Newtons Third Law

Separate an interaction pair from the net force on each block

Name _____ Period _____ Date _____

Predict the acceleration and contact forces of two touching blocks, then test what changes when their masses change.

About 20 to 25 minutes | buildphysics.com/?experiment=newton-third-law

Predict the coupled motion

The horizontal track is frictionless. A rightward push acts only on the left block. Set Left block mass to 1.0 kg, Right block mass to 2.0 kg, and Push on left block to 3.6 N. Right is positive.

1. Draw separate force diagrams for the two blocks, including vertical forces. Label each horizontal force by the object exerting it and the object receiving it. Circle the contact-force pair.

2. Treat both blocks as one system to calculate their shared acceleration. Then analyze the right block to predict the contact force. Explain why the contact forces cancel only in the two-block system calculation.

Observe the contact pair

Turn on Normal forces. Run to 0.50 s and select each block in Properties. Read horizontal acceleration in Live values. Read contact-force values from the horizontal arrows between the blocks.

Quantity	Prediction	Measurement
Shared acceleration (m/s^2)		
Left block on right block F_x (N)		
Right block on left block F_x (N)		

Change the mass distribution

Keep the push at 3.6 N. For each pair of masses below, calculate the shared acceleration and contact-force magnitude before running. Reset and test at 0.50 s.

Left mass (kg)	Right mass (kg)	Predicted a (m/s²)	Measured a (m/s²)	Measured contact magnitude (N)
1.0	2.0			
2.0	1.0			
1.5	1.5			

3. Compare the first two cases. Why can the contact force change even when total mass and external push are unchanged?

4. A student says, “The two contact forces cancel, so neither block can accelerate.” Evaluate this statement using one block’s force diagram and your measurements.

5. Do equal and opposite contact forces mean the two blocks have equal and opposite accelerations? Explain why the total horizontal force on each block must be considered.