

THINGS THAT GO BUMP

A DEMONSTRATION OF FORCE AND MOMENTUM DURING COLLISIONS

Name: _____ Per: _____ Date: _____

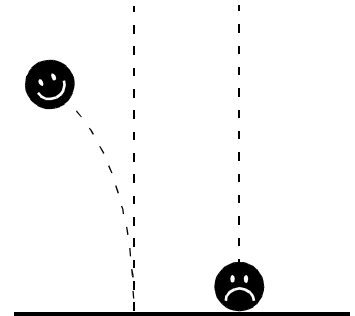
QUESTION

Is there more force when objects collide and stick or when objects collide and bounce off each other? Don't answer yet!

HAPPY BALL/SAD BALL

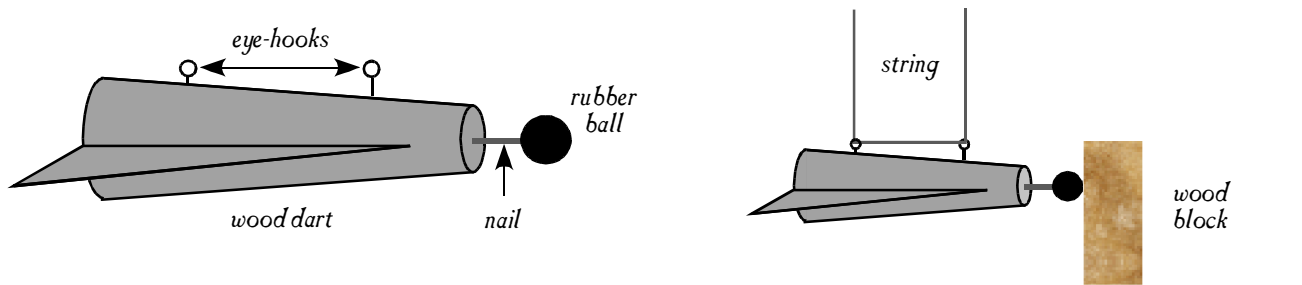
The happy ball is made of a highly elastic rubber that makes it "bouncy."
The sad ball is made of a more plastic rubber that makes it "unbouncy."

The sad ball will run into an obstacle and stop. The happy ball will run into an obstacle and bounce back.

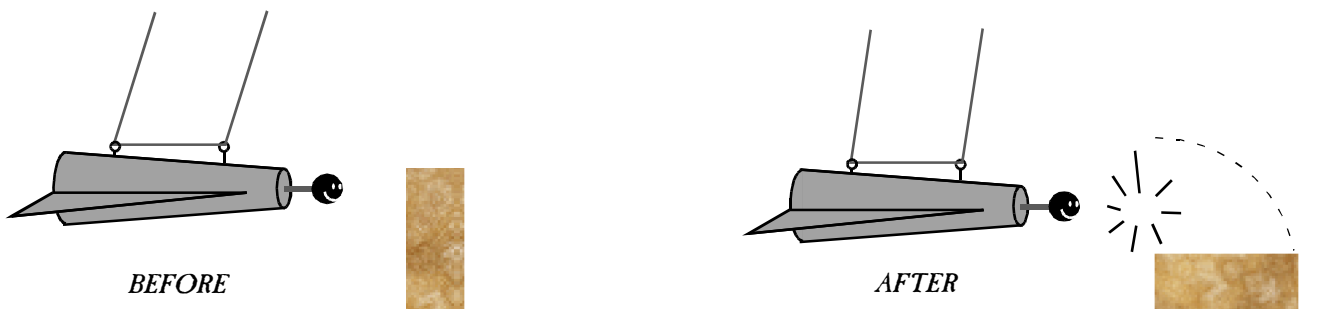


RUBBER DART KNOCK-DOWN PART 1

The happy ball is attached to a pendulum dart. The dart is arranged so that when the pendulum is at equilibrium, the tip of the dart barely touches the wood block.

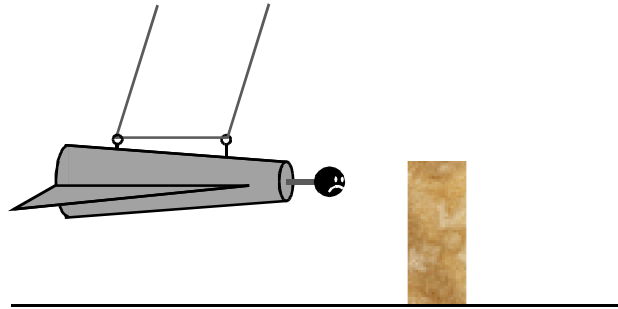


When the dart is pulled back and then released, it collides with the block. If the dart is pulled back far enough, it will knock the block over upon impact. By trial and error, the minimum pull-back distance is determined.

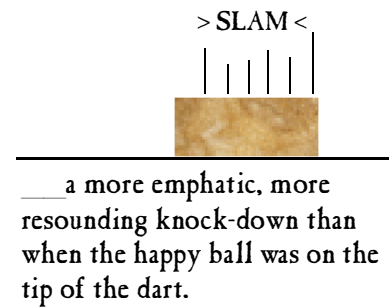
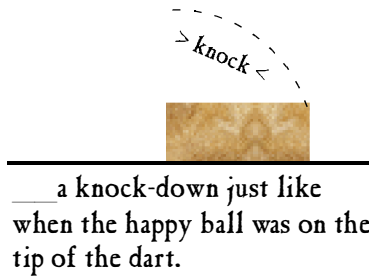
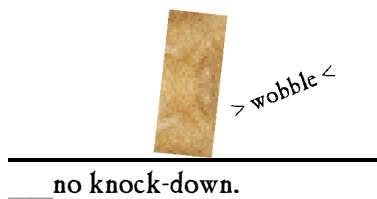


RUBBER DART KNOCK-DOWN PART 2

The happy ball is replaced by the sad ball on the tip of the dart. The dart is pulled back to the minimum pull-back distance found in the previous demonstration.



With the sad ball on the tip of the dart, the impact of the dart on the block will result in



Check-mark your prediction *before* the demonstration; box the correct outcome *after* the demonstration.

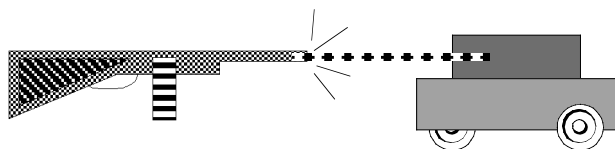
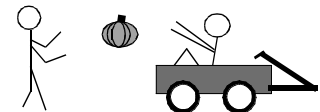
What is the reason for this outcome?

POST-DEMONSTRATION QUESTIONS

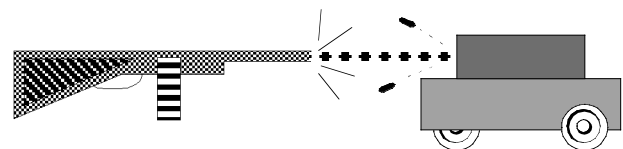
1. Consider two children, a pumpkin, and a wagon. Which will result in the greatest speed for the child in the wagon?

- A. Child in wagon throws pumpkin to other child.
- B. Child in wagon catches pumpkin thrown by other child.
- C. Child in wagon catches pumpkin then throws it back.

Defend your answer.



A. Bullets fired from a machine gun embed in a block of wood; the cart moves forward.



B. Bullets from a machine gun bounce from a bullet-proof plate on the wood block; the cart moves forward.

2. In A and B above, the mass of the bullets, rate of fire, and the initial mass of the carts are all identical. Which configuration is more effective in accelerating the cart? Explain.