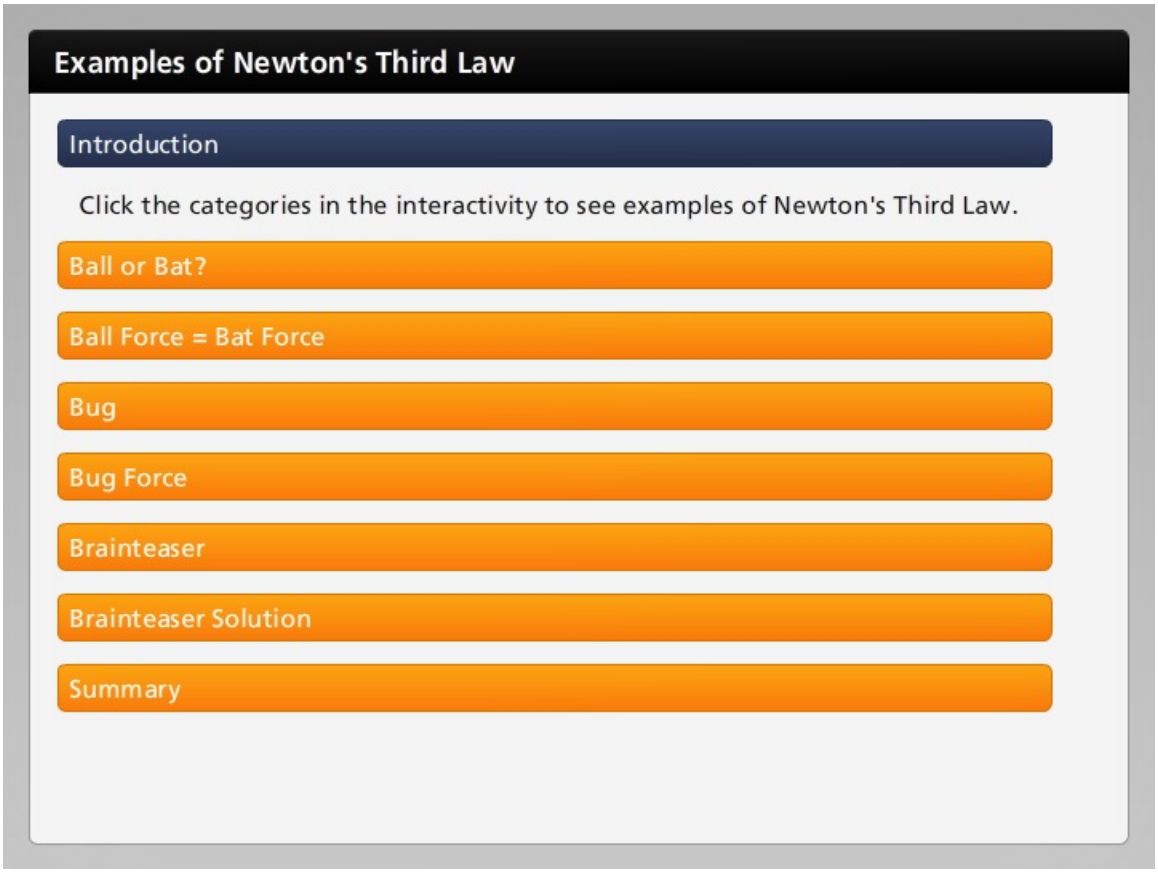
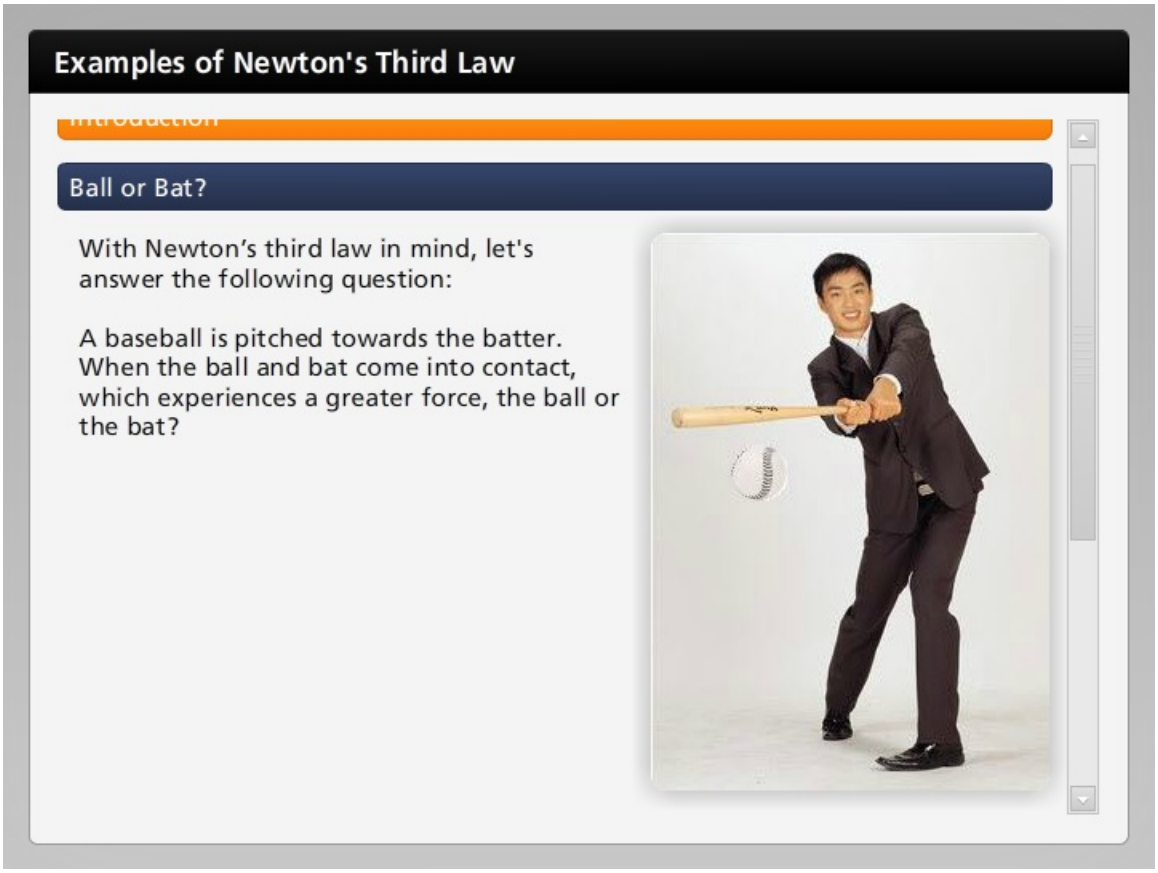
Module 5: Impulse and Momentum
Topic 2 Content: Examples of Newton's Third Law

