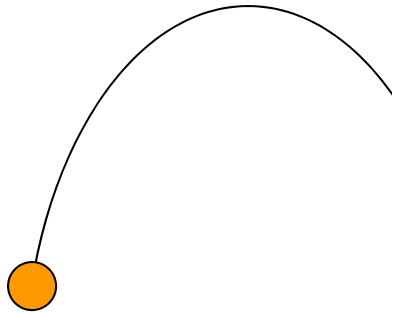
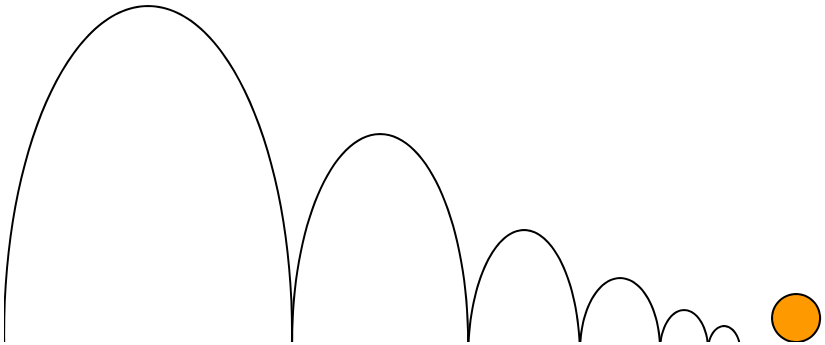


