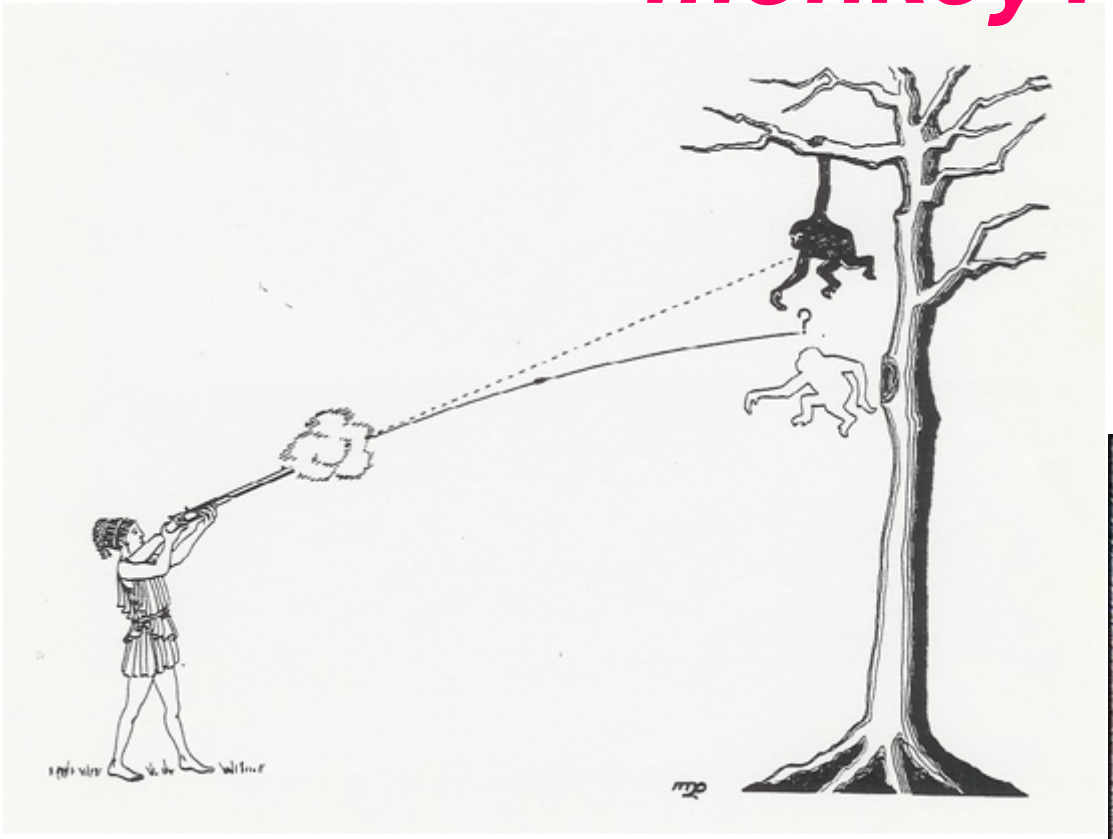
Monkey and the Hunter

No Animals were injured in the production of this lesson!

The story…

- The Story: "*A hunter with a blowgun goes out in the woods to hunt for monkeys. He sees one hanging from a tree.*
- *He knows that a monkey will always drop from its branch the moment a hunter fires his dart.*

How does the hunter aim his gun to make sure he hits the monkey?"

