LEARNING AND SIMULATING PROJECTILE MOTION: PART II

Projection Motion Simulator Worksheet

Go to the projectile motion simulator at http://phet.colorado.edu/sims/projectile-motion/projectile-motion.swf

1. Starting with the pumpkin as your projectile, gather data and answer the following questions. use angles greater than 45.

a. With an initial speed of 18m/s and no air resistance, what angle must the cannon be at to hit the bull's eye?

b. Clear your results from part a. Now add air resistance and answer the same question.

c. Clear your results from part b and remove the air resistance. Collect data to figure out how the angle must be changed to hit the bull's eye as the initial speed use angles greater than 45increases.

Initial speed	**Angle**
14m/s	
18m/s	75
22m/s	
26m/s	

Conclusion: As the speed increases the angle _____.

2. Now, using different projectiles, collect data to figure out how the angle must be changed as the mass of the projectile changes. Use 18m/s as your speed. Use angles greater than 45

Projectile	**Mass**	**Angle**
Football		
Bowling ball		
Adult human		
Piano		
Buick		

Conclusion: As the mass of the object increases, the angle _____ as long as the speed is constant.

3. Now, repeat the experiment in #2, only keep the angle constant at 65, and determine what happens to the initial speed needed to hit the bull's eye as the mass of the projectile changes.

Projectile	Mass	Initial speed
Football		
Bowling ball		
Adult human		
Piano		
Buick		

Conclusion: As the mass of the object increases, the initial speed _____ as long as the angle is constant.

1. Repeat the experiment in #3, except set the speed based on your results in #3, add air resistance and record the drag coefficient and whether the object hits the bull's eye or not.

Projectile	Initial speed (from #3)	Drag coefficient	Hit bull's eye?
Football			
Bowling ball			
Adult human			
Piano			
Buick			

Conclusion: How does the air resistance relate to whether the object could still hit the bull's eye or not? _____

5. Finally, choose any object and analyze its motion without air resistance. Fill in the data table below by first choosing an initial speed and angle. As the object is in motion record the remaining data. After collecting all the data, prove that the simulator is accurate by using the mathematical formulas from Ch3-3 and showing that the height, distance and time that the object traveled are accurate. Show your work. (Hint: you have to watch for the maximum height as the object is moving)

Object:	
Angle:	
Initial Speed:	
Max. height:	
Range:	
Time:	

Calculations for time, height and range:

_____

_____

_____