Beer Pong

Investigating

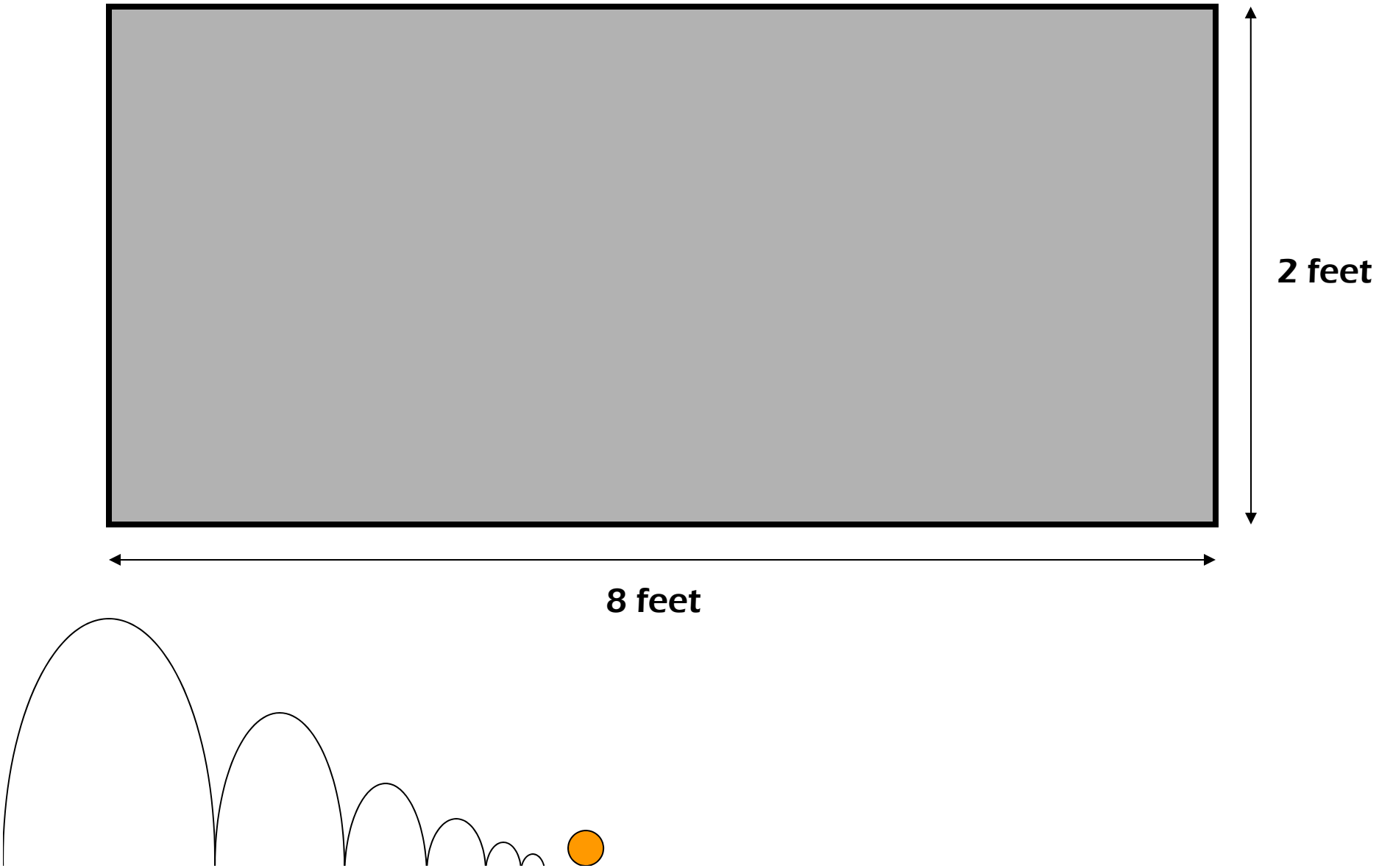
scenarios and strategies



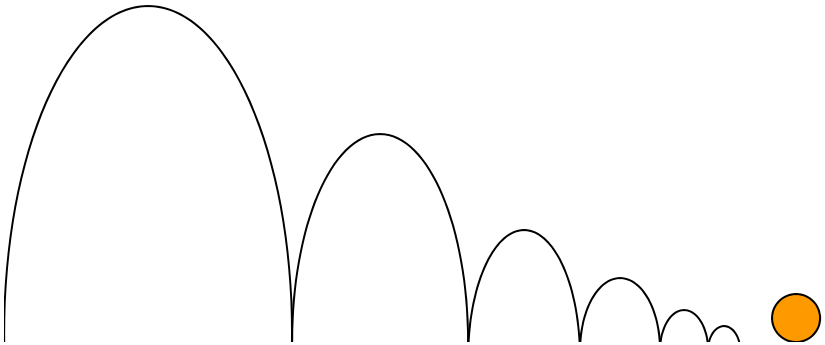
Maureen St Georges

