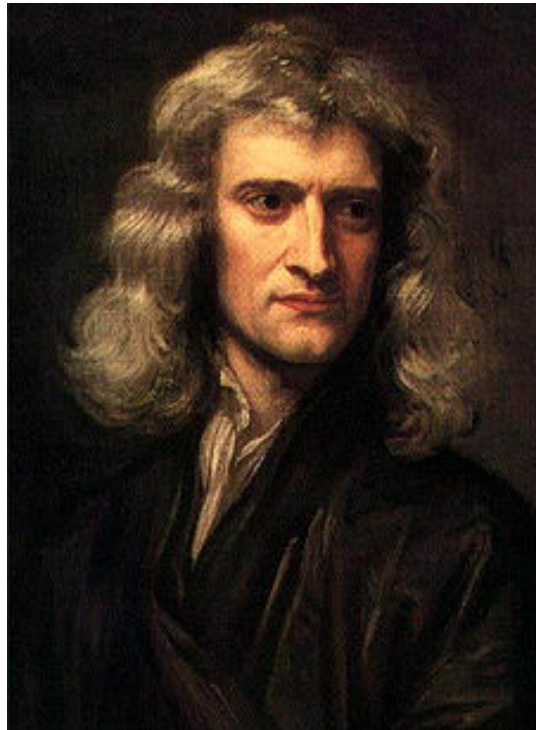


Inertia and Newton's First Law of Motion

The branch of physics that deals with the description of motion is called **kinematics**. The branch of physics that deals with the causes of motion is called **dynamics**.

For centuries people have been curious about the causes of motion. For early Greeks the laws of motion were simple: a constant force is needed to produce a constant velocity. If the force was increased the object moved faster. If the force was decreased the object moved slower. If the force was removed, the object stopped.

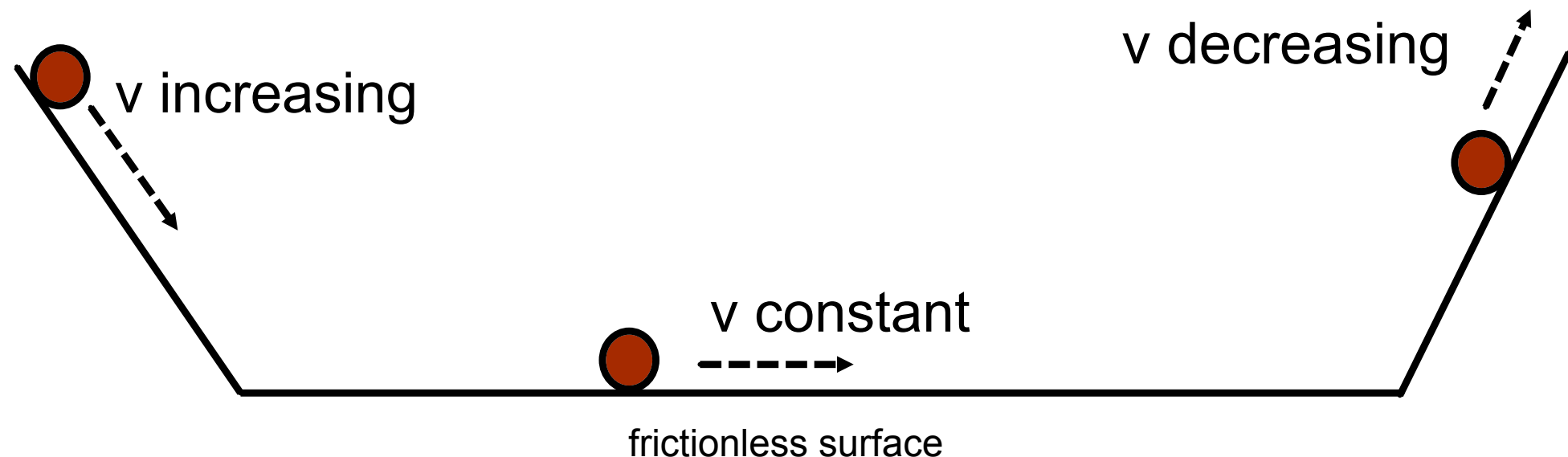
These statements are logical, but incorrect! They didn't have all the information.



