

## Sail Car Test Worksheet

**Part 1: Calculate your sail car's acceleration! Acceleration is given by:**

$$\text{distance} = \text{starting velocity} * \text{time} + \frac{1}{2} \text{acceleration} * \text{time}^2$$

$$d = V_1 t + \frac{1}{2} a t^2$$

The distance is the distance your car travelled, in our case 36 inches. The acceleration is the rate at which the speed of our car changed (that is, from starting at a speed of 0!). The velocity is the speed of the car at the very beginning, which was zero!

Please fill in the blank spots below for time (t) and solve for acceleration (a).

Then, solve for final velocity and reflect on your design.

We know that:

$$d = 36 \text{ inches}$$

$$V_1 = 0 \text{ inches/second}$$

$$t = \text{_____ seconds}$$

We can rearrange the equation to solve for acceleration:

$$d = V_1 t + \frac{1}{2} a t^2$$

$$d = \frac{1}{2} a t^2$$

$$2d = a t^2$$

$$a = \frac{2d}{t^2} = 2 * 36 \text{ inches} / \text{_____}^2$$

$$a = \text{_____ inches/second}^2$$

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

**Part 2: Calculate your sail car's final velocity! Velocity is given by:**

*ending velocity = starting velocity + acceleration \* time*

$$V_2 = V_1 + at$$

We know that:

$$V_1 = 0 \text{ inches/second}$$

$$t = \text{_____ seconds}$$

$$a = \text{_____ inches/second}^2 \text{ [From part 1]}$$

Now, just plug all those numbers in and do some math to get your final velocity!

$$V_2 = 0 \text{ inches/second} + \text{_____ inches/second}^2 * \text{_____ seconds}$$

$$V_2 = \text{_____ inches/second}$$

**Part 3: Design Reflection**

What improvements did you make to your design?

Did the changes help?

How can we use this technology in the future? Feel free to draw your idea(s).