Scientific Computing | Spring 2007

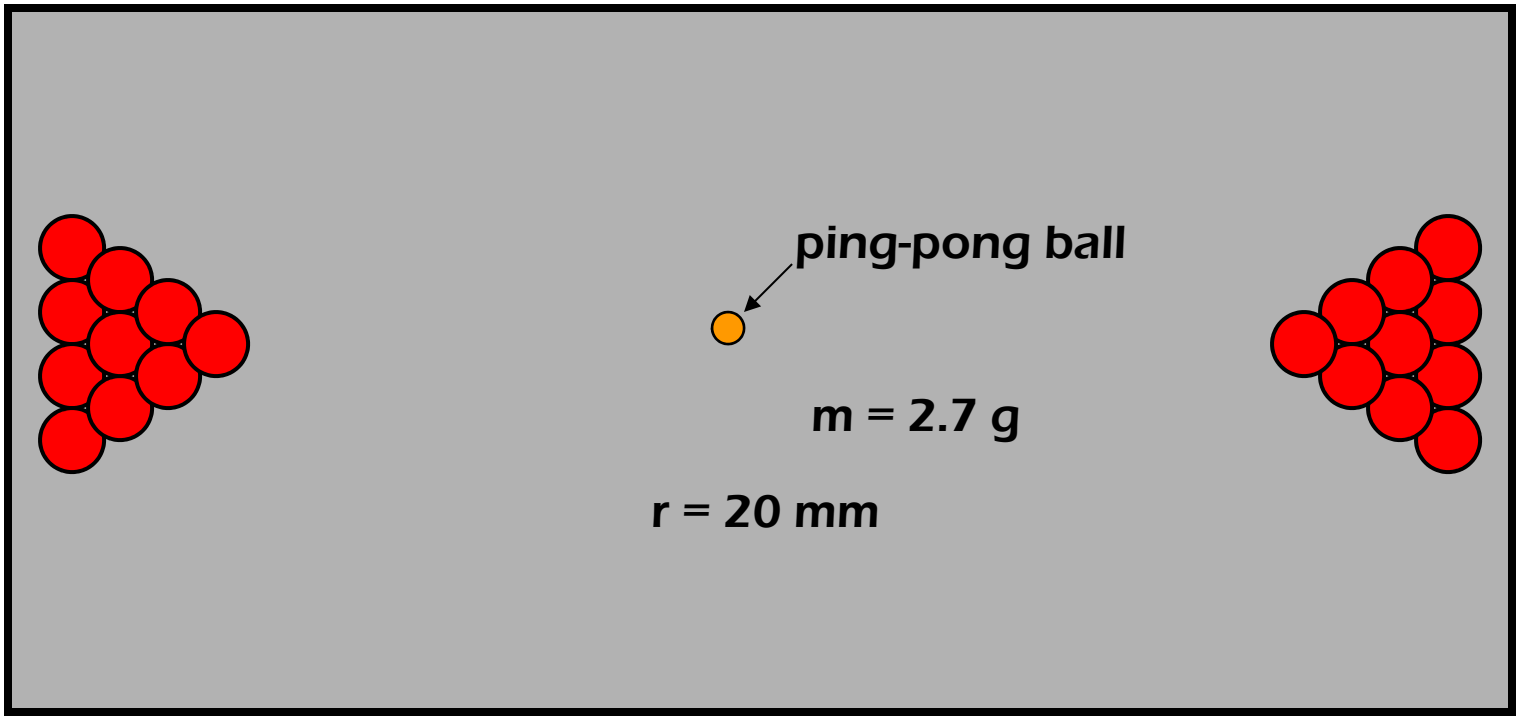
TABLE

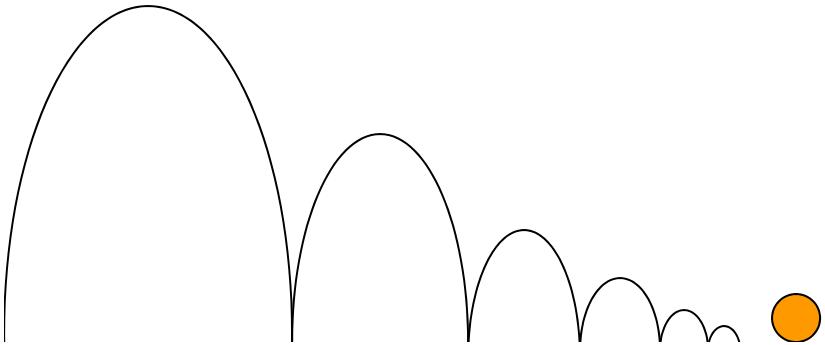


TARGETS