Introduction



Click the categories in the interactivity to see examples of Newton's Third Law.

Ball or Bat?



With Newton's third law in mind, let's answer the following question:

A baseball is pitched towards the batter. When the ball and bat come into contact, which experiences a greater force, the ball or the bat?

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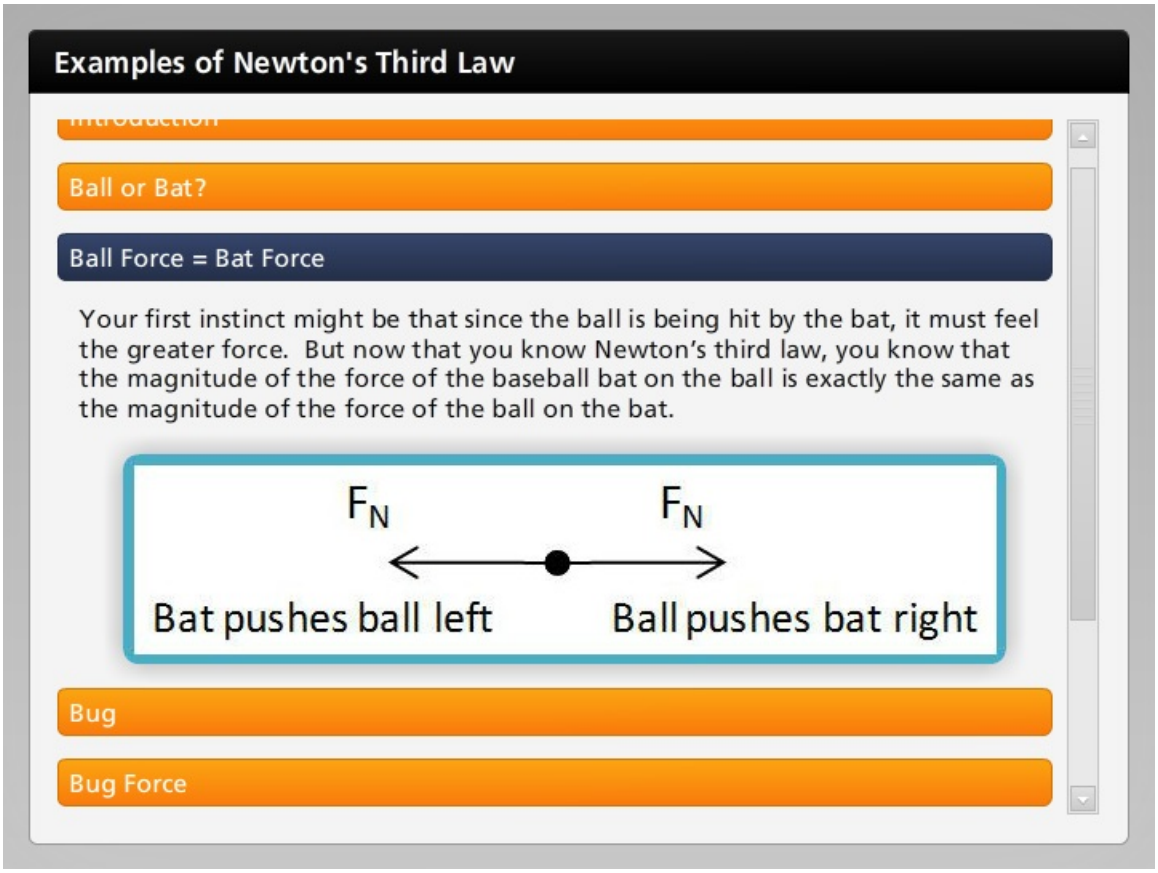
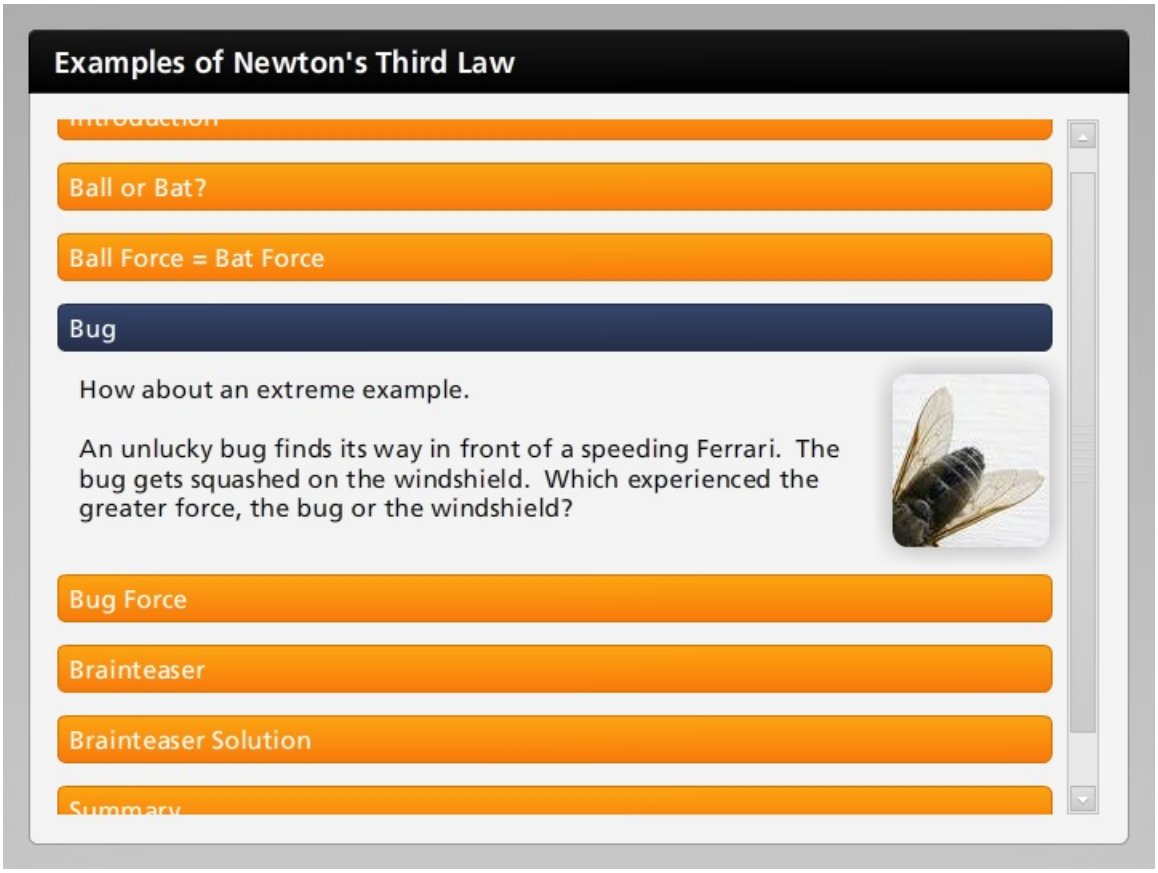
Ball Force = Bat Force



