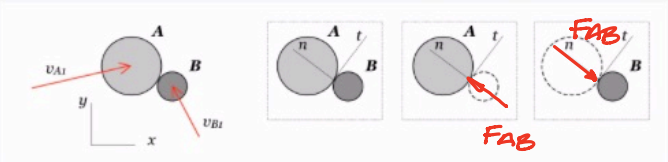
Q1 Impact 1
4 Points



Particles A and B, having masses of 2m and m, respectively, impact each other with initial velocities shown.

Q1.1
2 Points

During impact, linear momentum for particle B ALONE is conserved in (select all correct responses):

- [ ] the x-direction
- [ ] the y-direction
- [ ] the n-direction
- [x] the t-direction
- [ ] none of the above

$\Sigma F_x \neq 0$
$\Sigma F_y \neq 0$
$\Sigma F_n \neq 0$
$\Sigma F_t = 0$

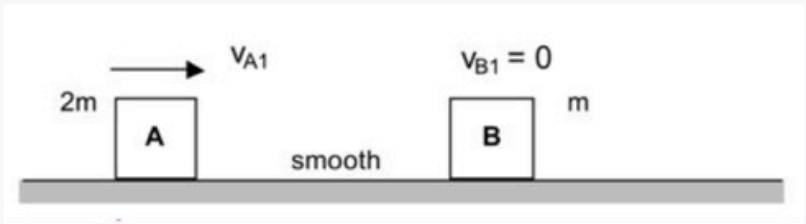
Q1.2
2 Points

During impact, linear momentum for particles A and B TOGETHER is conserved in (select all correct responses):

- [x] the x-direction
- [x] the y-direction
- [x] the n-direction
- [x] the t-direction
- [ ] none of the above

$\Sigma F_x = 0$
$\Sigma F_y = 0$
$\Sigma F_n = 0$
$\Sigma F_t = 0$

Q2 Impact 2
4 Points



Block A impacts stationary Block B, where A and B have masses of 2m and m, respectively.

Q2.1
2 Points

$e = 0 = \frac{v_{B2} - v_{A2}}{v_{A1} - v_{B1}} \Rightarrow v_{B2} = v_{A2}$

If the coefficient of restitution for the impact is e = 0, after impact:

- (•) Blocks A and B stick and move together as one.
- ( ) Block A moves to the right with a different speed than Block B.
- ( ) Block A stops and B moves to the right.
- ( ) Block A rebounds to the left.
- ( ) None of the above.

$2mv_{A1} = 2mv_{A2} + mv_{B2}$
$e = 1 = \frac{v_{B2} - v_{A2}}{v_{A1} - v_{B1}} \Rightarrow$ ($v_{B1} = 0$)
$v_{B2} = v_{A2} + v_{A1}$
$2mv_{A1} = 3mv_{A2} + mv_{A1}$
$\hookrightarrow v_{A2} = \frac{1}{3}v_{A1} > 0 \ (\neq v_{B2})$

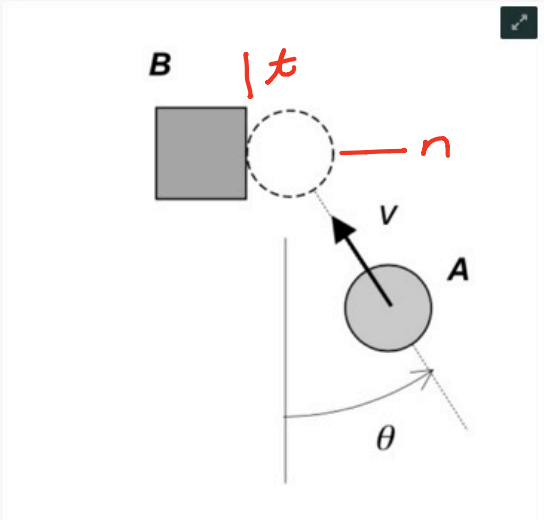
Q2.2
2 Points

If the coefficient of restitution for the impact is e = 1, after impact:

- ( ) Blocks A and B stick and move together as one.
- (•) Block A moves to the right with a different speed than Block B.
- ( ) Block A stops and B moves to the right.
- ( ) Block A rebounds to the left.
- ( ) None of the above.

Q3 Impact 3

1 Point



Particles A and B each have a mass m. Particle A impacts stationary particle B with a speed of v and at an angle of θ, as shown above.

