General Physics I Laboratory, Section 7 Due November 6, 2024
Dr. Pogo

Quiz #9

Name:_____ **Use a pencil, not a pen.**

One-dimensional collisions

Blocks m_1 and m_2 approach each other on a (frictionless) surface.
Before the collision, they have velocities v_{1i} and v_{2i}.
It goes without saying that their velocities have opposite signs!
After the collision, they have velocities v_{1f} and v_{2f}.

Block 1	Block 2
$m_1 = 270$ g	$m_2 = 140$ g
$v_{1i} = +28$ cm/s	$v_{2i} = -46$ cm/s
$v_{1f} = -18$ cm/s	$v_{2f} = +43$ cm/s

1. Compute the missing 11 items in this box. Use the provided examples for help if you're struggling with values or units.

units	Block 1	Block 2	Total
g·cm/s	$p_{1i} = 7560$	$p_{2i} =$	$p_{1i} + p_{2i} =$
g·cm/s	$p_{1f} = -4860$	$p_{2f} =$	$p_{1f} + p_{2f} =$
g·cm/s	$\Delta p_1 = -12420$	$\Delta p_2 =$	$\Delta p_{1f} + \Delta p_{2f} =$
mJ	$KE_{1i} = 10.584$	$KE_{2i} =$	$KE_{1i} + KE_{2i} =$
mJ	$KE_{1f} =$	$KE_{2f} =$	$KE_{1f} + KE_{2f} =$

2. Use $\frac{KE_{f\ total} - KE_{i\ total}}{KE_{i\ total}} \times 100\%$ to compute the relative change in mechanical energy. You expect a negative number, because some energy is being converted into sound, heat, etc.

Energy change = %

3. Use $\frac{p_{f\ total} - p_{i\ total}}{p_{1i}} \times 100\%$ to compute the relative change in momentum. Because momentum is a vector, we have no reason to expect either a positive or a negative number.

momentum change = %

Note that the denominator is quite a bit different than what you might expect, since it uses only the momentum of object 1 instead of the total momentum. Why? Since the two colliding objects have opposite signs, then the total momentum could conceivably be zero, which would make that kind of fraction conceptually invalid.