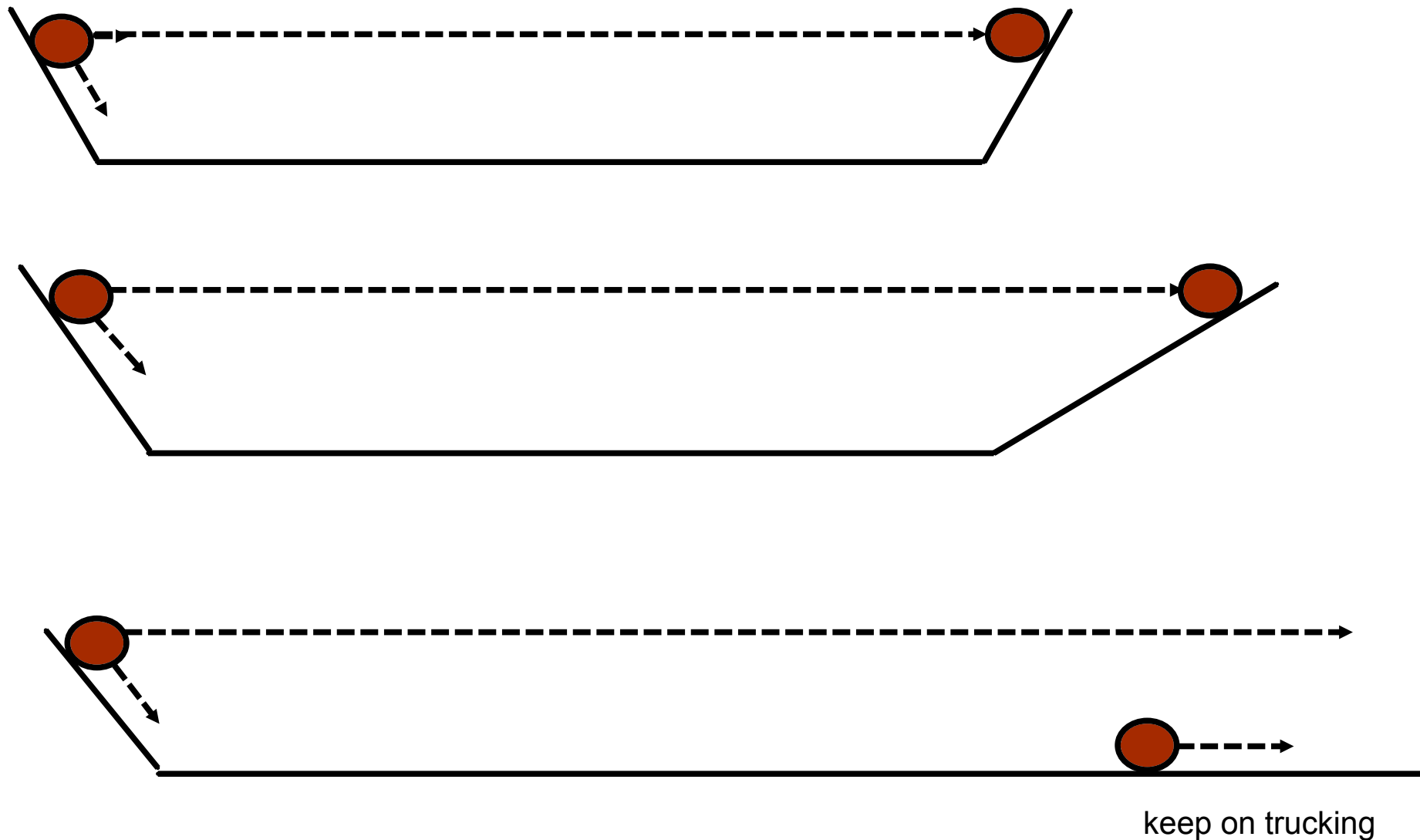
Sir Isaac Newton

Galileo explained the relationship between force and motion more accurately.

1. Galileo's first thought experiment involved a ball rolling down a slope. As it rolls the ball rolls down the slope it speeds up and as it rolls up a slope it slows down. If the ball rolls across a horizontal, non-sloping surface the ball will neither slow down or speed up but continue to move with a constant velocity, indefinitely. (If we ignore friction).



2. Galileo's also reasoned that if the slope of the plane was decreased to make it less steep than the descending slope, the ball would roll farther along this slope; stopping when it reached the height from which it was released. So if the slope was decreased to zero the ball could never achieve the same height so would continue on indefinitely at constant velocity.



Sir Isaac Newton also speculated about motion and came up with three laws of motion.

1. Newton's First Law of Motion (The Law of Inertia)

When no external, unbalanced force acts on an object, its velocity remains constant.

$$\vec{F}_{\text{net}} = 0 \text{ then } \vec{a} = 0$$

OR

If no net force acts on an object, the object maintains its state of rest, or its constant speed in a straight line.

OR

Object will resist changes to their motion unless acted upon by an unbalanced force.

OR

Things like to keep on doing what their already doing.

Implications

An external force is required to change the velocity of an object. Internal forces have no effect.

The external force must be unbalanced to change the velocity.

Objects at rest stay at rest unless an unbalanced force is applied.

Moving objects continue to move in a straight line at a constant speed unless acted upon by an external unbalanced force.

Demos

<http://www.youtube.com/watch?v=uOSBC0SXVR4&feature=fvw>



<http://www.youtube.com/watch?v=7Ix-eywqUOg&feature=related>

Card and Coin



Ball and stand

Table Cloth and Cups

Bucket and Water

Back Window Ledge of Car

People Lost in Space

Inertia is a property all matter possesses. It is the property of matter that causes objects to resist changes in their state of motion.

Greater the mass of an object, the greater the inertia it possesses.

It is easier to get a light object to move than a heavy object.



Examples of N1

1. Shovelling snow.

2. Head on collisions

3. Serving drinks on a airplane.

4. Throwing a baseball.

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