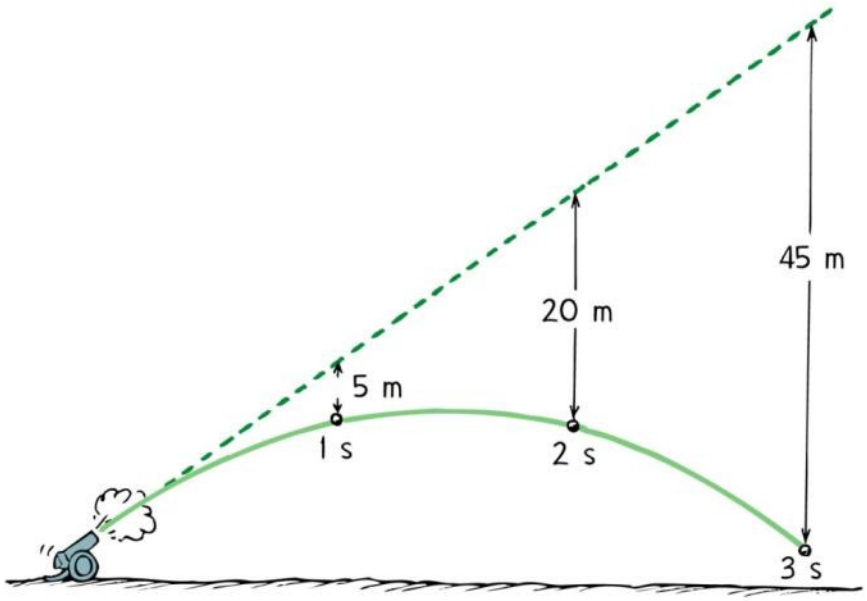


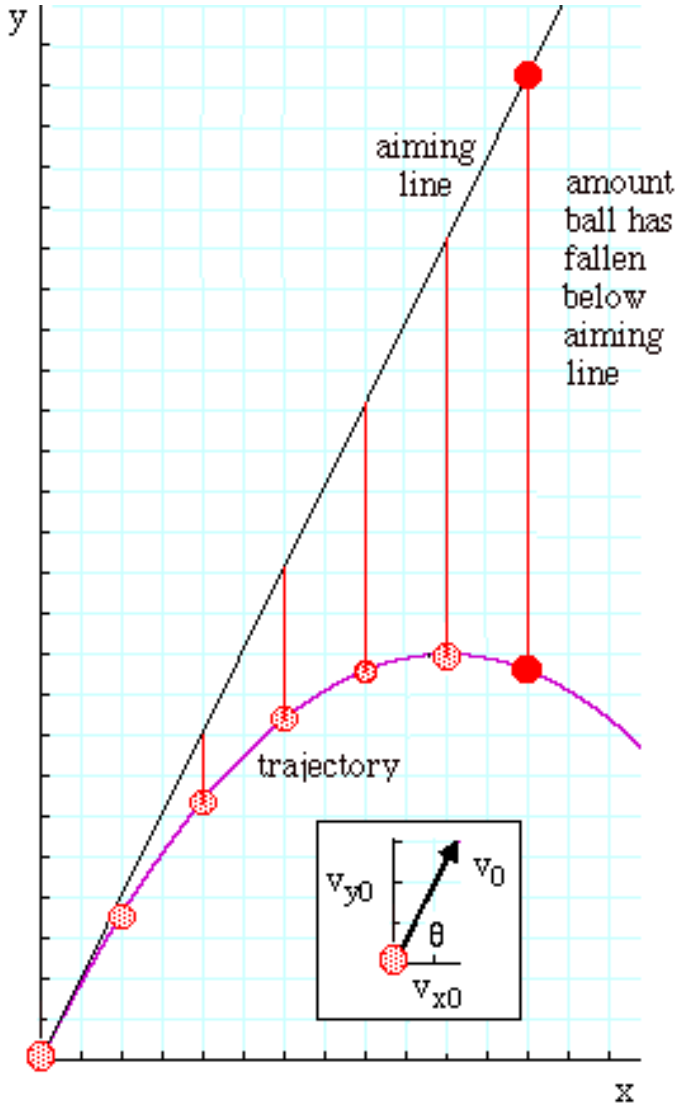
What about “g”

