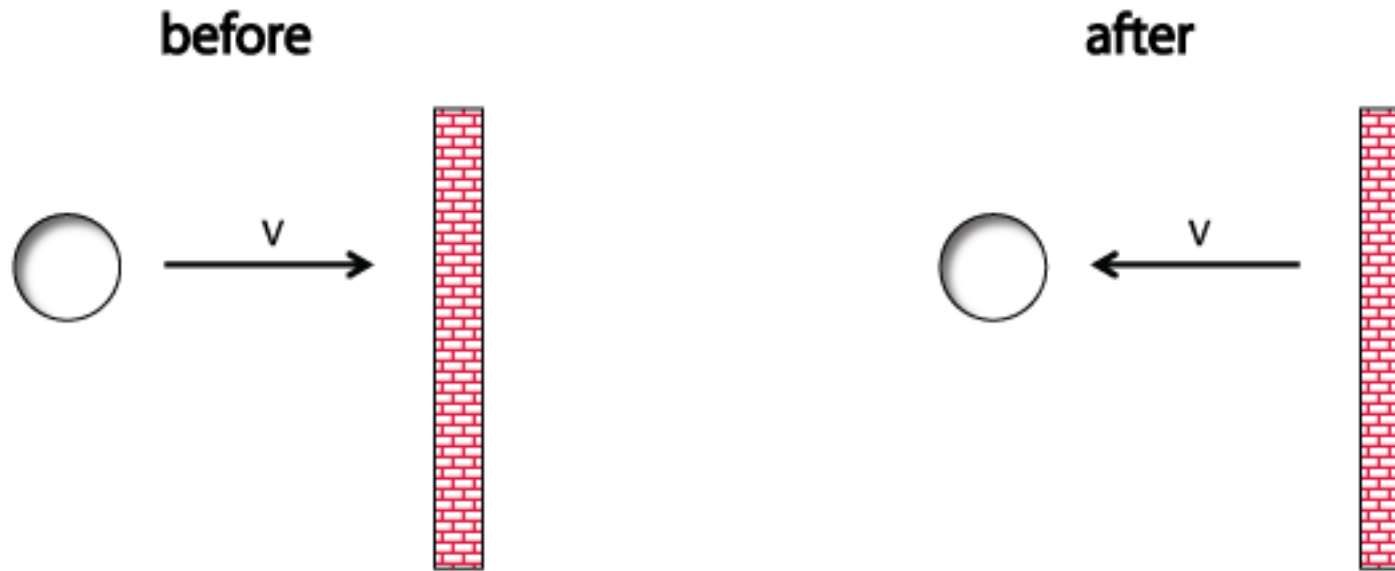
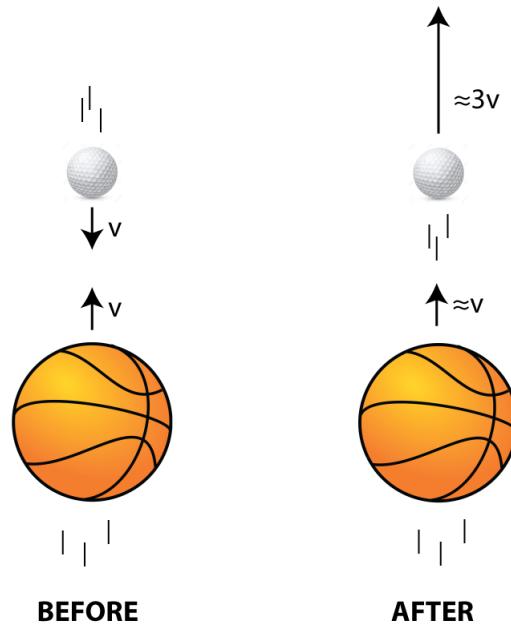