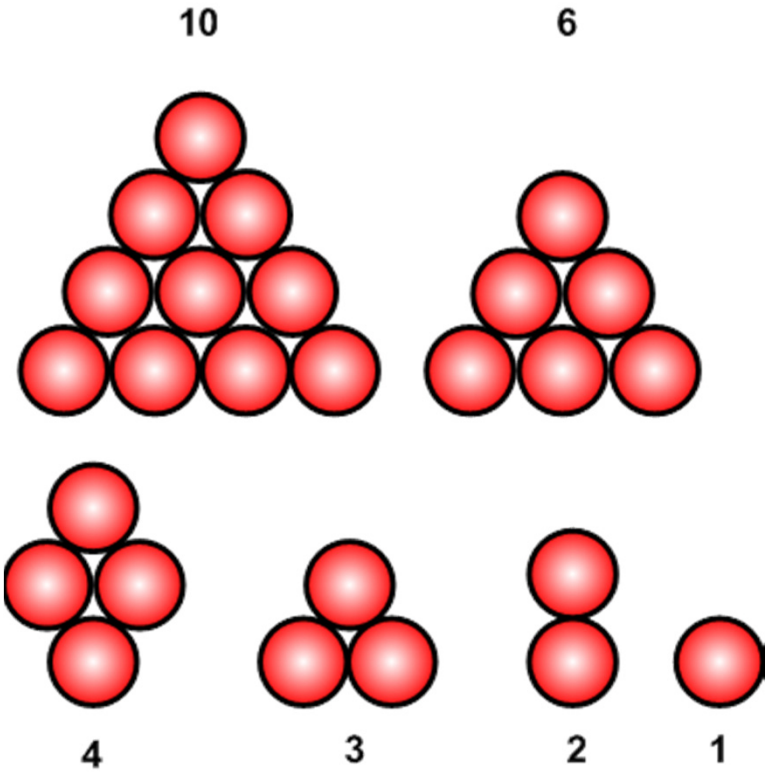


PROJECTILE

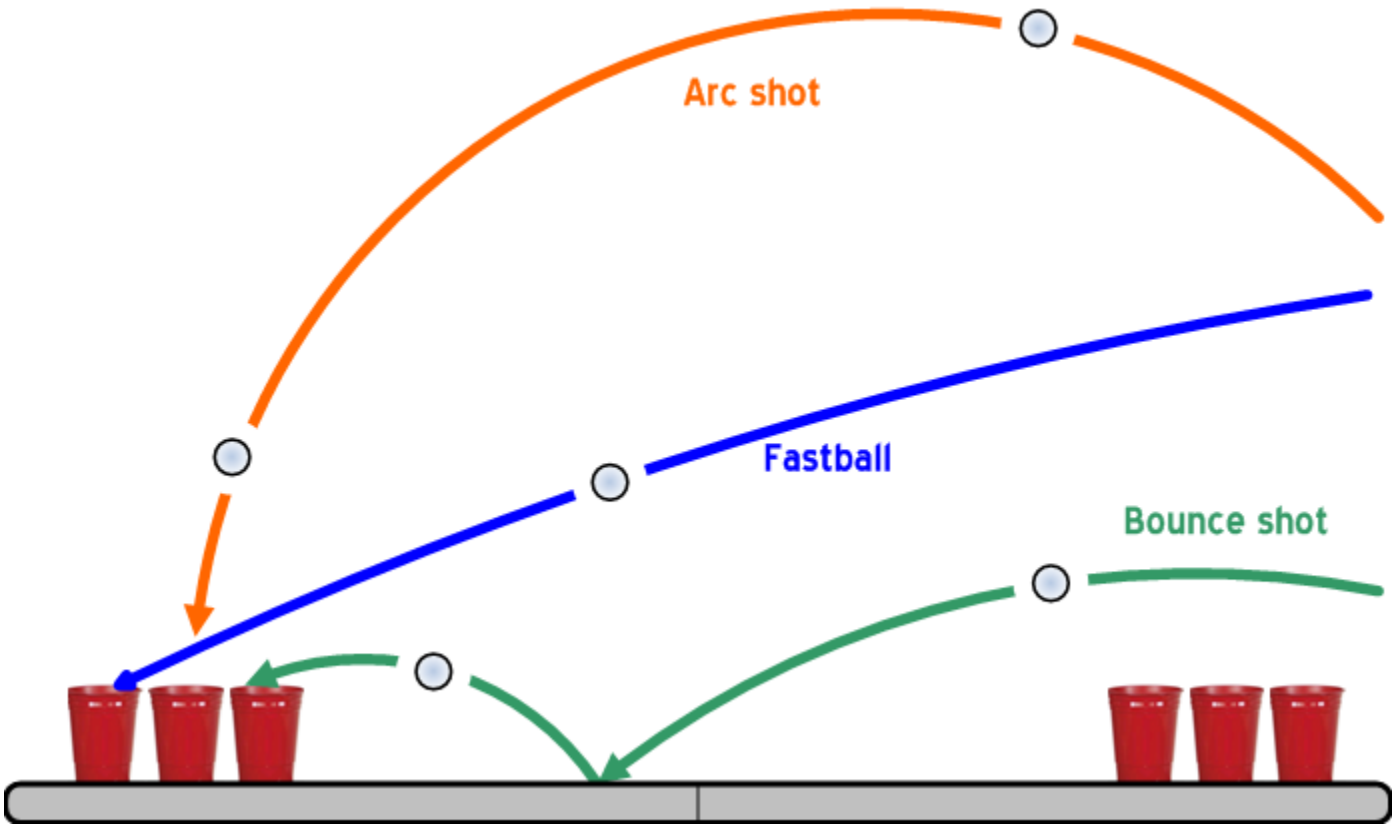




RACKS

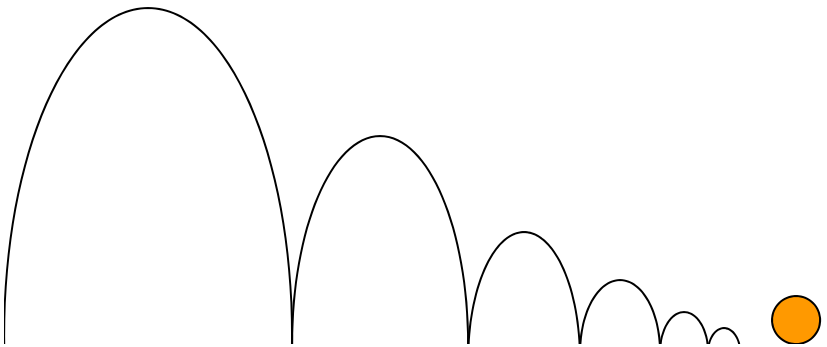


SHOTS



GOALS

