

**?**

second law to solve

.

third law.

**Apply** Newton’s

.

that involve Newton’s

**Relate** Newton’s first

law to the concept of

**Identify**

.

**Explore** Newton’s three

**Lesson Goals**

**Lesson**

**Question**

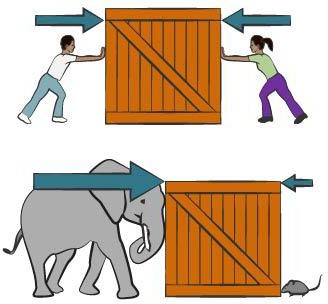
**W**

**2K**

# Words to Know

*Fill in this table as you work through the lesson. You may also use the glossary to help you.*

|  |  |
| --- | --- |
| relate | to show or explain a between two concepts |
| inertia | the property of matter that change in  motion |
| Newton’s first law of motion | an object at stays at rest, and an object in  stays in motion, unless acted on by an force |
| Newton’s second law of motion | the total acting on an object is equal to times  (𝐹 = 𝑚𝑎) |
| Newton’s third law of motion | for every , there is an equal and opposite |



# Forces

* forces do not cause a change in motion.
* forces cause a change in motion.
* is the overall force acting on an object.

*Circle the situation that shows balanced forces. Put a box around the situation that shows unbalanced forces.*

**Slide**

*Mathematica*, in 1687

, *Philosophiae Naturalis Principia*

* Published his most significant

works on mathematics, history, and theology

•

involving light (optics)

* Performed many

**Isaac Newton (1643–1727)**

**PROFILE**

**2**

motion.

in

* Inertia is the natural tendency of objects to

.

* This is also known as the law of

force.

rest, and an object in motion stays in motion, unless acted on by an

of motion states that an object at rest stays at

* Newton’s

**Newton’s First Law**

**Slide**

**3**

# Newton’s First Law

## EXAMPLE

* Let’s use this nice and neatly set up table in order to demonstrate the concept of . What will happen if I were to take the two ends of this tablecloth and pull really quickly? Why do these objects not fly off the table with the tablecloth?
* The objects have —there is substance to them. The mass of an

object is also a of its inertia. It is also how much would be required for the objects to be moved.

**Slide**

# Newton’s Second Law

**6**

* + Newton’s of motion states that the total

acting on an object is equal to times .

𝐹 = 𝑚𝑎

𝐹 = = N = kg × m/s2

𝑚 = (kg)

𝑎 = (m/s2)

* + The equation is written in three ways:
    - 𝐹 = 𝑚𝑎
    - 𝑚 = 𝐹/𝑎
    - 𝑎 = 𝐹/𝑚

**Slide**

**6**

# Application of Newton’s Second Law: Calculate Force

## REAL-WORLD CONNECTION

Calculate the force needed to accelerate an object to 4.3 m/s2. The object has a mass of 2.2 kg. Round the answer to the nearest tenth.

*Given:*

* 𝑎 = 4.3 m/s2
* 𝑚 = 2.2 kg

*Unknown: F*

*Equation to use:* 𝐹 = 𝑚𝑎

*Solve:*

* 𝐹 = (2.2 kg)(4.3 m/s2)
* 𝐹 = 9.46 =

**Slide**

**8**

# Application of Newton’s Second Law: Calculate Acceleration

## REAL-WORLD CONNECTION

Calculate the acceleration of a moving object, given that the object is 500 g and has a force of 6.5 N.

*Given:*

* 𝑚 = 500 kg = 0.5 kg
* 𝐹 = 6.5 N

*Unknown: a*

*Equation to use:* 𝑎 = 𝐹/𝑚

*Solve:*

* 𝑎 = 𝐹/𝑚
* 𝑎 = (6.5 N)/(0.5 kg)
* 𝑎 =

**Slide**

**NASA Deep Impact Mission: Parts of the Spacecraft**

**CAREER CONNECTION**

* Scientists at NASA study the forces involved with and acceleration for a mission.
* This mission was to study a comet’s materials that are ejected in a collision.
* The spacecraft has two parts:
  + the impact craft collides with a comet
  + the support craft collects data

**10**

**11**

* Scientists used Newton’s second law in the calculations.

ample force in the collision.

of the craft to ensure

**NASA Deep Impact Mission: The Collision**

**CAREER CONNECTION**

* Scientists carefully calculated the

**Slide**

# Newton’s Third Law

**14**

* + Newton’s of motion states that for every action, there is an and reaction.
  + Considered action/reaction
    - The skate pushing is the force.
    - The ice pushing is the force.

**Slide**

**14**

# Real-World Applications of Newton’s Third Law

## REAL-WORLD CONNECTION

The action reaction forces:

hands:

* The action and reaction forces are felt independently based on the point of view of the observer.
  + Active force:
    - The baby feels the pressure of the dad’s hand pushing

down on its hand.

* + Reactive forces:
    - The dad can feel the baby’s hand resist.
* Helium :
  + Active force:
    - The gases inside are pushing outward.
  + Reactive forces:
    - The balloon elastic is pushing back on the gases.

**?**

How do Newton’s laws describe the motion of an object?

**Lesson**

**Question**

**Answer**

**Slide**

# Review: Key Concepts

**2**

|  |  |
| --- | --- |
| **Law of motion** | **Description** |
| law of motion | An object at rest stays at rest, and an object in  motion stays in motion, unless acted on by an  force. |
| Second law of motion | The total acting on an object is  equal to times . |
| Third law of motion | For every , there is an equal and  opposite . |

*Use this space to write any questions or thoughts about this lesson.*