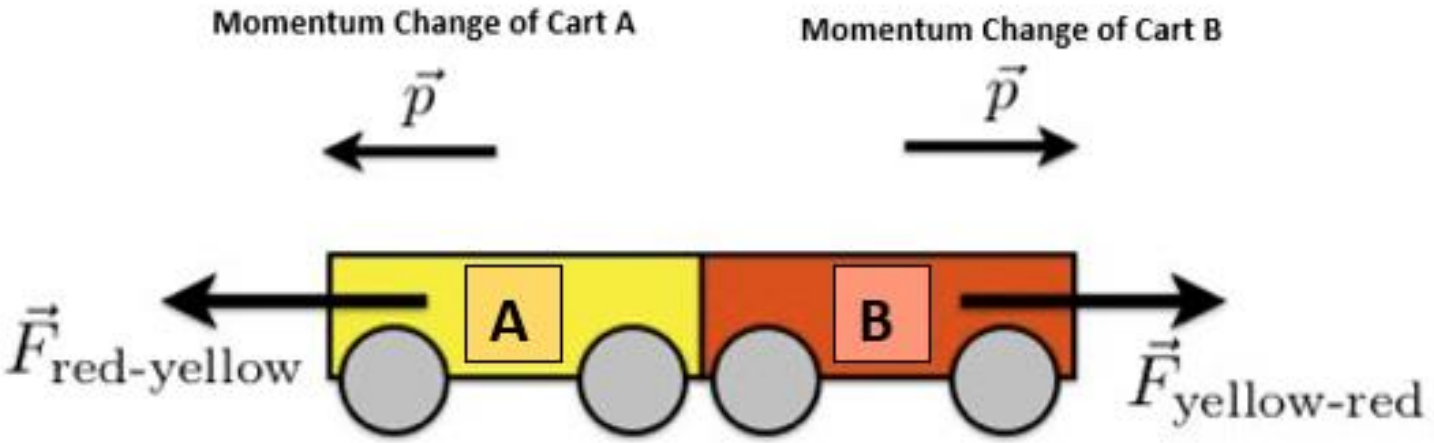
Physics
Instructor: Mr. Butler

Resource Doc
Momentum Transfer and Conservation in Collisions

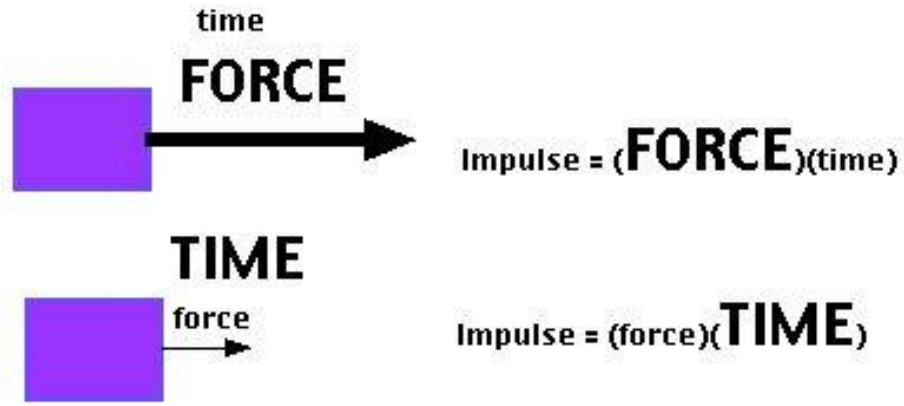
Momentum and motion transfer >
In an interaction (collision) between two or more bodies:

a) **Newton's third law force pairs act internally between bodies undergoing a collision. This means that**
   1) **each body exerts equal and opposite forces on the other.**
   2) **each body imparts an equal and opposite impulse on the other.**
   3) **each body changes the momentum of the other body by an equal amount but in the opposite direction.**
   4) **each body's momentum changes by the same amount, but in opposite directions.**
b) **motion (momentum) is exchanged – this means that whatever amount of momentum or motion is lost by one body is gained by one or more other bodies.**
c) **the total amount of motion (momentum) in any system must remain constant, or conserved, as long as no outside or external forces are applied to the objects during the interacting collision.**
d) **momentum conservation equations can be applied to determine a variety of quantities.**

