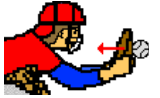


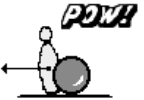
# Practice - Newton's 3<sup>rd</sup> Law & Systems

1. Consider the following three examples of "actions". One of the forces in the mutual interaction is described; describe the other force in the action-reaction force pair.

a. Baseball pushes on glove left.



b. \_\_\_\_\_  
Bowling ball pushes on pins left.



c. \_\_\_\_\_  
Air particles push on balloon wall outwards.



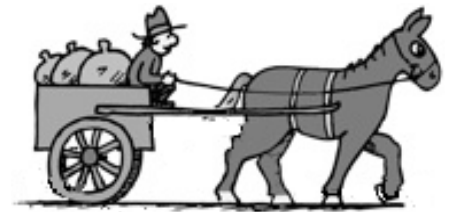
d. Now consider that the Earth is in orbit around the sun. Identify *both* the action and the reaction forces in this pair.

Action: \_\_\_\_\_

Reaction: \_\_\_\_\_

2. Your teacher (100. kg) used to think he could significantly alter the motion of an entire aircraft carrier ( $1.00 \times 10^8$  kg) floating in the water (assumed frictionless) with a solid push. Was he correct? If he was able to push the carrier with 500. N, what acceleration would it experience? In comparison, what acceleration would your teacher experience? Show all work as taught in class.

3. Referring to the horse-cart picture showing a horse attempting to get a cart rolling down the street:



a. If we view the cart as the system:

i. What external horizontal forces are exerted on the cart?  
\_\_\_\_\_

ii. What needs to happen to get the cart moving?  
\_\_\_\_\_

b. If we view the horse as the system:

i. What external horizontal forces are exerted on the horse?  
\_\_\_\_\_

ii. What needs to happen to get the horse moving?  
\_\_\_\_\_

c. If we view the horse-cart as the system:

i. What internal horizontal forces are acting within the system?  
\_\_\_\_\_

ii. What do these forces contribute to motion?

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iii. What external horizontal forces are exerted on the system?

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iv. What needs to happen to get the cart moving?

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