

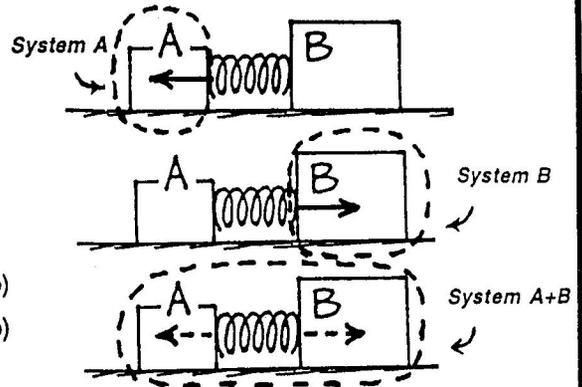
Systems

Momentum conservation (and Newton's 3rd law) apply to *systems* of bodies. Here we identify some systems.

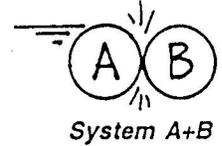
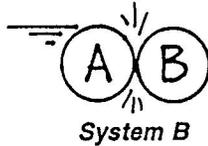
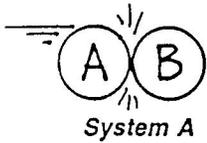


1. When the compressed spring is released, Blocks A and B will slide apart. There are 3 systems to consider here, indicated by the closed dashed lines below — System A, System B, and System A+B. Ignore the vertical forces of gravity and the support force of the table.

- a. Does an external force act on System A? (yes) (no)
Will the momentum of System A change? (yes) (no)
- b. Does an external force act on System B? (yes) (no)
Will the momentum of System B change? (yes) (no)
- c. Does an external force act on System A+B? (yes) (no)
Will the momentum of System A+B change? (yes) (no)

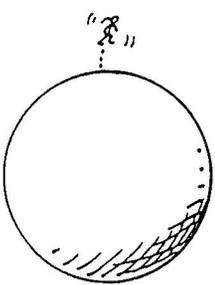


2. Billiard ball A collides with billiard ball B at rest. Isolate each system with a closed dashed line. Draw only the external force vectors that act on each system.



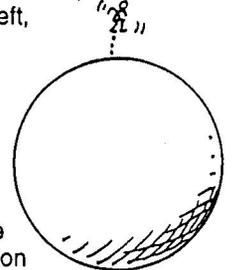
- a. Upon collision, the momentum of System A (increases) (decreases) (remains unchanged).
- b. Upon collision, the momentum of System B (increases) (decreases) (remains unchanged).
- c. Upon collision, the momentum of System A+B (increases) (decreases) (remains unchanged).

3. A girl jumps upward from the Earth's surface. In the sketch to the left, draw a closed dashed line to indicate the system of the girl.



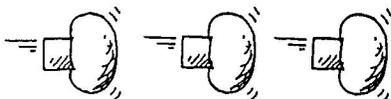
- a. Is there an external force acting on her? (yes) (no)
Does her momentum change? (yes) (no)
Is the girl's momentum conserved? (yes) (no)

b. In the sketch to the right, draw a closed dashed line to indicate the system [girl + Earth]. Is there an external force due to the interaction between the girl and the Earth that acts on the system? (yes) (no)



Is the momentum of the system conserved? (yes) (no)

4. A block strikes a blob of jelly. Isolate 3 systems with a closed dashed line and show the external force on each. In which system is momentum conserved?



5. A truck crashes into a wall. Isolate 3 systems with a closed dashed line and show the external force on each. In which system is momentum conserved?



thank to Cedric Linder

Hewitt
Draw it!