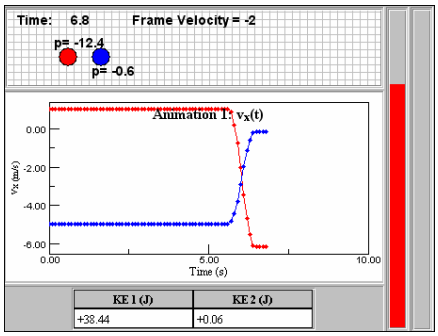
Worksheet for Exploration 9.2: Compare Energy in Different Frames



How does the *energy* of a particle change when viewed from a different reference frame? The energy of the two balls in the animation is shown in the table and on the bar graphs to the right. The graph displays the velocity **(position is given in meters and time is given in seconds)**. Restart.

You can view the collision in another inertial reference frame by entering a new value into the frame velocity text box, -10 m/s < v < 10 m/s, before you start the animation. Consider the two particles to be an isolated system and answer the following questions using at least two different inertial reference frames for each animation.

Complete the tables for each animation. You may select several reference frame velocities.

		Animation 1				
v_{ref}		KE_1	KE_2	KE_{tot}	p_1	p_2
	before					
	after					
	before					
	after					
	before					
	after					
	before					
	after					

		Animation 2				
v_{ref}		KE_1	KE_2	KE_{tot}	p_1	p_2
	before					
	after					
	before					
	after					
	before					
	after					
	before					
	after					

a. Do the kinetic energies of the individual particles depend on your choice of reference frame?
   i. Animation 1

   ii. Animation 2

b. Does the change in total kinetic energy due to the collision depend on the reference frame?
   i. Animation 1

   ii. Animation 2

c. Is the total kinetic energy constant in different reference frames? (Be sure and answer both animations.)
   i. Animation 1

   ii. Animation 2

d. Find mass and the ratio of masses of the two balls. Does this result depend on the reference frames?
   i. Animation 1

   ii. Animation 2

e. What is special about the reference frame in which the total momentum is zero? Is the kinetic energy zero in this frame?