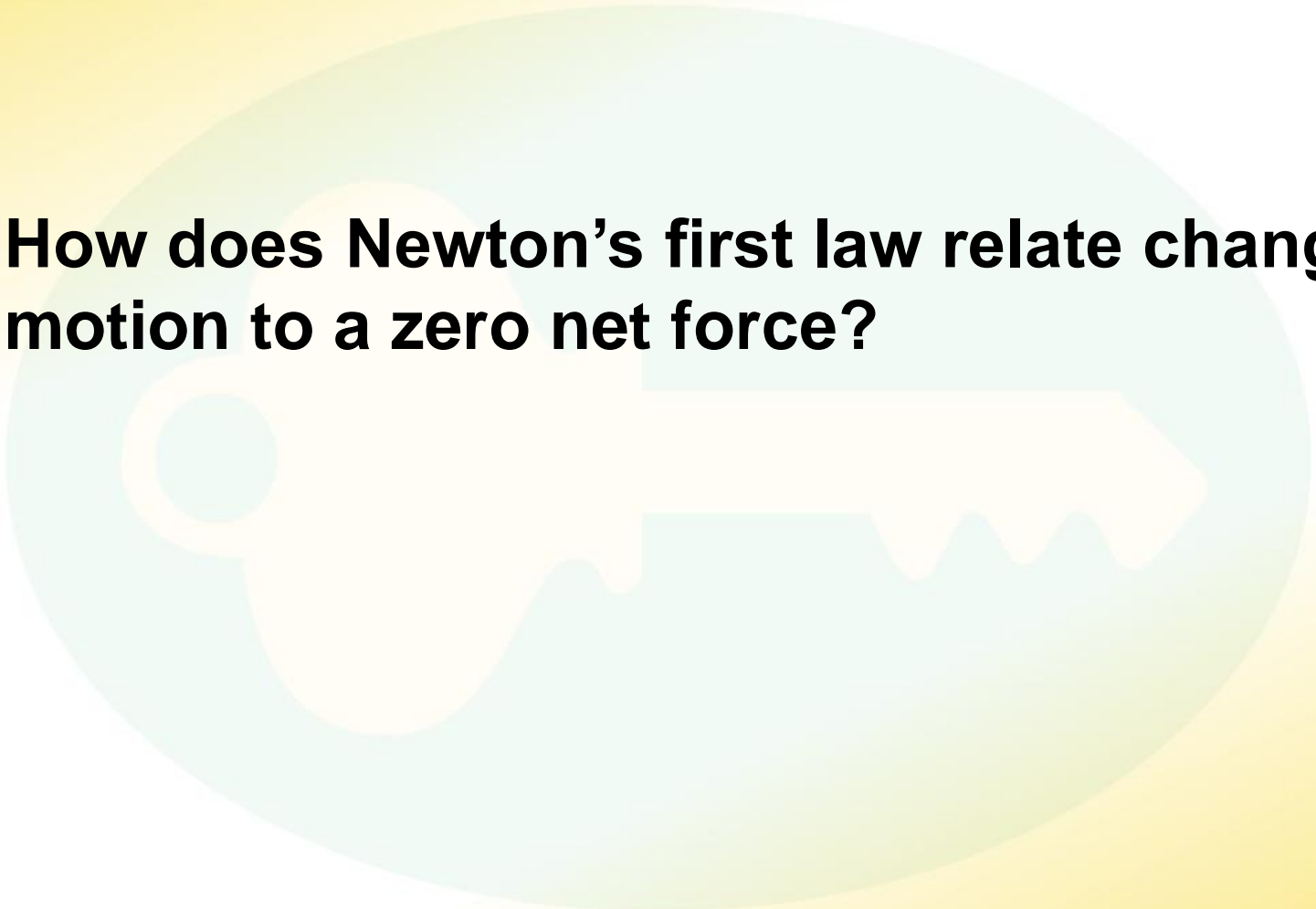


Newton's First Law of Motion



How does Newton's first law relate change in motion to a zero net force?



Newton's First Law of Motion

Inertia is –

Newton's First Law of Motion

This crash sequence illustrates inertia. The test dummy continues its forward motion as the car slows and stops.

