Momentum Conservation as a Guide to Thinking

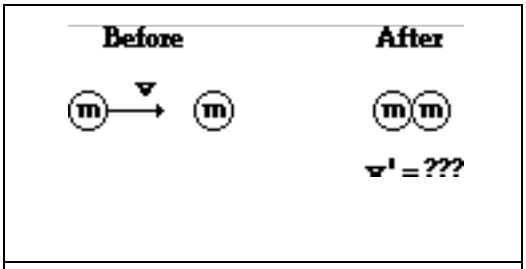
Read from **Lesson 2** of the **Momentum and Collisions** chapter at **The Physics Classroom**:

http://www.physicsclassroom.com/Class/momentum/u4l2dd.html

MOP Connection: Momentum and Collisions: sublevel 10

1. The following diagrams depict inelastic collisions between objects of different mass. For each case, determine the post-collision velocity (**v'**) of the two *coupled* objects. Express **v'** in terms of **v**.

a.



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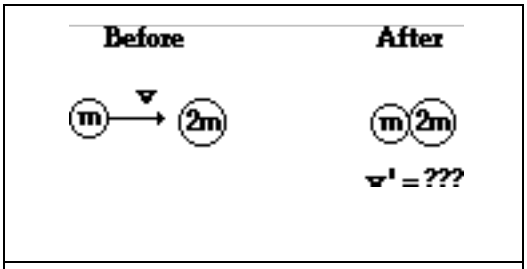

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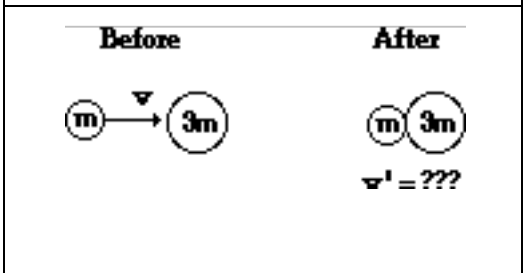

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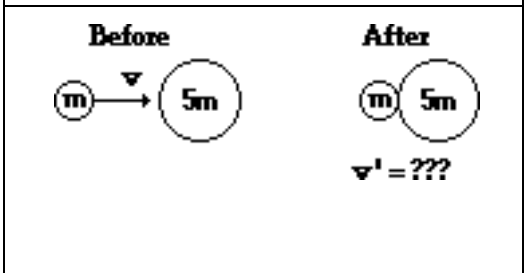

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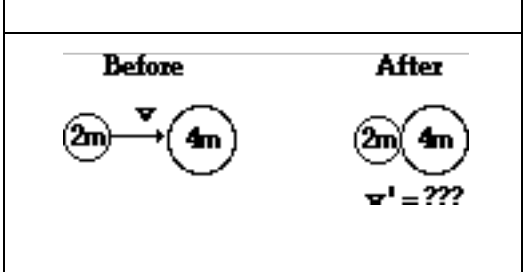

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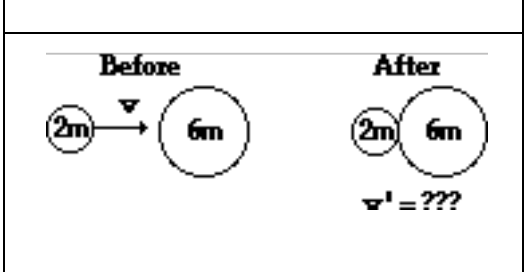

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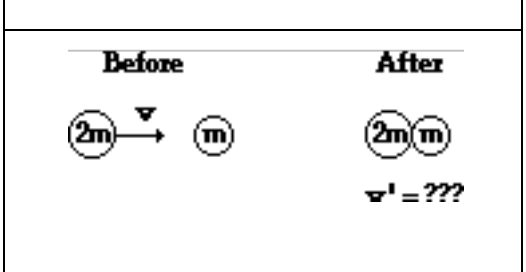