ping pong ball and brick wall



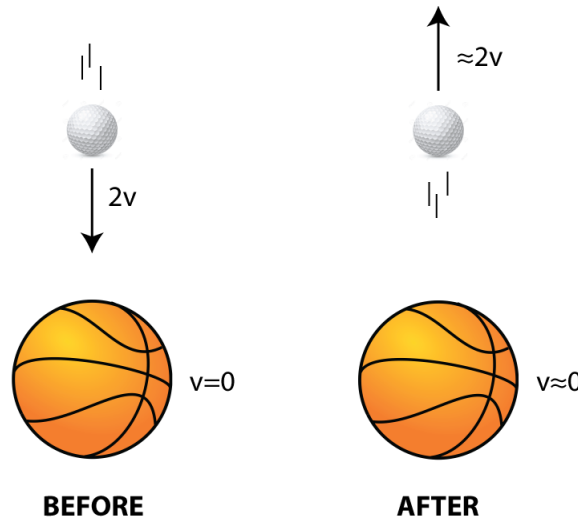
A ping pong ball bounces straight off a brick wall. Conservation of energy requires the ball to rebound with the same speed it had before the collision, assuming that heating losses are negligible.

1. A ping pong ball and a basketball are dropped together. The basketball strikes the ground first and rebounds back up with speed v . The ping pong ball is still headed downward with the same speed.



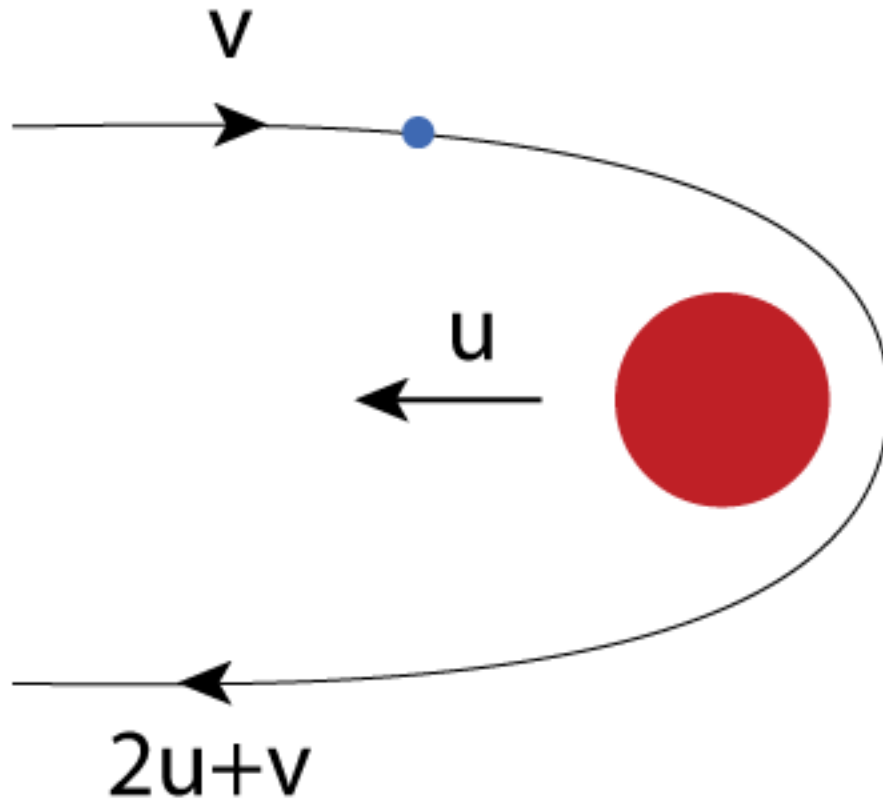
4. From the point of view of the ground, the basketball is still moving upward at speed v with the ant, and the ping pong ball is moving upward at speed $3v$ ($2v$ relative to the ant).

2. From the point of view of an ant riding on the basketball, the basketball is stationary (relative to the ant) and the ping pong ball is approaching at speed $2v$.



3. After the collision, the basketball hardly moves, assuming the basketball is much heavier than the ping pong ball. The ping pong ball rebounds at speed $2v$, just like it would off a brick wall.

gravity assist



NASA uses the “gravity assist” to accelerate space probes as they swing around the back side of a moving planet. A space probe (blue dot) approaches at speed v and does a U turn around the back side of a planet (red circle) traveling at speed u . After the 'collision', the probe emerges at speed $2u+v$.

CASSINI - VVEJGA OCT 1997 INTERPLANETARY TRAJECTORY