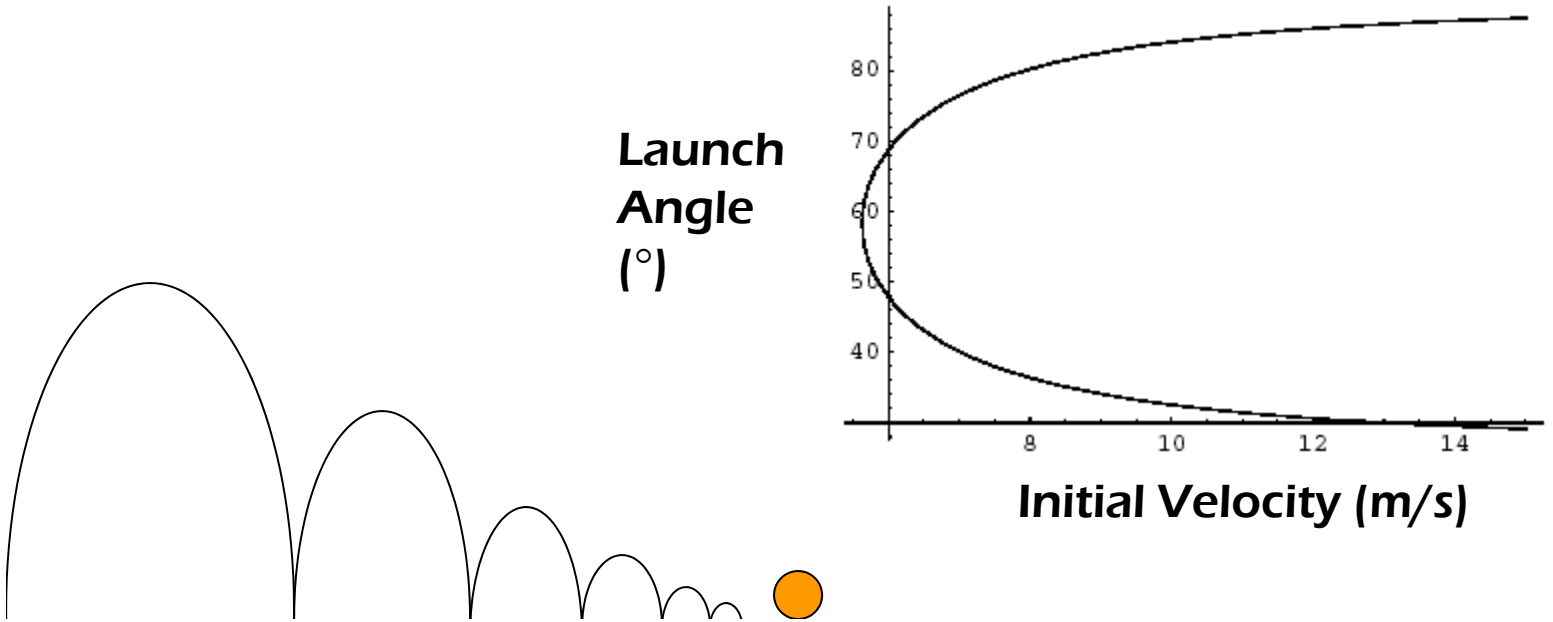
- model projectile motion and bouncing motion of ping-pong ball
- explore probabilities of advantageous shots and racks