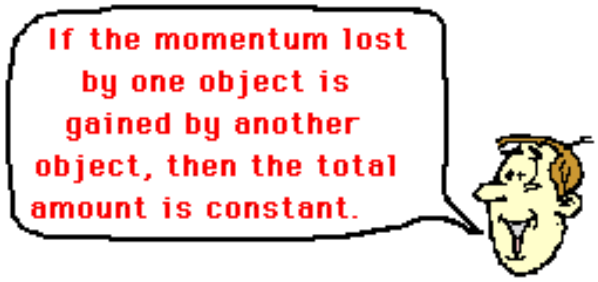


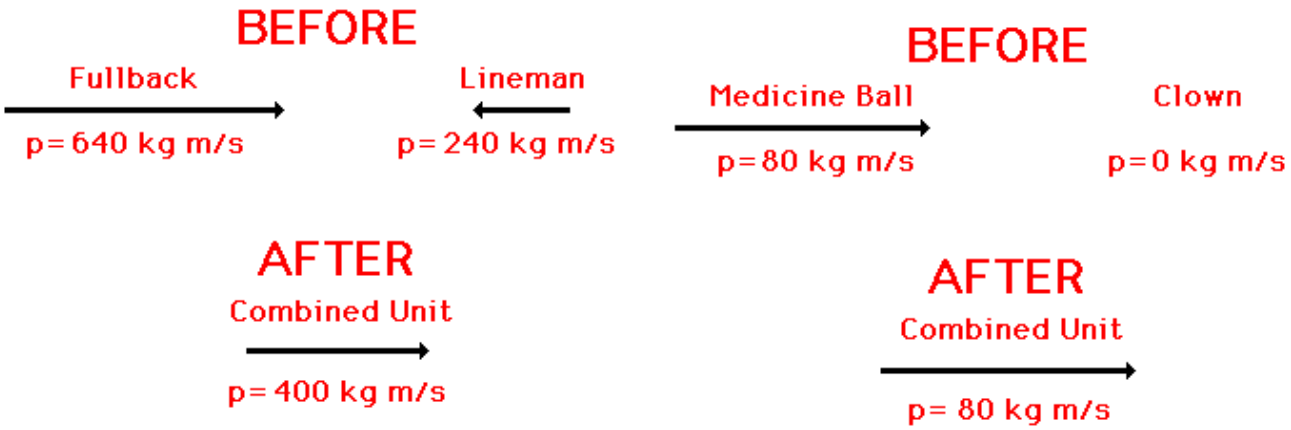
Impulse is the mechanism that changes momentum.

Two different forces can Impart identical impulses If the large force actin over a short time interval is the same as the smaller force acting over longer time interval.



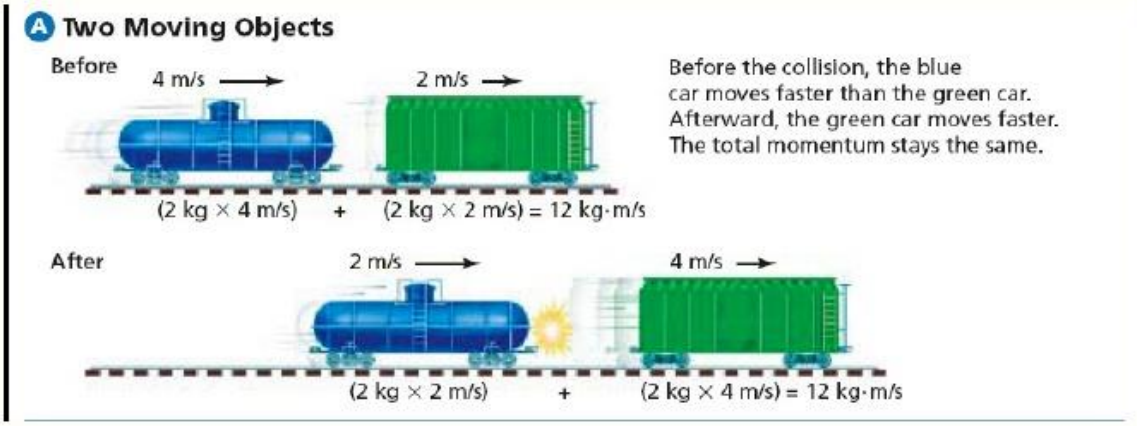
Momentum Transfer and Momentum Conservation





Collisions With Two Moving Objects

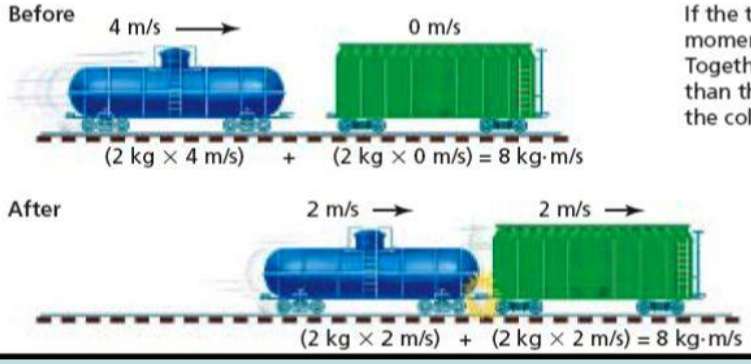
- In Figure 18A, a train car travels at 4 m/s down the same track as another train car traveling at only 2 m/s.
- The two train cars have equal masses.
- The blue car catches up with the green car and bumps into it.
- During the collision, the speed of each car changes.



Collisions With Connected Objects

- **Suppose that, instead of bouncing off each other, the two train cars couple together when they hit.**
- **Is momentum still conserved in Figure 18C?**
- **After the collision, the coupled train cars make one object with twice the mass.**

C Two Connected Objects



If the two cars couple together, momentum is still conserved. Together, the cars move slower than the blue car did before the collision.