NAME: _____

Matchbox Stunts and Simulations

Phase 1: Matchbox Stunt Demo

Stunt Demo 1: Driving/moving the matchbox car at 1 m/s

a. In the sketch space to the right, provide a quick sketch of the path of the Matchbox car after it leaves the table.

b. What is the path of the of the Matchbox car?

c. How will the path of the Matchbox car change when we drive/move the Matchbox car at a faster speed?

Sketch Space

Stunt Demo 2: Driving/moving the matchbox car at 2 m/s.

a. In the sketch space to the right, provide a quick sketch of the path of the Matchbox car after it leaves the table.

b. How did the path of the matchbox change when we drove/moved the Matchbox car at a faster speed?

c. Was our original hypothesis confirmed?

In the movies, car stunts can be performed by stunt drivers or by a mix of mechanical effects with camera magic. When using real cars instead of Matchbox cars, computer simulations are often used to test various factors. We can use an online simulator to gather data to allow us to model the path using a quadratic function which can be entered into a computer, graphed, and manipulated. The online projectile motion simulator found at phet.colorad.edu will allow us to simulate real cars making various jumps, but not Matchbox cars. For the purpose of understanding how to simulate the projectile motion of future objects, we will be using an object with a similar mass for simulating the movement of the Mathchbox car.

Let's watch a quick video that will help us simulate a situation and allow us to collect data.

Video found at: https://youtu.be/Jy2_Cq0JC9Q

Phase 2: Online Stunt Simulation

Stunt Demo #1: Driving/moving the "Matchbox car" at 1 meter per second.

a. Collect data points from the simulation video.

b. Determine a quadratic regression, written as a function identified as f(x), for the path of the Matchbox Car which was moved at a speed of approximately1 m/s.

c. Configure your graphing window with the following:
. Xmin=0, Xmax=1, Xscl=0.1, Ymin=0, Ymax=1, and Yscl=0.1
Then, graph f(x) using the graphing calculator.

d. Provide a sketch of the graph of f(x) in the provided sketch space to the right.

Sketch Space

Stunt Demo #2: Driving/moving the "Matchbox car" at 2 meter per second.

a. Collect data points from the simulation video.

b. Determine a quadratic regression, written as a function, identified as h(x), for the path of the Matchbox car which was moved at a speed of approximately 2 m/s.

c. Graph h(x) on the same coordinate plane as f(x) using the graphing calculator.

d. In the provided sketch space, sketch the graph of h(x) on the same coordinate plane where f(x) is found.

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Phase 3: Analysis

1. Using the graph and/or quadratic function created from the simulation data, how far did the Matchbox car travel when it moved off the table at a rate of 1 m/s?

2. Using the graph and/or quadratic function created from the simulation data, how far did the Matchbox car travel when it moved off the table at a rate of 2 m/s?

3. How much further did the Matchbox Car travel at 2 m/s compared to when it moved off of the table at a rate of 1 m/s?