Your first instinct might be that since the ball is being hit by the bat, it must feel the greater force. But now that you know Newton's third law, you know that the magnitude of the force of the baseball bat on the ball is exactly the same as the magnitude of the force of the ball on the bat.

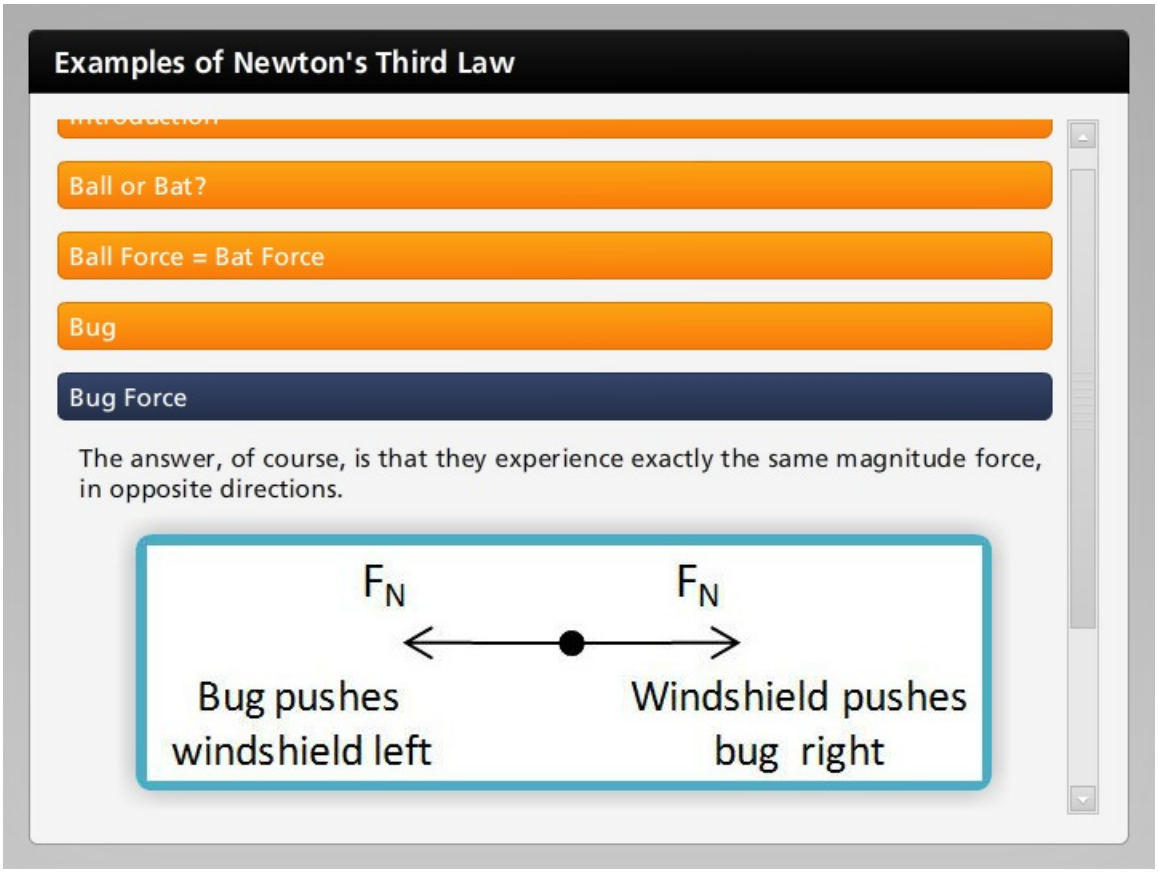
Bug



How about an extreme example.

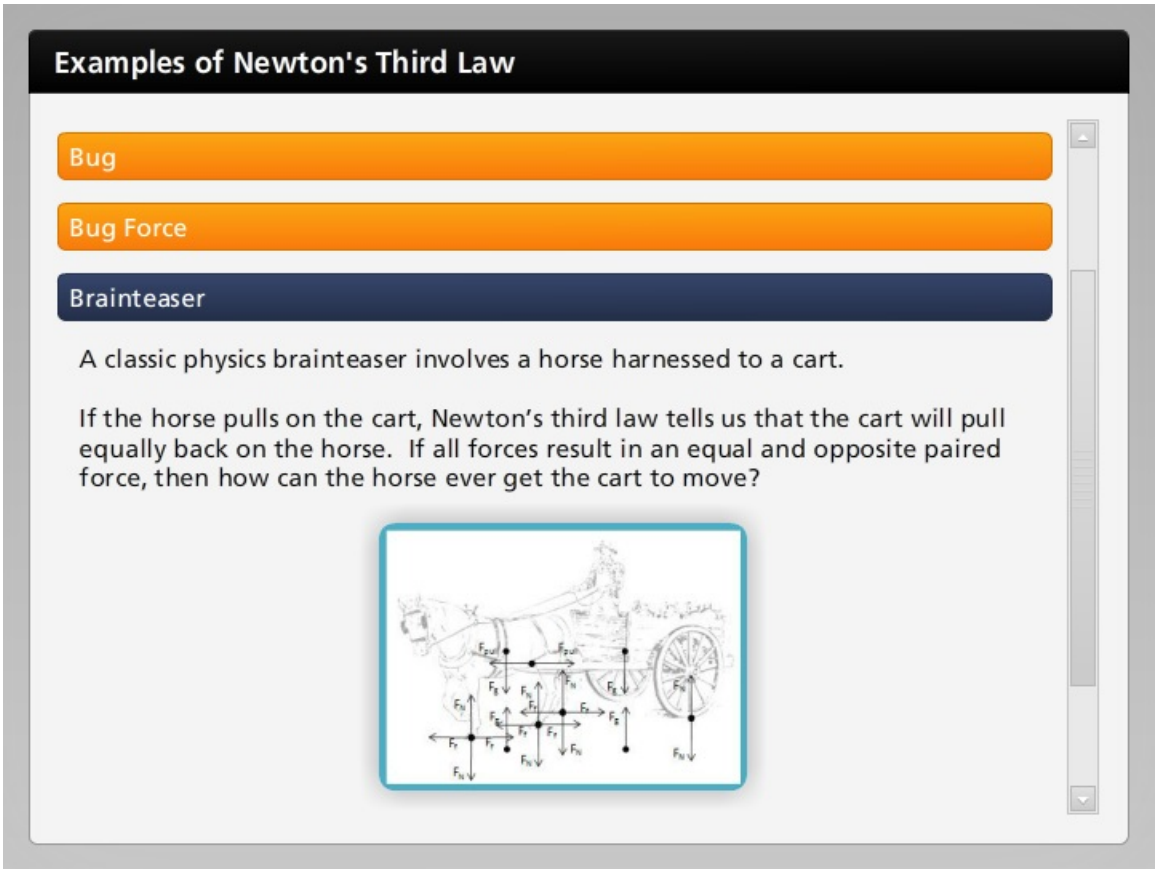
An unlucky bug finds its way in front of a speeding Ferrari. The bug gets squashed on the windshield. Which experienced the greater force, the bug or the windshield?