DOK question:

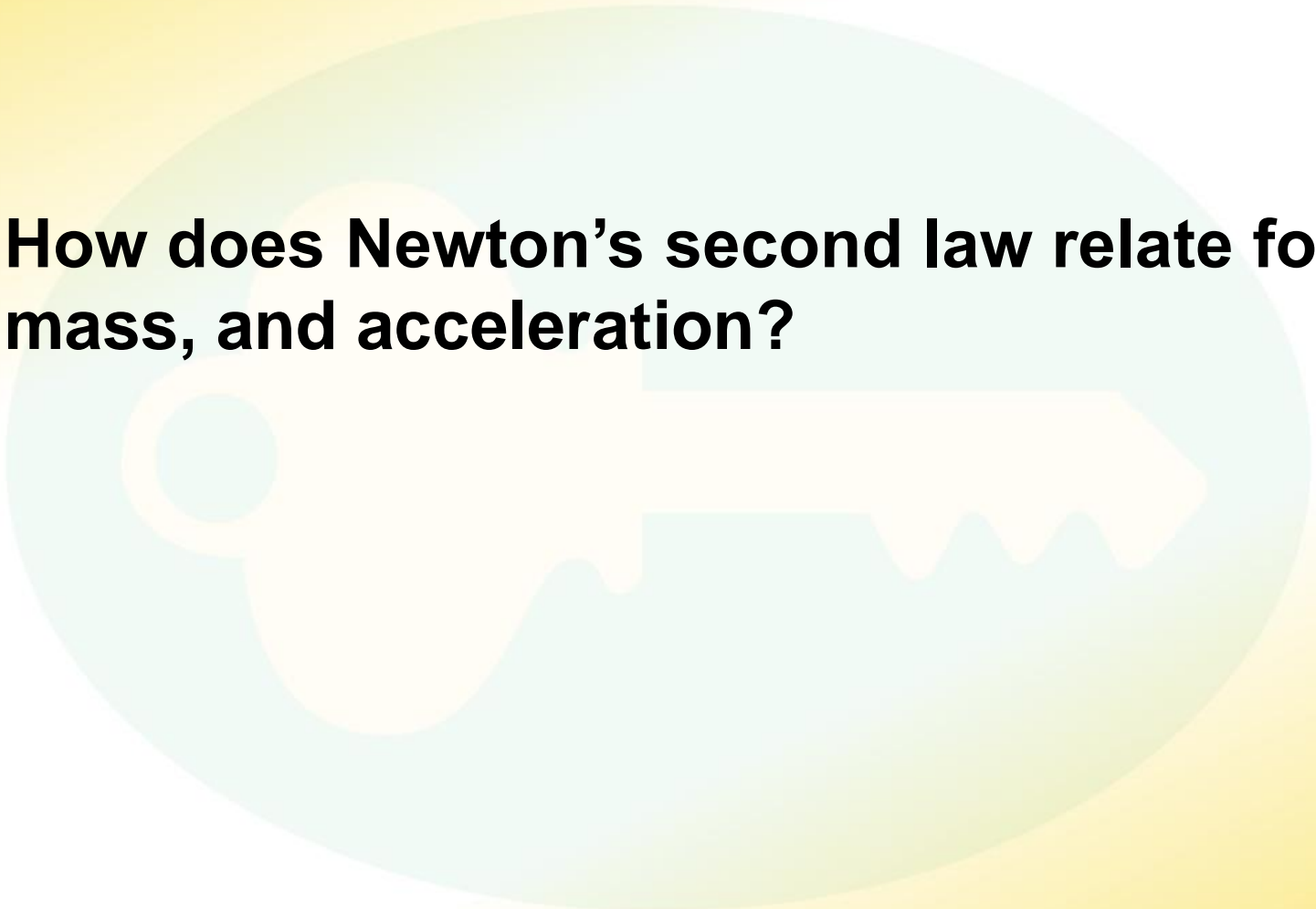
Restate the principle behind this action in your own words.



Newton's Second Law of Motion



How does Newton's second law relate force, mass, and acceleration?



Newton's Second Law of Motion

Mass is –

Newton's Second Law

$$\text{Acceleration} = \frac{\text{Net force}}{\text{Mass}}, \quad \text{or} \quad a = \frac{F}{m}$$

Newton's Second Law of Motion

Math Skills

Newton's Second Law

An automobile with a mass of 1000 kilograms accelerates when the traffic light turns green. If the net force on the car is 4000 newtons, what is the car's acceleration?

