Total Elastic Collisions (TEC) Work sheet

In a total elastic collision, the kinetic energy before the collision equals the kinetic energy after the collision. The best example of this is when two equally mass billiard balls collide. Most of you have a good natural feel what will happen during a TEC. This work sheet will strengthen your feel for collisions.

Open up **VAirtable** and go to **File → Run Experiment → Collision Samples #1 → Billiard Ball**
Go to the **Data Tab** and notice that the both pucks have the same mass and that the black puck is stationary at the start. After each collision, go to the **Measurement Tab** and click the **Data Table Button** to analyze the data from the collision. (note: Units for energy will be kg cm^2/s^2)

1) Fill in the table on the back of this sheet to help summarize the energies and momentums involved in the collisions. (note: **keep black pucks velocity zero for parts a) through d)**)

a) Predict what will happen when the two objects collide?

(Click start and then stop a little bit after the collision happens.) Was your prediction correct?

b) How will changing the initial velocity of the red puck affect the outcome? Make the prediction below and then run the simulation. Were you correct?

c) Make the mass of the red puck larger than the mass of the black puck. Make a prediction below and then run the simulation. Were you correct?

d) Now make the red pucks mass smaller then the blacks. How will this change the outcome?

e) Set each mass back to the same value and now give the black mass a velocity. You can change the direction of the velocity by grabbing the small black circle and bringing it to the other side of the mass. Predict what will happen. Were you right? Try different velocities but keep the masses the same.

f) Now that you have a better feel for collisions, try several other collisions where you set the masses different but give each mass a different velocity. How were your predictions on direction of travel?

Remember: Velocity to the right is positive

	Red			Black			Kinetic Energies (E_k) ($kg\ cm^2/s^2$)				Does E_k before equal E_k after?	Momentum (**p**) (kg cm/s [R])				Does **p** before equal **p** after.
	Mass (kg)	V_i (cm/s)	V_f (cm/s)	Mass (kg)	V_i (cm/s)	V_f (cm/s)	Red before	Black before	Red after	Black after		Red before	Black before	Red after	Black after	
a)																
b)																
c)																
d)																
e)																
f)																

Conclusion:

1) What do we notice about the total energies in the system?
2) Why must energy be a scalar quantity?
3) Does the data confirm that momentum is a vector quantity?
4) Explain why momentum must be a vector using the data collected.