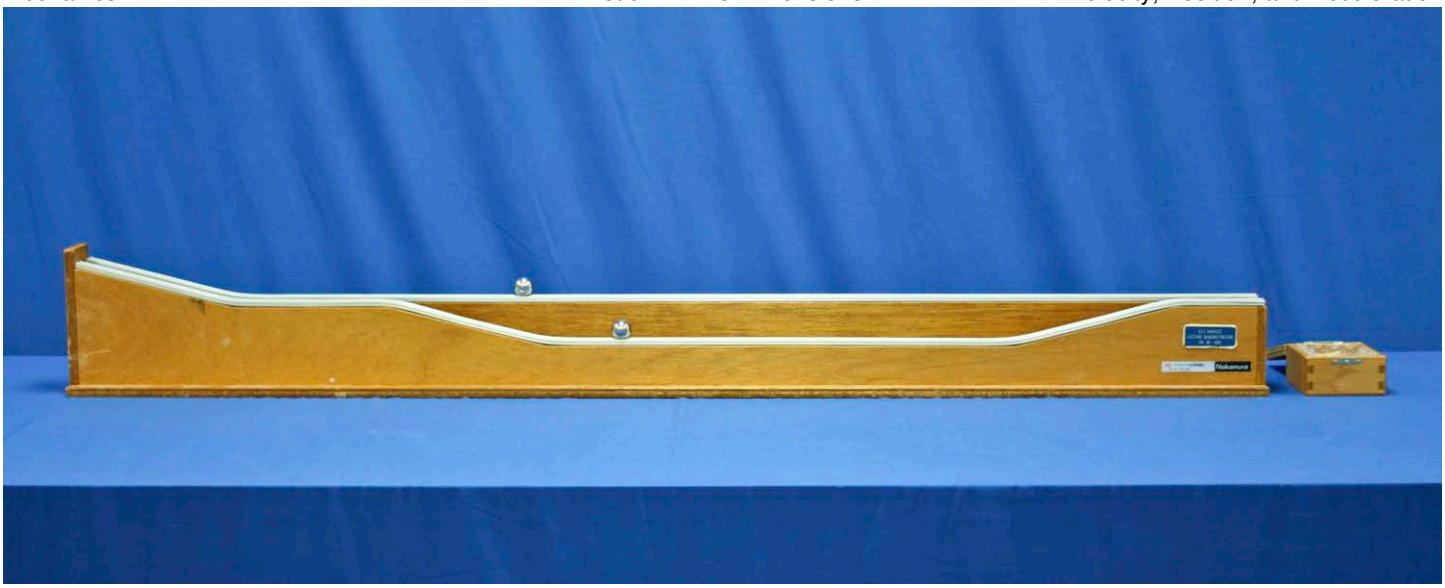
HIGH ROAD, LOW ROAD 1D15.20



Concept:

The two balls are released simultaneously from rest and have equal initial and final heights. The High Road remains at a constant height but the Low Road is a longer path with a changing height. Which path is faster?

The time required for each ball to traverse its path is the horizontal displacement divided by the average horizontal velocity. The High Road and Low Road have equal horizontal displacements, but the Low Road has the greater average horizontal velocity. Why? Because the normal force of the Low Road track produces an instantaneous horizontal velocity that is always equal to or greater than the instantaneous horizontal velocity produced by the normal force of the High Road track.

Thus, the Low Road is the faster path.

This outcome holds true for any lower path shape, no matter its length, as long as the ball does not slip or leave the track.

Equipment:

- (2) Steel Balls
- High Road, Low Road Track
- Wooden Ball Box

Procedure:

1. Ask the class to predict which ball will win.
2. Position the box to catch the balls at the end of the track.
3. Release both balls at the same time from the high end of the track.

Notes and Extras:

- Video Link: http://blip.tv/file/1071517
- Leonard, William J., and William J. Gerace. “The power of simple reasoning.” The Physics Teacher 34, no. 5 (1996): 280. http://dx.doi.org/10.1119/1.2344436
- Yang, Ju-xing. “The rolling unrestrained brachistochrone.” American Journal of Physics 55, no. 9 (1987): 844. http://dx.doi.org/10.1119/1.15001