```
 1  /* Problem 4--I Shot An Arrow
 2     I imagine that this will turn out to have been the hardest problem in
 3     the contest.  Even with command of trigonometry, solving the equation
 4     is not necessarily easy. */
 5
 6  import java.io.*;
 7  import java.util.*;
 8
 9  public class prob4 {
10
11   private static Scanner in = null;
12   private static PrintWriter out = null;
13   private static int cs = 0;
14
15   public static void main (String[] args) throws Exception {
16
17    in = new Scanner (new File ("prob4.in"));
18    out = new PrintWriter ("prob4.out");
19    while (in.hasNextInt ()) {  //read in data
20     int px = in.nextInt (), py = in.nextInt (), pv = in.nextInt (),
21         pth = in.nextInt (),
22         ax = in.nextInt (), ay = in.nextInt ();
23     Process (px,py,pv,pth,ax,ay);
24    }
25    in.close ();
26    out.close ();
27   }
28
29   /* Process computes the answer for the input.  It uses binary search
30      to solve equations that are nasty hard algebraically. */
31   public static void Process (int px, int py, int pv, int pth,
32                               int ax, int ay) throws Exception {
33
34    //Equations are:
35    //ax + 200 t cos at = px + pv t cos pth
36    //ay + 200 t sin at = py + pv t sin pth
37    double maxtime = Math.sqrt ((px-ax)*(px-ax)+(py-ay)*(py-ay))/100;
38    double l = 0, h = maxtime, t = 0, x = 0, y = 0;
39    //solving for t which must fall between 0 and maxtime.
40    while (true) {
41     t = (l+h)/2;
42     x = px+pv*t*Math.cos (pth*Math.PI/180); //where does the player move
43     y = py+pv*t*Math.sin (pth*Math.PI/180); //in this time
44     double at = Math.sqrt ((x-ax)*(x-ax)+(y-ay)*(y-ay))/200;
45     if (Math.abs(t-at)<1e-8) break; //how long will it take the arrow to
46     if (at < t) h = t; //move there.  Which gets there first?
47     else l = t;
48    }
49    double aa = Math.atan2(y-ay,x-ax)*180/Math.PI; //compute angle from
50    if (aa < 0) aa += 360; //intersection point
51    double ha = Math.atan (0.08*t)*180/Math.PI; //compute vertical angle
52    out.printf ("Case %d: Katniss fires at a horizontal angle of %.1f "+
53                "degrees and a vertical angle of %.1f degrees.\r\n",
54                 ++cs,aa,ha);
55   }
56  }
57
```