

USING SCIENCE TO DECK THE TEACHER! LAB

Newton's 1st Law - Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.

This we recognize as Galileo's concept of inertia, and this is often termed simply the "Law of Inertia."

Newton's 2nd Law – If an unbalanced (net) force acts on an object, that object will accelerate (or decelerate) in the direction of the force.

$$\text{Acceleration} = \frac{\text{Final speed} - \text{Initial Speed}}{\text{Time}}$$

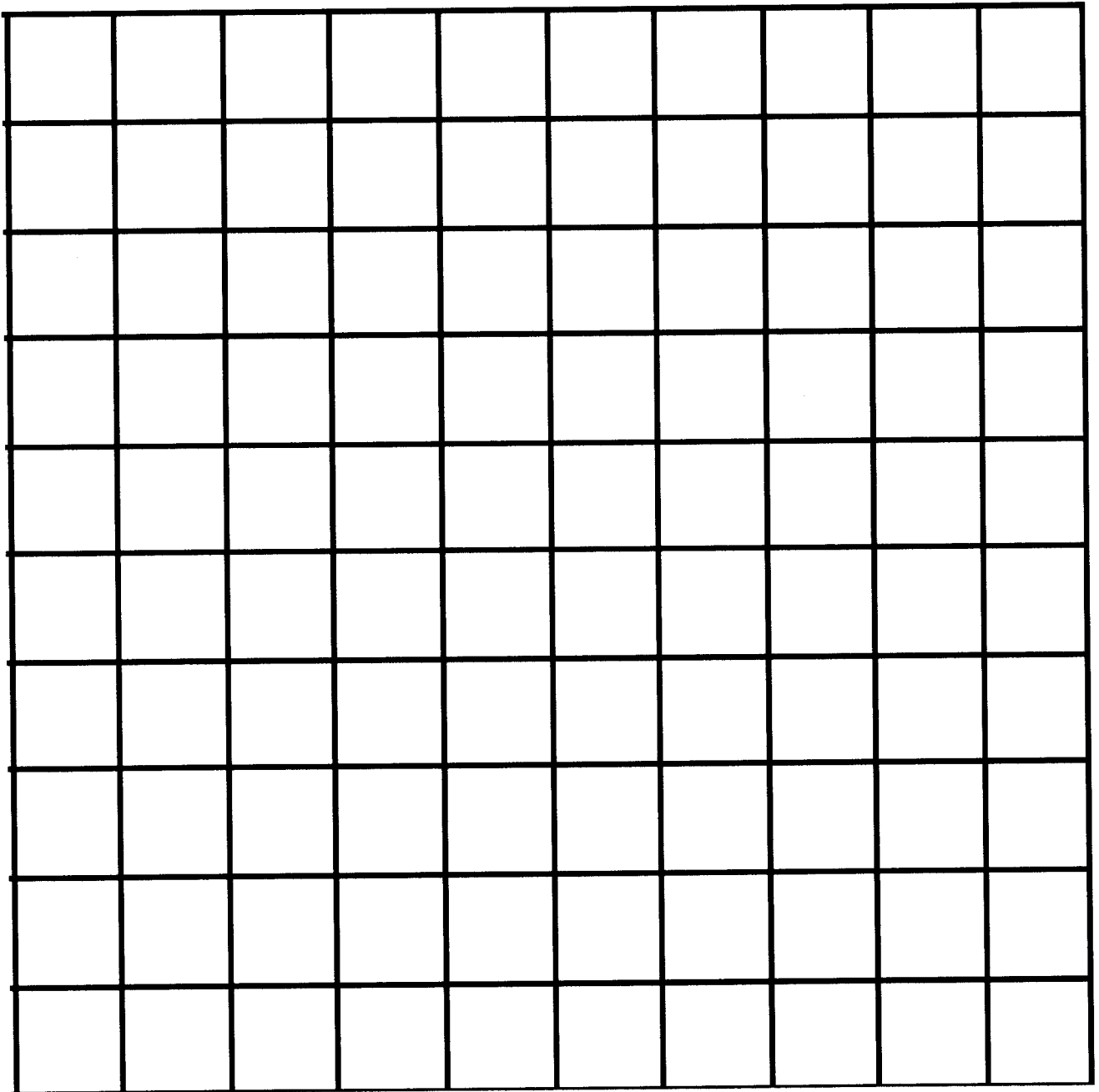
Newton's 3rd Law – For every action force, there is an equal and opposite reaction force.

Preliminary Questions to ask: (We will need to test these)

- What is a bottle rocket and what does it have to do with science?
- Why do bottle rockets fly?
- What is the expected outcome for these rockets?
- Why do we have to use water...or do we?
- Will it fly without water?
- If a little water works, will a lot of water work better?

Must Show all Work!!!!

Graph all acceleration rates for each trial. Include labels. Dependent vs Independent



What was the average acceleration rate?

STUDENT WORKSHEET: Force and Acceleration Exercises

a. Using $\mathbf{F = m \times a}$

1. Your bicycle has a mass of 9.1 kilograms. You accelerate at a rate of 1.79 m/s^2 . Calculate the net force that is accelerating the bicycle.
2. The Space Shuttle has a liftoff mass of 2,041,000 kg and accelerates at a rate of 16 m/s^2 . Calculate the force (thrust) that is accelerating the Space Shuttle.
3. A rocket accelerates at 56 m/s^2 . It has a mass of 800,000 kg. Calculate the force (thrust) that the rocket engines must supply.

b. Using $\mathbf{a = F \div m}$

1. A runner has a mass of 89 kilograms. He produces a force of 84 Newtons between the ground and his running shoes. How fast does he accelerate?
2. Calculate the acceleration of a car if the force on the car is 450 Newtons and the mass is 1300 kilograms.
3. Calculate the acceleration of a jet car racing on the Bonneville Salt Flats if the force on it (the "Thrust") is 500,000 Newtons and the mass is 2,100 kilograms.