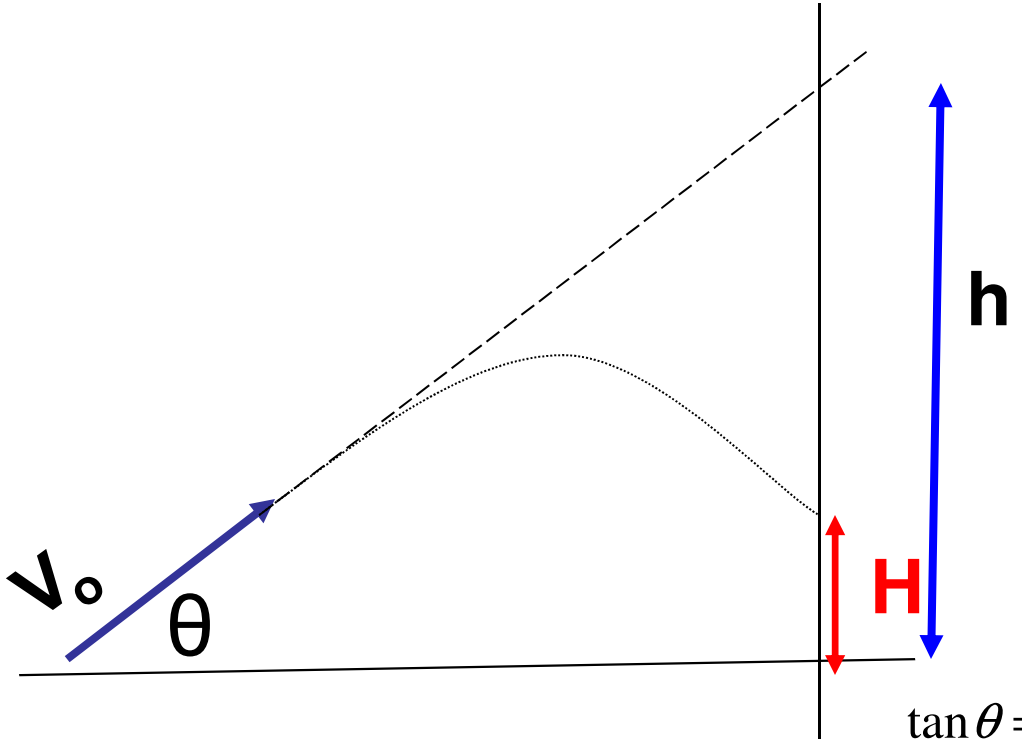
- Imagine for a moment that gravity could be "turned off" ie g = 0
- The hunter's task would be simple.
- If he point his gun directly at the monkey and fired. The monkey would let go of his branch and hover in the air (because gravity wouldn't pull him down).
- The shot would fly in a straight line with some velocity v and, after time t, hit the monkey.
- it would follow an inertial pathway. $d = v_0 \times t$

Reality Bites…

g isn't zero, (duh!!)
The acceleration due to gravity is the same for both the dart and the monkey.
If the hunter fires his gun directly at the monkey with the same velocity v as before, the horizontal component of v (and therefore the time t for the dart to travel the horizontal distance to the monkey) is the same as before.
Since gravity is accelerating both the dart and the monkey downward at the same rate, the dart still hits the monkey!







$$\tan\theta = \frac{h}{d} \quad \therefore h = d\tan\theta$$

if the dart hits the object at height H

$$t = \frac{d}{v_x} = \frac{d}{v\cos\theta}$$

$$d_y = v_y t + \tfrac{1}{2} a t^2$$

$$H = v\sin\theta \bullet \frac{d}{v\cos\theta} - 4.9t^2$$

$$H = d\tan\theta - 4.9t^2$$

$$H = h - 4.9t^2$$

- Plot the trajectory of the dart and the monkeys position on a graph.
- Use an angle of your choice but remember that it must be to scale!
- Complete a data table , draw the graph
- Hand both in at the start of next days class.

You Try it…

A very cool applet is located at

http://jersey.uoregon.edu/vlab/newCannon/NewCannon_plugin.html

Or find the link at

www.cambierobotics.com

http://www.physics.umn.edu/video.html?url=/outreach/pforce/circus/videos/MechanicsProjectileMotion-MonkeyAndHunter.flv&vidname=Physics%20Force:%20Monkey%20and%20Hunter&goback=/outreach/pforce/circus/