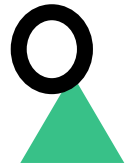


The background of the slide is decorated with a variety of colorful geometric shapes and patterns. These include circles, squares, triangles, and lines, some of which are filled with patterns like stripes or dots. The colors used are primarily blue, green, yellow, and red. The central text is enclosed in a double-lined rectangular frame with a green outer border and a blue inner border.

# CS3201 Algorithm Design Term Project problem(1192)

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## 1192. Ball in a Dream(diff 110)



A little boy likes throwing balls in his dreams. He stands on the endless horizontal plane and throws a ball at an angle of  $\alpha$  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  $10 \text{ m/s}^2$ ;

- 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.

## 1192. Ball in a Dream(diff 110)



### 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.

| input     | output |
|-----------|--------|
| 5 15 2.50 | 2.08   |

## Question Analysis



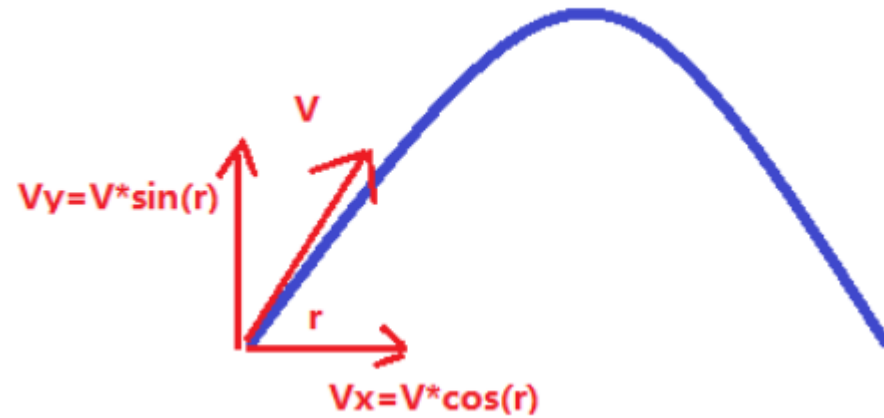
There is a small ball that moves at the initial velocity  $V$  from the angle of (angle is not radian) to the ground. When it lands, it bounces again and its kinetic energy becomes  $1/K$ . But when it bounces, its angle with the ground equals the angle between it and the ground. How far can you bounce from the earth (horizontal distance)?

## Question Analysis



First of all, every two bounces of the ball is a standard parabolic motion, and it is a symmetrical parabola (because there is no air resistance, the velocity of the ball decreases only when it collides with the ground). So if the initial velocity of a ball is known to be  $v$ , and the angle between the ball and the ground is  $R$  (radian), how far can the ball go before the next impact on the ground?

# Question Analysis



Finally, we can get a formula:  $S_x(\text{Horizontal distance}) = \frac{v^2}{g} \sin(2r)$

WE USE THIS LATER

# My code



```
question_1192.java
5 public class question_1192 {
6
7     static double v;
8     static int a;
9     static double k;
10    static double PI = 3.1415926535;
11    static double r;
12    static double S;
13
14    public static void main(String[] args) {
15        // TODO Auto-generated method stub
16        Scanner in = new Scanner(System.in);
17        v = in.nextInt();
18        a = in.nextInt();
19        k = in.nextDouble();
20
21        in.close();
22        // System.out.println(v);
23        // System.out.println(a);
24        // System.out.println(k);
25        caculate_distance();
26        // System.out.println();
27    }
28
29    public static void caculate_distance() {
30        r = (double)a / 180 * PI;
31        // System.out.println(r);
32        while (v > 0.01) {
33            S += v * v / 10.0 * Math.sin(2 * r);
34            v = v / Math.sqrt(k);
35        }
36        System.out.println(String.format("%.2f", S));
37    }
```

## Result

|                                                                                            |                                                                                             |                                                                                                 |
|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|  Problems |  Javadoc |  Declaration |
| <terminated> question_1192 [Java Applicati                                                 |                                                                                             |                                                                                                 |
| 5 15 2.50                                                                                  |                                                                                             |                                                                                                 |
| 2.08                                                                                       |                                                                                             |                                                                                                 |

|                             |                      |          |          |  |       |             |
|-----------------------------|----------------------|----------|----------|--|-------|-------------|
| <a href="#">JiadongJiao</a> | <a href="#">1192</a> | Java 1.8 | Accepted |  | 0.124 | 2 460<br>KB |
|-----------------------------|----------------------|----------|----------|--|-------|-------------|

## Reference



<https://blog.csdn.net/u013480600/article/details/39612495>



THANKS!