Bug Force



The answer, of course, is that they experience exactly the same magnitude force, in opposite directions.

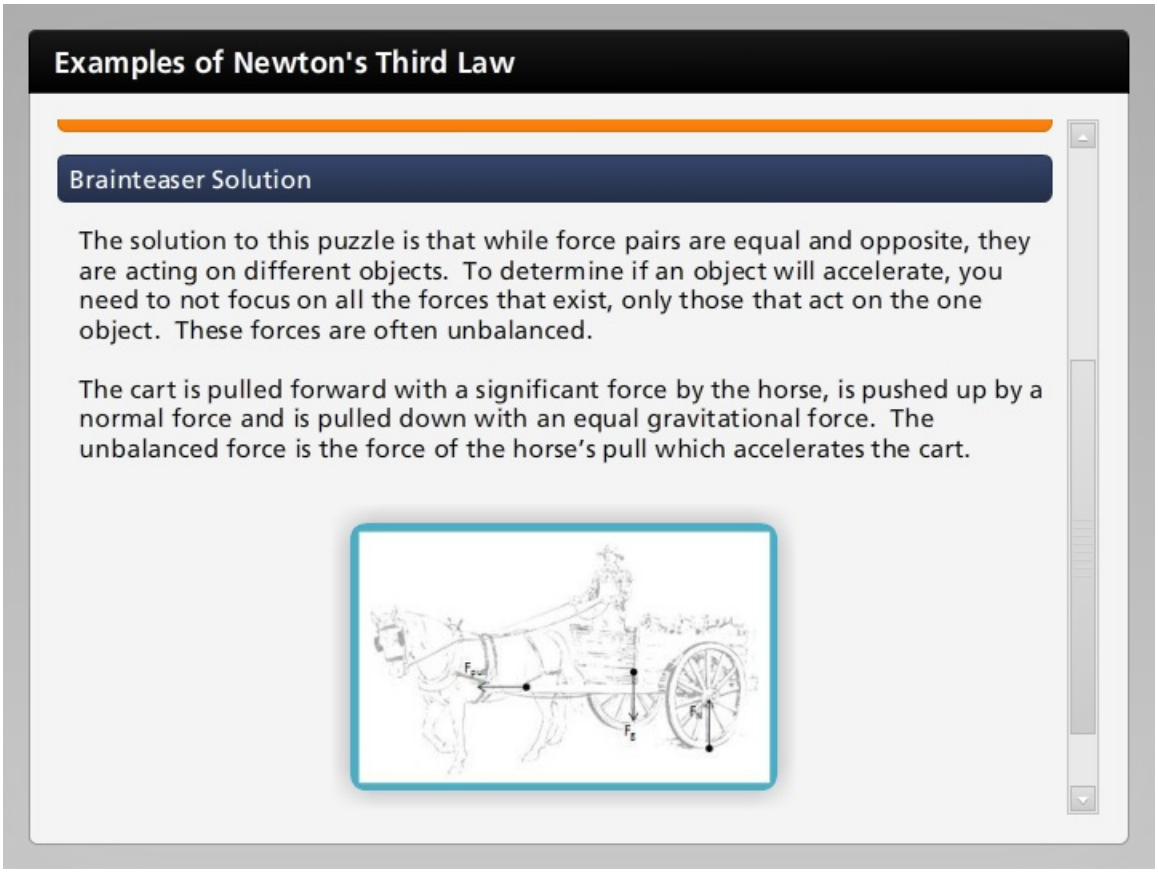
Brainteaser



A classic physics brainteaser involves a horse harnessed to a cart.

