Edgenuity

Warm-Up | Newton's First and Third Laws

Lesson Question

How do Newton's first and third laws describe the motion of an object?

Lesson Goals

Describe Newton's first law of motion and how it relates to inertia.

Explain Newton's third law of motion and how it relates to action and reaction forces.

Use vectors to calculate the effect of forces on objects.

Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

C Newton's first law of motion

A static equilibrium

B dynamic equilibrium

E Newton's third law of motion

D inertia

A. the state in which an object at rest has a net force of zero

B. the state in which an object in motion has a net force of zero

C. the law that states an object at rest will stay at rest and an object in motion will stay in motion with the same velocity unless acted on by an external force

D. the natural tendency of objects to resist a change in motion

E. the law that states for every action there is an equal and opposite reaction

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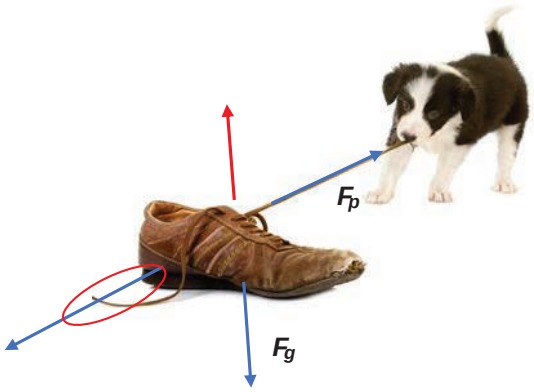
Forces

- Push/ pull
- Friction
- Gravity
- Normal

Draw an arrow representing the normal force, and circle the frictional force.



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Sir Isaac Newton (1642–1727)

PROFILE

- Studied other great scientific works
- Developed [hypotheses]
- Performed numerous experiments
- Published the three laws of [motion] in *Philosophiae Naturalis Principia Mathematica*, in 1687

Newton's First Law of Motion

Newton's first law of motion states that an object at rest will stay at rest and an object in motion will stay in motion with the same [velocity] unless acted on by an external [force].

- [Static] **equilibrium** is a state in which an object at rest has a net force of zero.
- Dynamic **equilibrium** is a state in which an object in [motion] has a net force of zero.

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Inertia

Inertia is the natural tendency of objects to [resist] a change in motion.

- An object at rest stays at [rest].
- An object in [motion] stays in motion.

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Mass and Inertia

The more mass an object has, the more [inertia] it has.

- Which object requires more force to move?

- Which object requires more force to stop?

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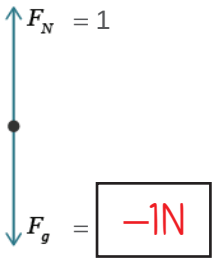
Calculating Force

In this case, we have two forces to look at.

- First, we have the force of [gravity]
- Then we have a [normal] force.

$$1\text{N} - 1\text{N} = 0\text{N}$$



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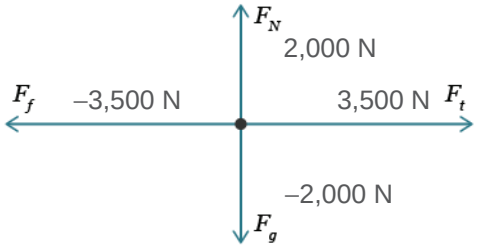
We have a lot of force vectors here.

- Force of gravity
- Normal force
- [Force] of the engine
- Air resistance combined with the [friction]



$2{,}000\ \text{N} - 2{,}000\ \text{N} =$ [0] N

$3{,}500\ \text{N} - 3{,}500\ \text{N} =$ [0] N

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Newton's Third Law of Motion

Newton's third law of motion states that for every action there is an equal and opposite [reaction].

Action/Reaction Force Pairs

Draw the action/reaction force vectors.

Paddle/water

Draw the action/reaction force vectors.

Shoe/cement

Draw the action/reaction force vectors.

Foot/trampoline

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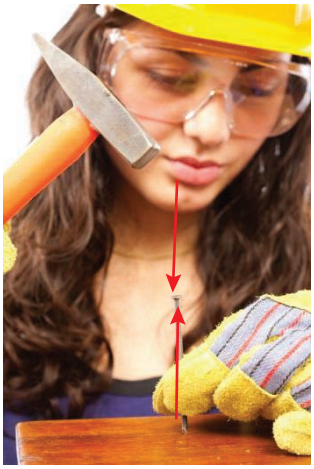
Action/Reaction Force Pairs

When you cannot see movement as a result of an action force, the reaction is still:

- equal.
- opposite.

Draw the action/reaction force vectors.



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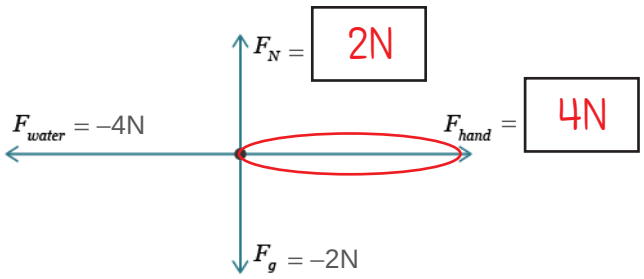
Calculating Force

Circle the force vector applied by hand, and write its magnitude.

$$2\text{N} - 2\text{N} = 0\text{N}$$

$$4\text{N} - 4\text{N} = 0\text{N}$$



Summary | Newton's First and Third Laws

Lesson Question

How do Newton's first and third laws describe the motion of an object?

Answer

(Sample answer) Newton's first law states that an object at rest will stay at rest and that an object in motion will stay in motion with the same velocity unless acted on by an external force. Newton's third law states that for every action there is an equal and opposite reaction.

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Review: Key concepts

- Newton's first law of motion says that an object at rest will stay at rest and an object in motion will continue in motion with the same [velocity] unless acted upon by an external force.
  - Law of [inertia]
  - Static equilibrium
  - Dynamic equilibrium
- Newton's third law of motion says that for every action there is an equal and opposite reaction.
  - [Action] /reaction force pairs

Summary | Newton's First and Third Laws

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