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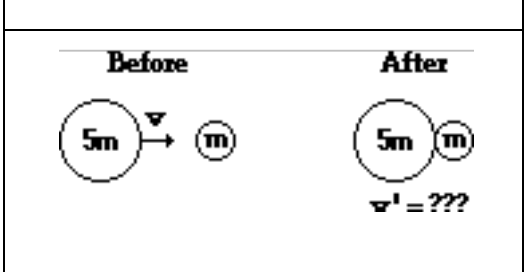
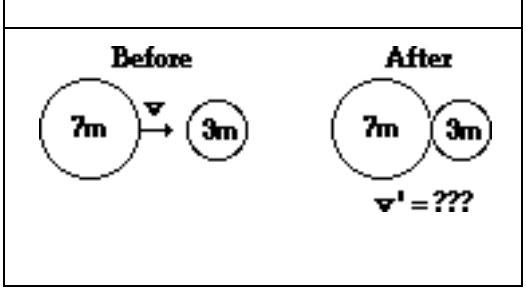
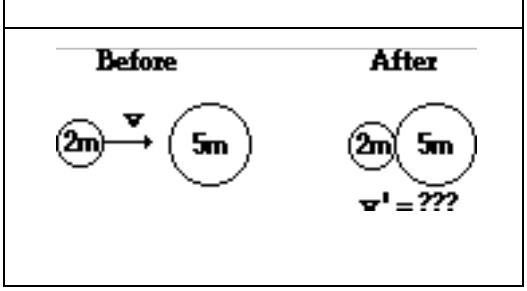


i.



j.



2. Complete the following verbal statements to illustrate your understanding of the effect of varying mass on the post-collision velocity.

   a. If an object of mass **m** collides and velocity **v** collides inelastically with an object of mass **3m** that is initially at rest, then the amount of total *system* mass in motion will increase by a factor of _____ and the velocity of the system will decrease by a factor of _____. The new velocity (**v'**) will be _____ **v**.

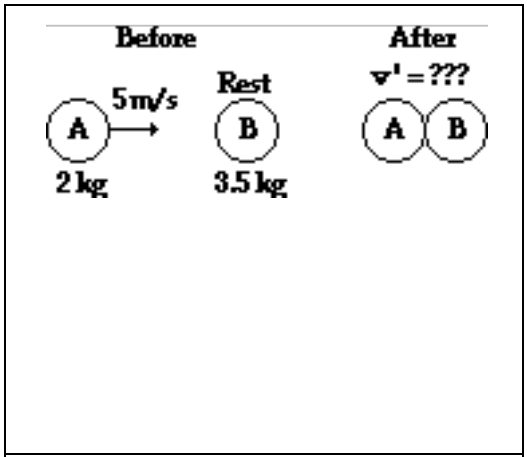
   b. If an object of mass **m** collides and velocity **v** collides inelastically with an object of mass **4m** that is initially at rest, then the amount of total *system* mass in motion will increase by a factor of _____ and the velocity of the system will decrease by a factor of _____. The new velocity (**v'**) will be _____ **v**.

   c. If an object of mass **3m** collides and velocity **v** collides inelastically with an object of mass **4m** that is initially at rest, then the amount of total *system* mass in motion will increase by a factor of _____ and the velocity of the system will decrease by a factor of _____. The new velocity (**v'**) will be _____ **v**.

   d. If an object of mass **5m** collides and velocity **v** collides inelastically with an object of mass **3m** that is initially at rest, then the amount of total *system* mass in motion will increase by a factor of _____ and the velocity of the system will decrease by a factor of _____. The new velocity (**v'**) will be _____ **v**.

3. Use proportional reasoning to determine the unknown quantity in the following collisions.

a.



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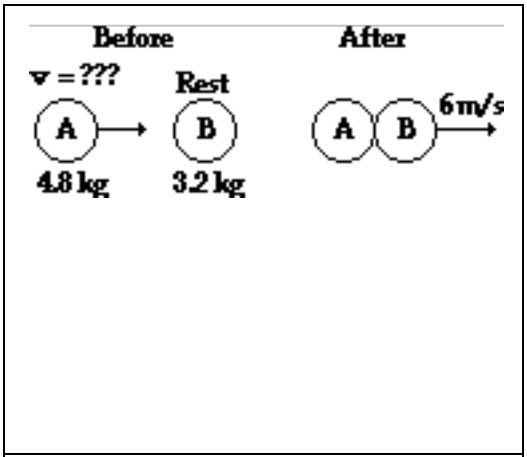
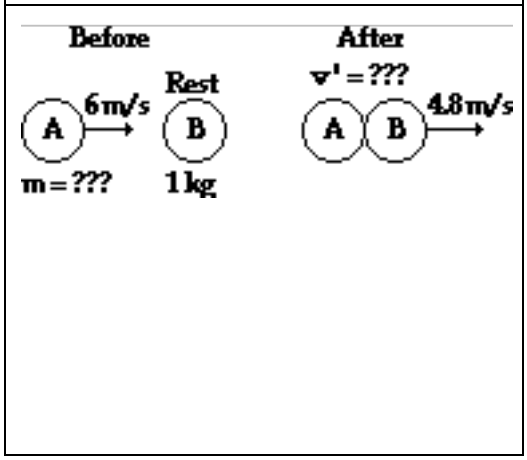


c.



d.