Newton's Second Law of Motion



1 Read and Understand

What information are you given?

Newton's Second Law of Motion

Math Skills

2 Plan and Solve

What unknown are you trying to calculate?

What formula contains the given quantities and the unknown?

Newton's Second Law of Motion

Math Skills

2 Plan and Solve

Replace each variable with its known value and solve.

Newton's Second Law of Motion



3 Look Back and Check

Is your answer reasonable?

Newton's Second Law of Motion

Math Practice

1. A boy pushes forward a cart of groceries with a total mass of 40.0 kg. What is the acceleration of the cart if the net force on the cart is 60.0 N?

Newton's Second Law of Motion

Math Practice

2. What is the upward acceleration of a helicopter with a mass of 5000 kg if a force of 10,000 N acts on it in an upward direction?

Newton's Second Law of Motion

Math Practice

3. An automobile with a mass of 1200 kg accelerates at a rate of 3.0 m/s^2 in the forward direction. What is the net force acting on the automobile? (*Hint: Solve the acceleration formula for force.*)

Newton's Second Law of Motion

Math Practice

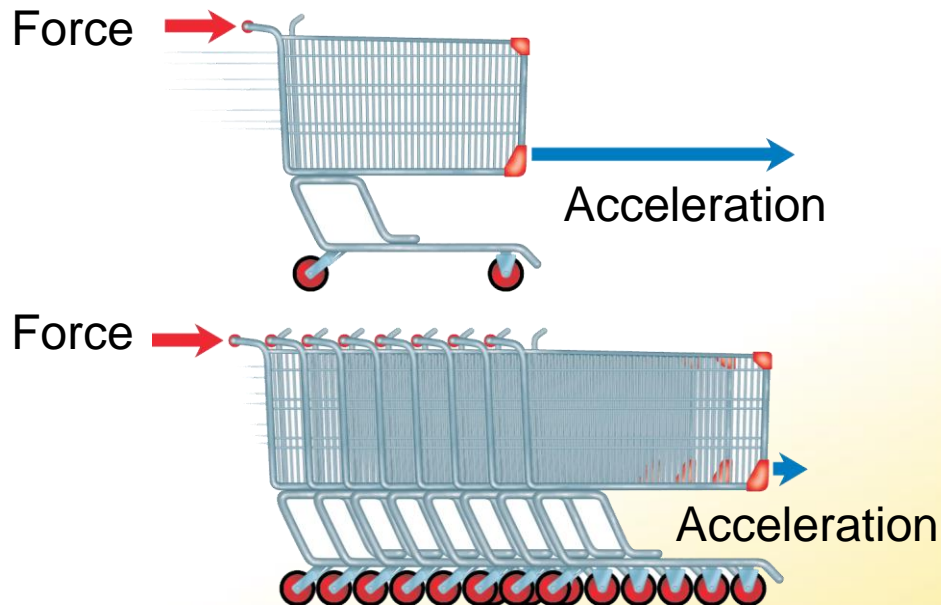
4. A 25-N force accelerates a boy in a wheelchair at 0.5 m/s^2 . What is the mass of the boy and the wheelchair? (*Hint: Solve Newton's second law for mass.*)

Newton's Second Law of Motion

Acceleration depends directly on force and inversely on mass. The same force causes the single cart to accelerate eight times faster than the chain of eight carts.

DOK question:

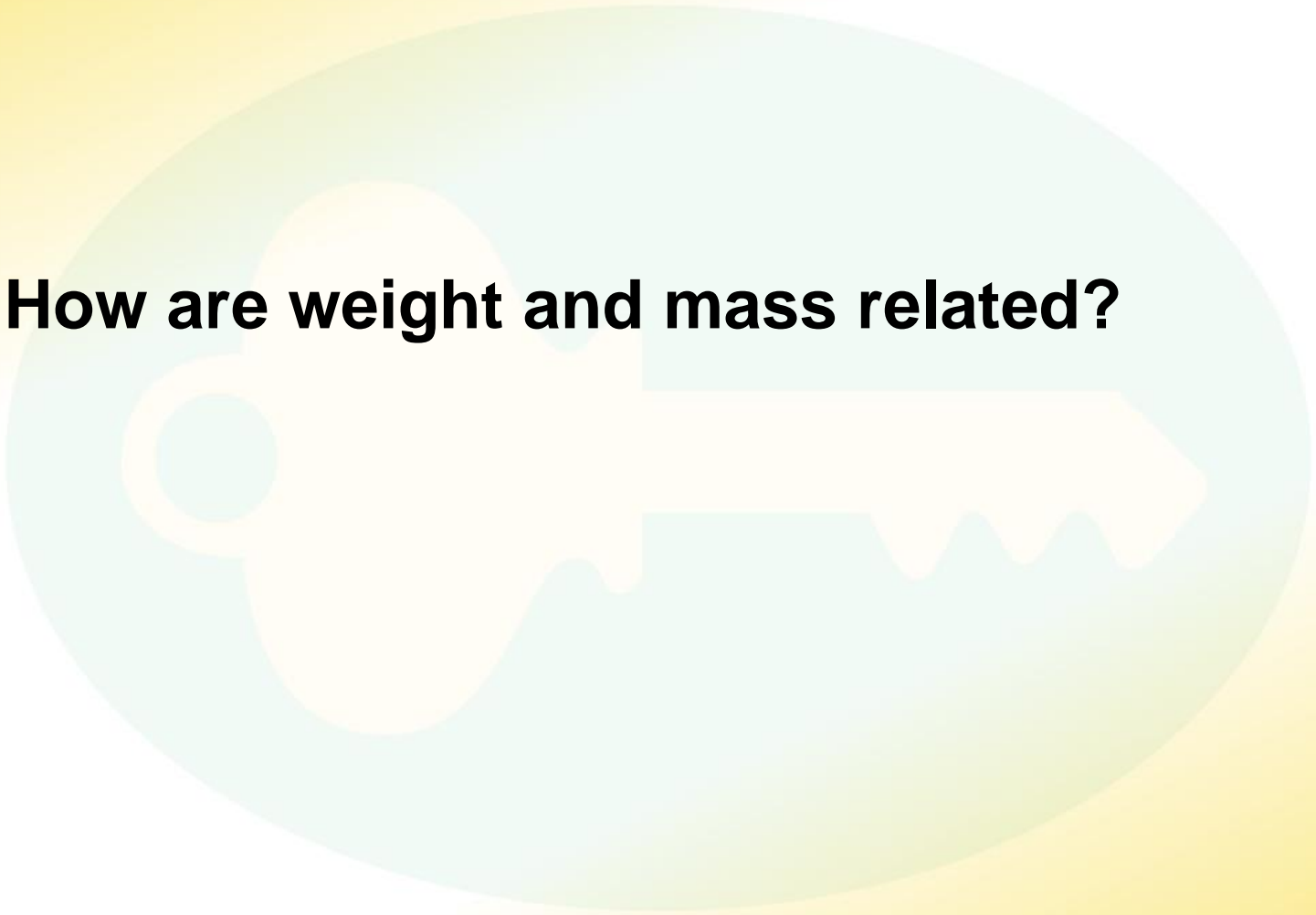
Hypothesize why this happens.



Weight and Mass



How are weight and mass related?



Weight and Mass

Mass and weight are related but are not the same.

- Mass is –

- **Weight** is –

Weight and Mass

$W = mg$ is –

The value of g in the formula is –

Weight Formula

Weight = Mass \times Acceleration due to gravity

$$W = mg$$

Weight and Mass

If an astronaut has a mass of 112 kilograms, what is his weight on Earth where the acceleration due to gravity is 9.8 m/s^2 ?

Weight and Mass

On the moon, the acceleration due to gravity is –

Assessment Questions

1. What is inertia?
 - a. the force of gravity acting on an object
 - b. forces of friction slowing an object's motion
 - c. the mass of an object
 - d. the tendency of an object to resist change in its motion

Assessment Questions

2. A 3600-N force causes a car to accelerate at a rate of 4 m/s^2 . What is the mass of the car?
- a. 600 kg
 - b. 900 kg
 - c. 14,400 kg
 - d. 1200 kg

Assessment Questions

3. How would your mass and weight change if you were on the moon's surface?
- They wouldn't change.
 - Your mass would remain constant, and your weight would increase.
 - Your mass and weight would decrease.
 - Your mass would remain constant, and your weight would decrease.