**Monkey Shooting**

 **Challenge:**

Create a simulation where the user can adjust the projectile trajectory and velocity to hit a monkey that is hanging on a tree branch but begins falling as the projectile moves.

**Things you’ll need to know:**

* How to use sliders (easy way to control trajectory and velocity)
* How to change the center of rotation of an object (to rotate gun properly)
* Buttons (Reset and Fire)

**Things you’ll need to think about:**

* The projectile should use the gun heading controlled by the slider for its trajectory (0-90 deg)
* The projectile should follow a parabolic path (assume no horizontal acceleration, but acceleration due to gravity for both the projectile and the monkey)

**Extensions:**

* Add a slider that allows the user to vary the starting height (where it falls from – unless you want to practice with 50 ft. tall monkeys) of the monkey
* Add a slider that allows the user to vary the acceleration due to gravity (In case you are shooting monkeys on different planets or in empty space)
* Add options for wind that the user would need to account for in aiming
* Add pentrails to the projectile and monkey so the user can more easily see their paths of motion
* Add a laser sight controlled by a button so the user can aim more accurately
* Add a button that will automatically calculate and adjust the trajectory to hit the monkey based on starting height
* Add a button to calculate both the trajectory and velocity required to hit the monkey at a certain distance in its fall
* Add an option for the monkey to shoot back at some point in its fall

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**Simulation:** The simulation lets the user experiment with projectile motion by trying to shoot a monkey that starts falling from a tree as the gun is fired. Sliders are available for the user to make adjustments to the projectile’s trajectory and initial speed as well as acceleration due to gravity and the monkey’s starting height.

**Directions:** Vary the conditions for the projectile’s initial velocity using the trajectory and speed sliders to hit the monkey. Fire – starts projectile and monkey motion which is traced by arrowheads. Go Home – erases projectile paths and resets monkey and projectile for next trial. Vary the monkey’s initial height or acceleration due to gravity to observe how these factors affect the motion of the two objects.

**Questions:**

1. How did you figure out where to aim to hit the monkey?
2. Were there a lot different trajectories and velocities that resulted in hits? Did they vary greatly, or need to be within certain ranges?
3. How does each of the variables relate to the other variables? ( For example: If the gravitational acceleration is doubled, what adjustments, if any, would need to be made to the other 3 sliders to produce a hit in the same location?)
4. What is different about hunting monkeys falling from trees compared to hunting pheasants that fly up from the ground or other game? How does knowledge of physics and projectile motion make hunting a more successful experience?