MODEL

- Angle necessary to reach a target (x, y) with initial velocity v:

$$\theta = \tan^{-1}\left(\frac{v^2 \pm \sqrt{v^4 - g(gx^2 + 2yv^2)}}{gx}\right)$$

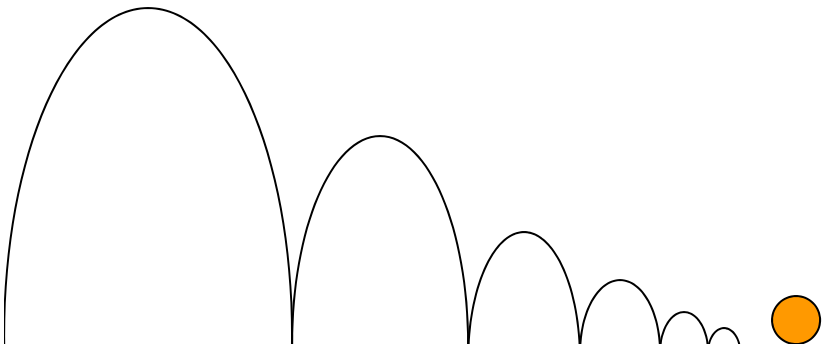


MODEL

- *Velocity adjusted for air resistance:*

```
(* Air resistance: *)
r = 0.03;
n = 1.8 * 10^(-5);
k = 6 * Pi * n * r;
m = 0.0027;
```

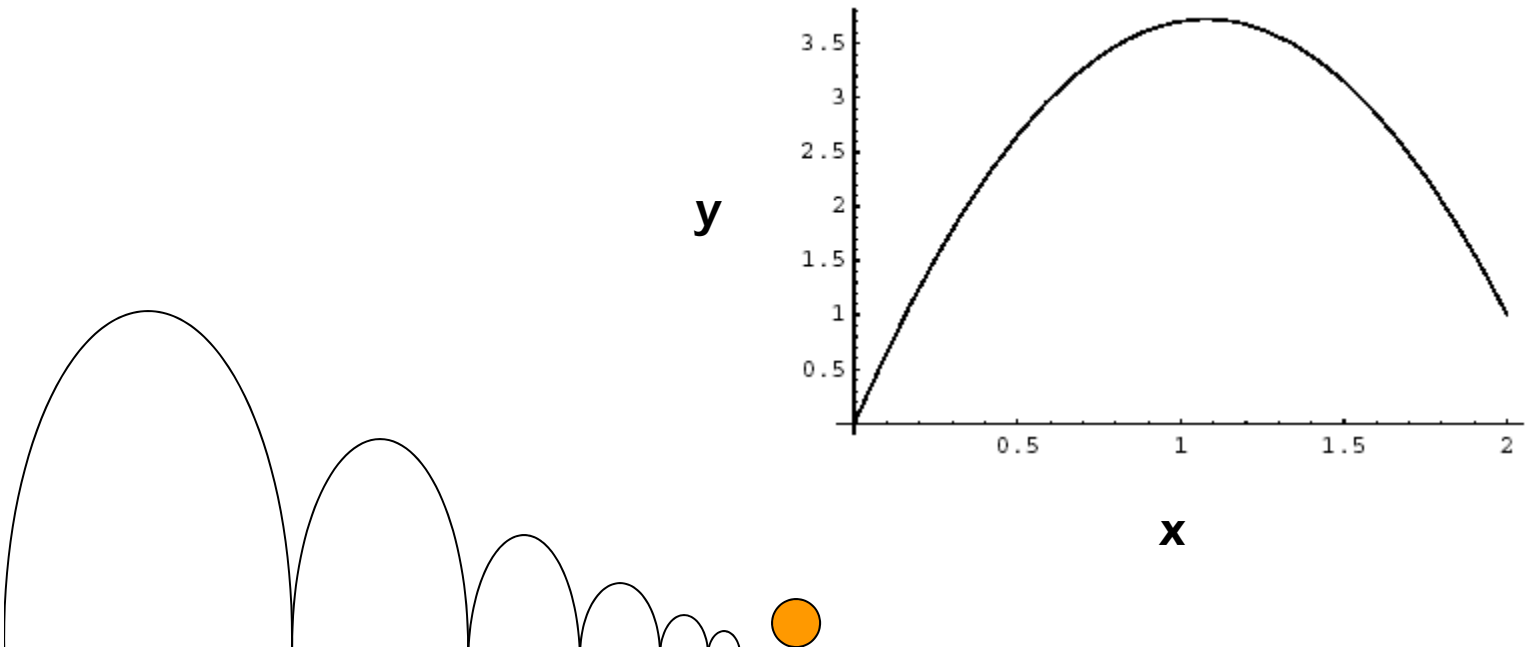
$$\text{Vel}[v\_, x\_] = v * e^{(-k/m*(x/v))};$$



