Name: _____ Date: _____

PHYSICS: MOMENTUM
Activity: My Personal Momentum and Kinetic Energy

Purpose: Students will determine their velocity, mass, momentum, and kinetic energy while walking slower and while walking faster.

Instructions

1. Use the mass of the teacher: 92 kg.
2. The teacher will walk slow, walk faster, and run in the same corridor.
3. The length of the corridor you walked is 32 meters (displacement).
4. Complete the table

	Slow walk/ slow pace	**Faster walk/ faster pace**	**Fastest/ Running**
Mass, m (kg)			
Displacement, Δx (m)			
Time, t (s)			
Velocity, v (m/s)			
Momentum, *p* (kg·m/s)			
Kinetic energy, KE (Joules)			

Calculations

Calculate your average velocity. Divide the displacement traveled by the time. Velocity must be in units of m/s.

$$v = \frac{\Delta x}{t}$$

Calculate your momentum. Multiple the average velocity by your mass.

$$p = m \cdot v$$

Calculate your translational kinetic energy. KE is calculated as the product of ½ multiplied by your mass multiplied by your velocity squared.

$$KE = \frac{1}{2} \cdot m \cdot v^2$$

Part 2. MOMENTUM and KINETIC ENERGY. The following problems involve momentum and translational kinetic energy (KE). Calculate the momentum and the KE.

$$p = m \cdot v \qquad KE = \frac{1}{2} \cdot m \cdot v^2$$

A toy airplane flies through the air. Over time the toy airplane gets faster and faster. The mass of the airplane is 1.2 kg. Calculate the airplane's momentum and translational KE at the different flying speeds.

Time after takeoff	Flying Speed	Momentum (p) kg·m/s	KE (J)
10 seconds	10 m/s		
20 seconds	20 m/s		
30 seconds	30 m/s		
40 seconds	40 m/s		

Follow-up questions

The flying speed doubled from 10 m/s to 20 m/s. What happened to the magnitude of the momentum?	
The flying speed tripled from 10 m/s to 30 m/s. What happened to the magnitude of the momentum?	
The flying speed doubled from 10 m/s to 20 m/s. What happened to the magnitude of the KE?	
The flying speed tripled from 10 m/s to 30 m/s. What happened to the magnitude of the KE?	

Four cars of different mass are driving at the same velocity on the road. All four cars are moving at 10 m/s. Calculate the momentum and kinetic energy of the cars.

Mass of cars	Velocity	Momentum (p) kg·m/s	KE (J)
300 kg	10 m/s		
600 kg	10 m/s		
900 kg	10 m/s		
1200 kg	10 m/s		

Follow up questions

The 600 kg car has 2-times the mass of the 300 kg car. How does the momentums differ?	
The 1200 kg car has 4-times the mass of the 300 kg car. How does the momentums differ?	
The 600 kg car has 2-times the mass of the 300 kg car. How does the KE differ?	
The 1200 kg car has 4-times the mass of the 300 kg car. How does the KE differ?	