If the horse pulls on the cart, Newton's third law tells us that the cart will pull equally back on the horse. If all forces result in an equal and opposite paired force, then how can the horse ever get the cart to move?

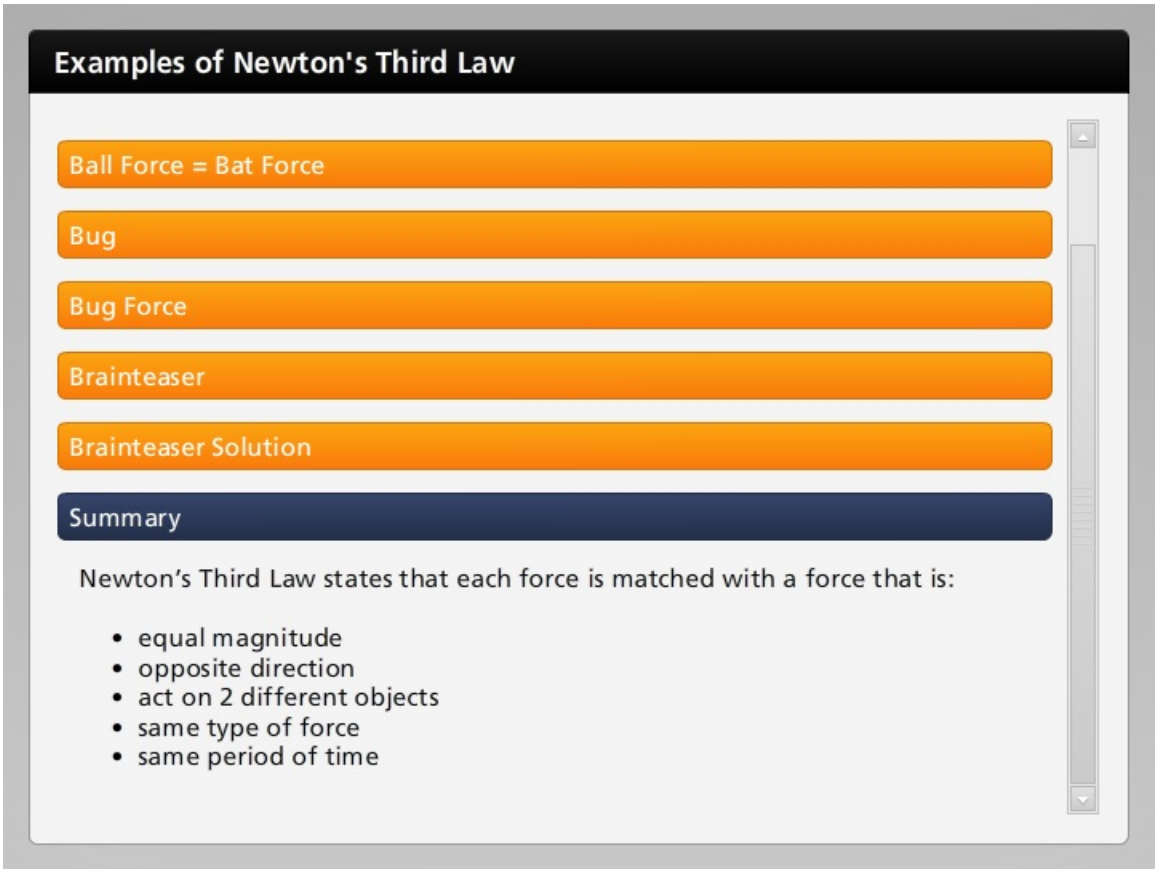
Brainteaser Solution



The solution to this puzzle is that while force pairs are equal and opposite, they are acting on different objects. To determine if an object will accelerate, you need to not focus on all the forces that exist, only those that act on the one object. These forces are often unbalanced.

The cart is pulled forward with a significant force by the horse, is pushed up by a normal force and is pulled down with an equal gravitational force. The unbalanced force is the force of the horse's pull which accelerates the cart.

Summary



Newton's Third Law states that each force is matched with a force that is:

- equal magnitude
- opposite direction
- act on 2 different objects
- same type of force
- same period of time