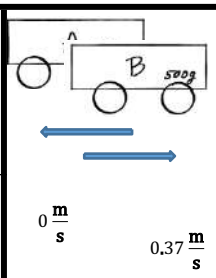
Activity: collisions of carts

Watch the videos of four experiments with two carts that move with negligible friction on a dynamics track. **The system consists of both carts**.

a) Cart A (**mass of A is 500 g**) is moving to the right at constant speed of $0.37\ \frac{\mathbf{m}}{\mathbf{s}}$. Cart A hits the stationary cart B (**the mass of B is 500 g**). After the collision cart A is at rest whereas cart B is moving with a speed of $0.37\ \frac{\mathbf{m}}{\mathbf{s}}$ to the right.
Watch the video of the experiment on the following link:
https://youtu.be/Ikc03NBA11U

Sketch the situation before and after the collision. To do so, copy and paste of the carts, arrows and speeds from the right part of the box. You can adapt the lenght of the arrows, if necessary.

BEFORE COLLISION	x	
AFTER COLLISION		

Compile the following table with appropriate numbers.

	System	Mass m	Speed v	Velocity $\vec{v}$	Product of mass and speed mv	Product of mass and velocity $m\vec{v}$
BEFORE COLLISION	Cart A					
	Cart B					
	A and B together					
AFTER COLLISION	Cart A					
	Cart B					
	A and B together					

b) Cart A is loaded with an additional weight (**mass of cart + weight is 1470 g**). Cart A is moving to the right with the speed of $0.31\ \frac{\mathrm{m}}{\mathrm{s}}$. Cart A collides with the stationary cart B (**500 g**). After the collision, both carts are mving to the right, cart A with the speed of $0.15\ \frac{\mathrm{m}}{\mathrm{s}}$, and cart B with the speed of $0.47\ \frac{\mathrm{m}}{\mathrm{s}}$.

Watch the video on the following link:
https://youtu.be/HbMBplGL3Zo

Sketch the situation before and after the collision. To do so, copy and paste of the carts, arrows and speeds from the right part of the box. You can adapt the lenght of the arrows, if necessary.

BEFORE COLLISION	x	A, B 500g, 970g, $0.47\ \frac{\mathrm{m}}{\mathrm{s}}$, $0.15\ \frac{\mathrm{m}}{\mathrm{s}}$, $0.31\ \frac{\mathrm{m}}{\mathrm{s}}$
AFTER COLLISION		

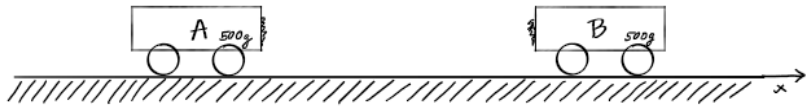
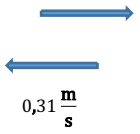
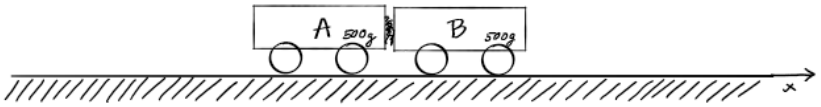
Compile the following table with appropriate numbers.

	System	Mass m	Speed v	Velocity $\vec{v}$	Product of mass and speed mv	Product of mass and velocity $m\vec{v}$
BEFORE COLLISION	Cart A					
	Cart B					
	A and B together					
AFTER COLLISION	Cart A					
	Cart B					
	A and B together					

c) Cart A (**500 g**) is moving to the right with the speed $0.31\ \frac{\mathbf{m}}{\mathbf{s}}$, whereas cart B (**500 g**) is moving to the left at the same speed- $0.31\ \frac{\mathbf{m}}{\mathbf{s}}$. After the collision, both carts stick together (thanks to the clay) and are then at rest.

Watch the video on the following link:
https://youtu.be/m9JO6LrZ1Mk

Sketch the situation before and after the collision. To do so, copy and paste of the carts, arrows and speeds from the right part of the box. You can adapt the lenght of the arrows, if necessary.

BEFORE COLLISION		
AFTER COLLISION		

Compile the following table with appropriate numbers.

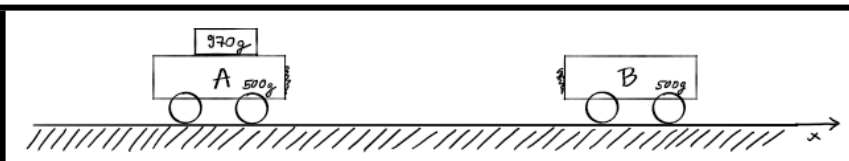
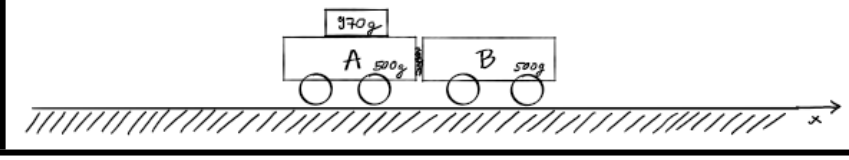
	System	Mass m	Speed v	Velocity $\vec{v}$	Product of mass and speed mv	Product of mass and velocity $m\vec{v}$
BEFORE COLLISION	Cart A					
	Cart B					
	A and B together					
AFTER COLLISION	Cart A					
	Cart B					
	A and B together					

d) Cart A is loaded with an additional weight (**mass of cart + weight is 1470 g**). Cart A is moving to the right with the speed of $0.35\ \frac{\mathrm{m}}{\mathrm{s}}$. Cart B (**500 g**) is moving to the left with the same speed - $0.35\ \frac{\mathrm{m}}{\mathrm{s}}$. After the collision, the two carts stick together. They are now moving to the right with a speed of $0.17\ \frac{\mathrm{m}}{\mathrm{s}}$

Watch the video on the following link:

https://youtu.be/tciBA4w4ZiU

Sketch the situation before and after the collision. To do so, copy and paste of the carts, arrows and speeds from the right part of the box. You can adapt the lenght of the arrows, if necessary.

BEFORE COLLISION		
AFTER COLLISION		$0{,}35\ \frac{\mathrm{m}}{\mathrm{s}}$ $0{,}17\ \frac{\mathrm{m}}{\mathrm{s}}$

Compile the following table with appropriate numbers.

	System	Mass m	Speed v	Velocity $\vec{v}$	Product of mass and speed mv	Product of mass and velocity $m\vec{v}$
BEFORE COLLISION	Cart A					
	Cart B					
	A and B together					
AFTER COLLISION	Cart A					
	Cart B					
	A and B together					

Comparing the numbers in the tables find out which quantity remains constant before and after the collision in all four experiments. You may colour the cells for help.