some distance, falls down, then jumps off, flies again, falls again, and so on.

As far as everything may happen in a dream, the laws of the ball's motion differ from the usual laws of physics:

- the ball moves in the gravity field with acceleration of gravity equal to 10 m/s^2 ;
- the rebound angle equals the angle of fall;
- after every fall, the kinetic energy of the ball decreases by a factor of K ;
- there is no air in the dream;
- "Pi" equals to 3.1415926535.

Your task is to determine the maximal distance from the point of throwing that the ball can fly.

Problem

- **Input:** The input contains three numbers: $0 \leq V \leq 500000$, $0 \leq a \leq 90$, and $K > 1$ separated by spaces. The numbers V and a are integers; the number K is real.
 - **Output:** The output should contain the required distance in meters rounded to two fractional digits.
-

Sample

Input	Output
5 15 2.50	2.08

Solution

```
import math

g = 10
n = input().split()
v = int(n[0])
a = math.pi*(int(n[1]))/180
k = float(n[2])
way = float(0)

while True:
    if v < 0.01:
        break
    way += (v * v * math.sin(2*a))/(g)
    v = v / math.sqrt(k)

print("%.2f" % (way))
```

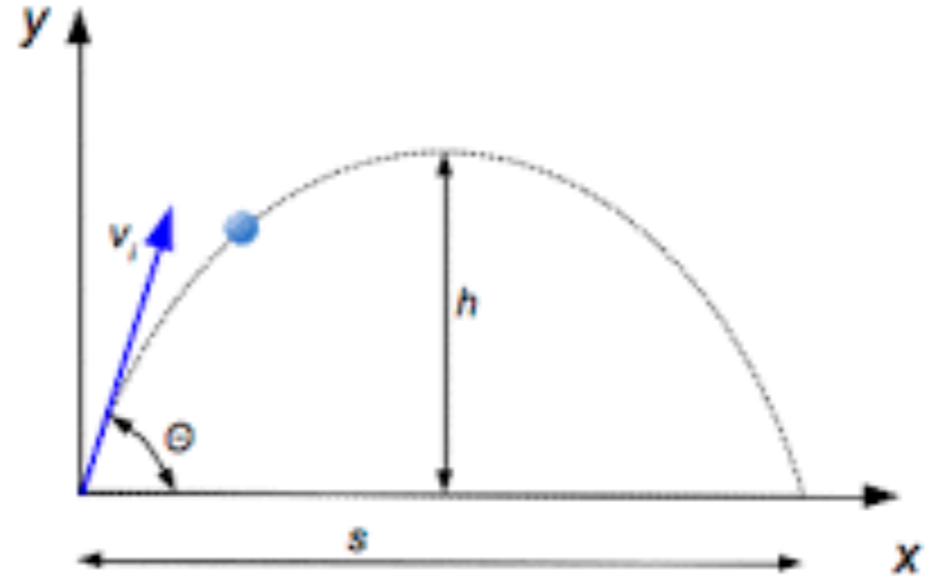
Formulas

- Radians formula

$$\text{Radians} = \left(\frac{\pi}{180^\circ} \right) \times \text{degrees}$$

- Range of projectile formula

$$R = \frac{v_i^2 \sin(2\theta_i)}{g}$$



Output

```
===== RESTART: /Users/nathananp/Desktop/1192 Ball_in_a_dream.py =====  
5 15 2.50  
2.08  
>>>  
===== RESTART: /Users/nathananp/Desktop/1192 Ball_in_a_dream.py =====  
6 14 3.25  
2.44  
>>>  
===== RESTART: /Users/nathananp/Desktop/1192 Ball_in_a_dream.py =====  
4 20 2.35  
1.79  
>>>  
===== RESTART: /Users/nathananp/Desktop/1192 Ball_in_a_dream.py =====  
3 15 3.50  
0.63  
>>>  
===== RESTART: /Users/nathananp/Desktop/1192 Ball_in_a_dream.py =====  
5 20 4.55  
2.06
```

Submission

ID	Date	Author	Problem	Language	Judgement result	Test #	Execution time	Memory used
7853593	10:17:23 18 Apr 2018	Nathanan	1192. Ball in a Dream	Python 3.6	Accepted		0.078	352 KB
7853589	10:14:06 18 Apr 2018	Nathanan	1192. Ball in a Dream	Python 3.6	Time limit exceeded	1	1.045	284 KB

- Language: Python 3.6
- Execution time: 0.078
- Memory used: 352 KB