MODEL

- Trajectory with initial velocity v and angle θ to reach target (x, y):

$$y = x \tan\theta - \frac{g x^2}{2v^2 \cos^2\theta}$$

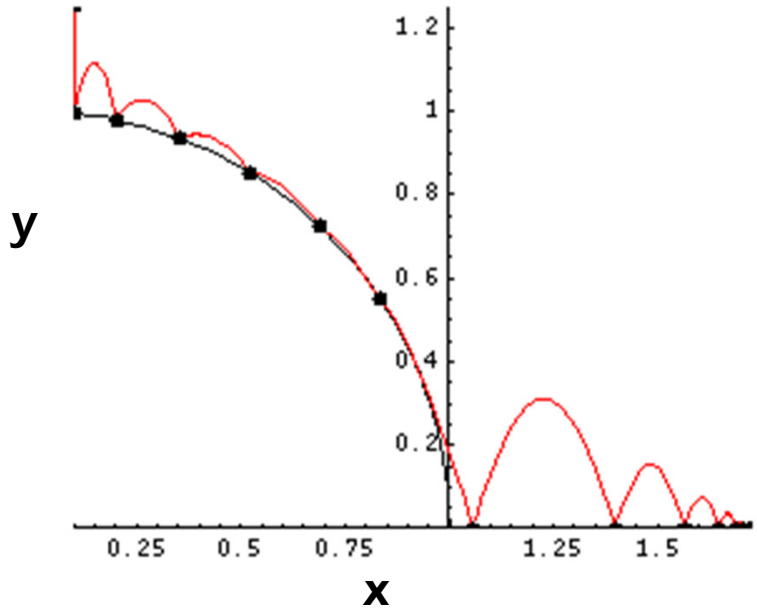


FUTURE WORK:

- **Bouncing & restitution coefficient:**

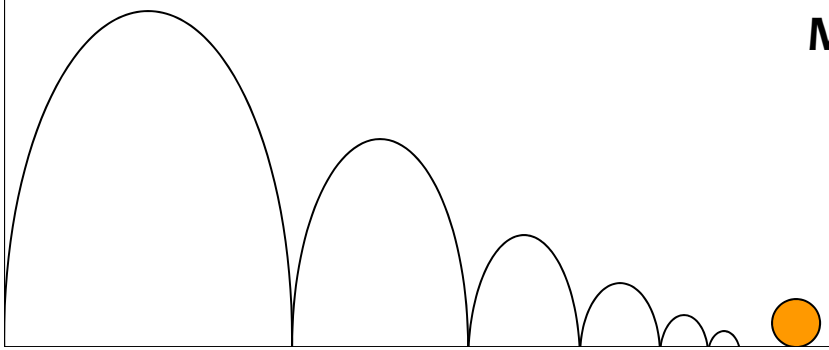
```
restCoef = 0.93;

vBounce = restCoef * Vel[v, xTarget]
```



