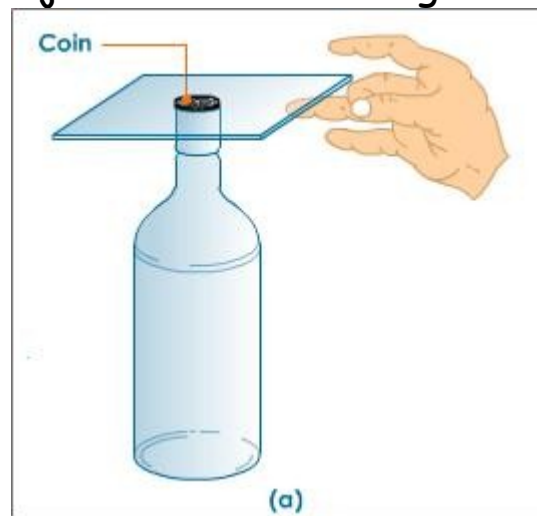


Physics 12
Dynamics: Why Objects Move.
Newton's Laws of Motion

1. Objects move because forces act on the object.
2. A force is a push or a pull.
3. Sir Isaac Newton (1642-1727) developed three laws of motion.
4. Newton's laws are valid in inertial (non-accelerating) reference frames.
5. Newton's first law is stated as:

Every body continues in its state of rest or uniform speed in a straight line unless acted on by a nonzero net force.

6. This means that if all the forces acting on an object are balanced then the object continues doing what it is doing.

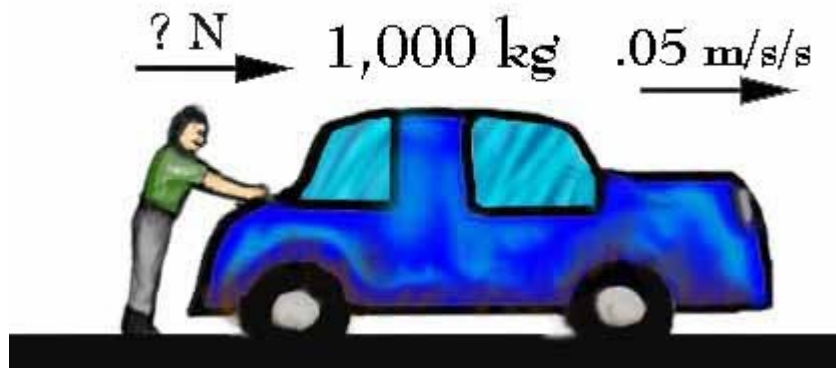


7. Newton's first law is also known as the law of inertia.

8. Inertia is a property of matter, it is the tendency of matter to resist any change in its motion. Mass can be considered to be a measure of the amount of inertia.

9. Newton's second law is stated as:

The acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass. The direction of the acceleration is in the direction of the net force acting on the object.



10. Newton's second law can be stated as:

$$F_{\text{net}} = ma$$

or

$$\Sigma F = ma$$

F_{net} or ΣF both mean add up all the forces acting on an object. The Σ is called sigma and in math it means add up a series of numbers.

Example:

A frictional force of 1500N acts on a fine 1000kg aircraft. The fine aircraft can produce a thrust of 2000N. Determine the acceleration of the fine aircraft.

$$\Sigma F = ma$$

$$\Sigma F = \text{Force of Thrust} - \text{Force of Friction} = ma$$

$$\Sigma F = F_t - F_f = ma$$

$$\frac{F_t - F_f}{m} = a$$

$$\frac{2000\text{N} - 1500\text{N}}{1000 \text{ kg}} = a$$
$$0.5 \text{ m/s}^2 = a$$

11. Newton's third law is stated as:

Whenever one objects exerts an force on a second object, the second object exerts an equal and opposite force on the first.

