

Laws of Motion

Mr. Sudbury

Brief History of Motion

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History of Motion–Aristotle

- ▶ Categorized motion as “natural” or “violent” motion.
 - “Natural Motion” was motion either straight up or straight down...
 - Objects seek their natural resting place.
 - These motions were natural—not caused by an external force
- ▶ “Violent” motion was imposed motion.
 - It was a result of forces that were caused by a push or pull.

What caused this boulder to move?

History of Motion – Copernicus

- ▶ Developed controversial theory (at the time) that the earth was in motion **AROUND** the sun.
 - **Heliocentric**
- ▶ Common belief was that earth was at center of universe.
 - **Geocentric**
- ▶ His work was not accepted until after his death.

History of Motion – Galileo

- ▶ Tower of Pisa – dropped spheres of different masses.
 - Both landed simultaneously.
- ▶ Disproved notion that a force was necessary to keep an object moving
- ▶ Concerned with **HOW** things move not **WHY** they move.

History of Motion – Galileo

- ▶ Gravity causes acceleration down a slope.
- ▶ Gravity causes deceleration up a slope.
- ▶ If there was no slope & no friction, Galileo hypothesized that the ball would roll forever.

History of Motion – Galileo

- Galileo tested ideas through experiment, rather than logically thinking through them.
- One very important experiment he completed involved two inclined planes where a ball rolled down one side would return to the same height on the opposite side even at a different angle.
- Stated that an objects desire is to keep moving if it is moving and resist change in it's state of motion.



Ch 4 Newton's 1st Law of Motion: Inertia

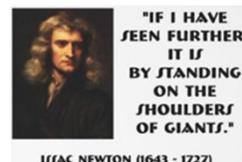
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Newton's 1st Law of Motion

- AKA: The Law of Inertia
- “Every object continues in a state of rest, or of motion in a straight line at constant speed, unless it is compelled to change the state by forces exerted upon it.”
- He borrowed this idea from the work of Galileo...

Newton's 1st Law of Motion

- Also commonly stated as:
 - “An object in motion will stay in motion, and an object at rest will stay at rest unless acted on by an unbalanced force.”



Inertia

- Galileo defined **INERTIA** as the reluctance of any body to change its state of motion.
 - If its moving... it will keep moving...
 - If its at rest... it will stay at rest...
- According to inertia, where would the red ball stop?



Inertia



If you pull the tablecloth out from under the dishes, what happens to the dishes?

Inertia



Newton's 1st law

- ▶ What will happen to the hockey puck?
- ▶ If it is not touched?
- ▶ If it is hit down the ice?

What if the same puck was shot on cement, not ice?



Newton's 1st law Summary

- ▶ We used to think that continual forces were needed to maintain motion, we now know that objects continue to move by themselves.
- ▶ Forces are needed set objects in motion initially and to overcome friction that may be present.
- ▶ Once an object is moving in a force-free environment, it will move in a straight line indefinitely.

Newton's 1st Law Demonstrations

- ▶ Bowling Ball @ rest.
- ▶ Bowling Ball in motion.
- ▶ Crash Test Dummy.
- ▶ Coin over cup.
- ▶ Card & Marble.
- ▶ Pen over Bottle.
- ▶ Skateboarder.
- ▶ Inertia Sphere.
- ▶ Ballistics Cart.
- ▶ Table Cloth Magic.