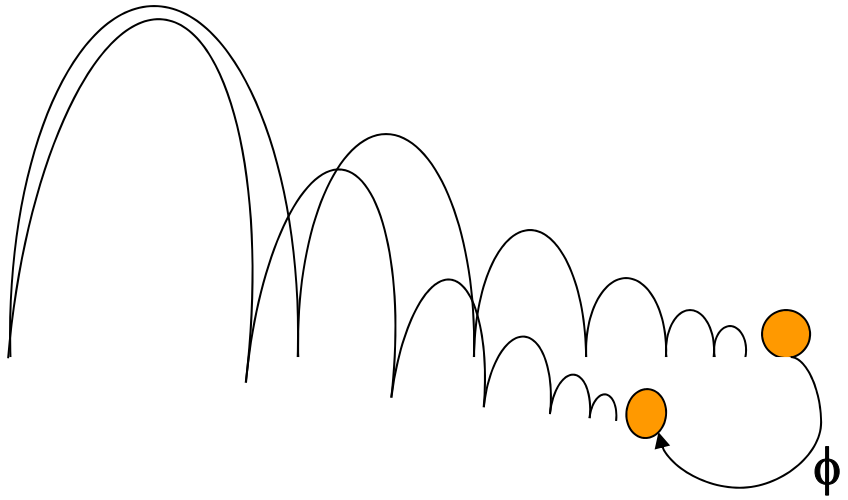
Solution:

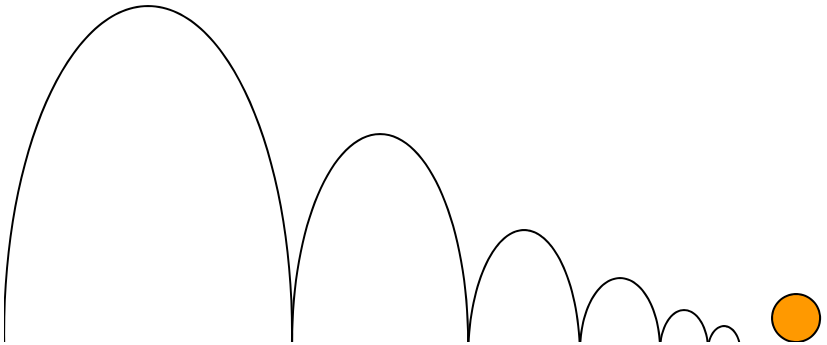
Mathematica's EventLocator



FUTURE WORK

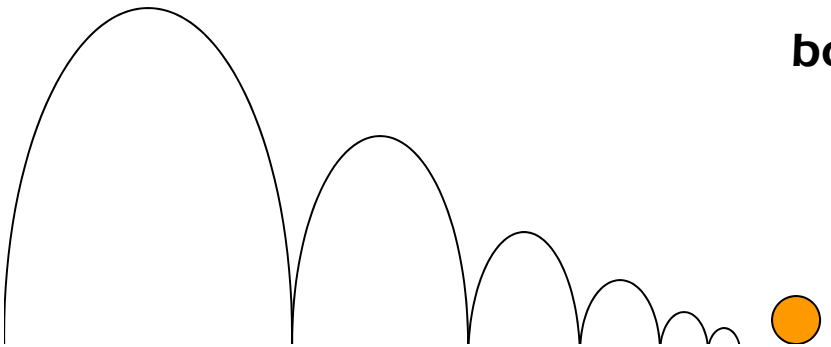
- 3rd dimension, ϕ :





FUTURE WORK

- explore probabilities:
  - racks:
    - line racks
    - dense racks
  - shots:
    - arc
    - bounce



QUESTIONS?

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