If the coefficient of restitution for the impact is e = 0:

- Blocks A and B stick and move together as one.
- Block A stops and B moves to the left.
- Block A rebounds to the right with continued forward motion.
- None of the above.

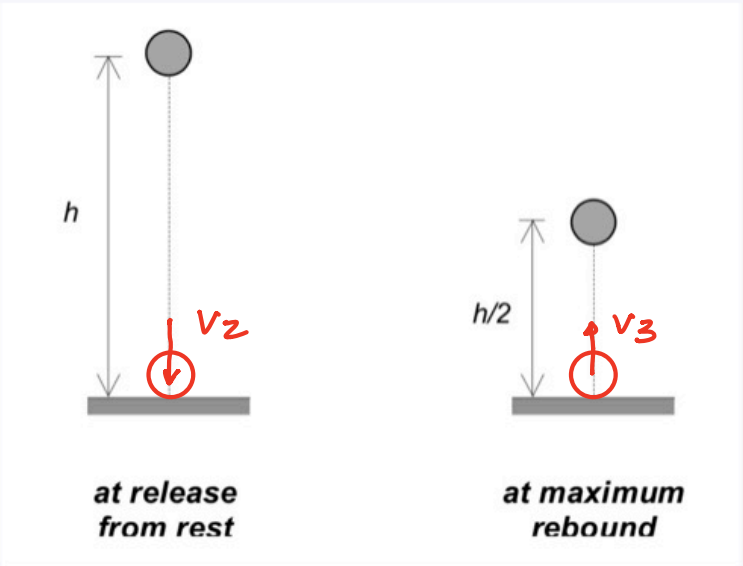
$e=0 \Rightarrow V_{Bn2} = V_{An2}$

$V_{At2} > 0$

$V_{Bt2} = 0$

Q4 Impact 4

2 Points



A particle of mass m is dropped from a height of h above a stationary floor. On rebound, the particle reaches a maximum height of h/2. The coefficient of restitution e for this impact is equal to:

- $e = 0$
- $e = 1/\sqrt{2}$
- $e = 1/2$
- $e = \sqrt{2}$
- $e = 2$
- $e = 1$

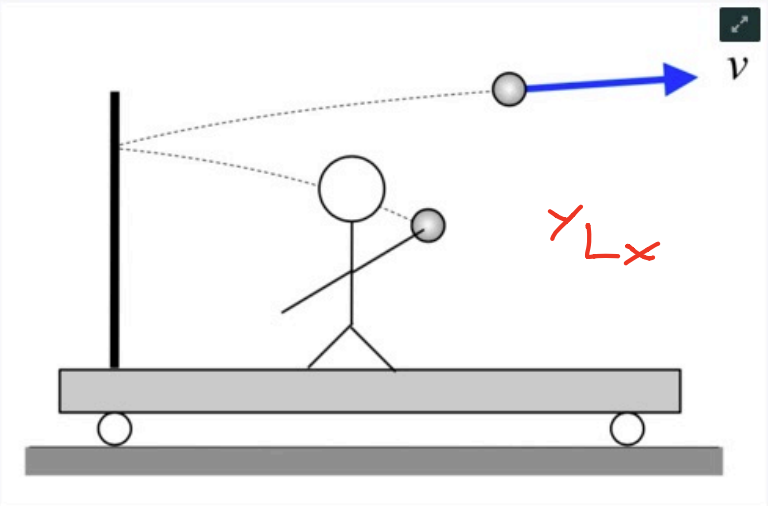
$\frac{1}{2}mv_2^2 = mgh \Rightarrow v_2 = \sqrt{2gh}$

$\frac{1}{2}mv_3^2 = gh/2 \Rightarrow v_3 = \sqrt{gh}$

$e = -\frac{v_3}{(-v_2)} = \frac{1}{\sqrt{2}}$

Q5 Impact 5

2 Points



You are standing at rest on a cart, with the cart being at rest on a smooth horizontal surface You throw a ball at a vertical surface on the cart. If the ball bounces off the wall as shown in the figure, then at the instant shown in the figure above where you are stationary with respect to the car:

- ○ the cart is moving to the right.
- ○ the cart is stationary.
- ◉ the cart is moving to the left.
- ○ more information is needed about the impact to answer this question.

For system = person+cart+ball:

$\Sigma F_x = 0 \Rightarrow$ lin. mom. conserved in x

$$0 = m_{pc} v_{pc2} + m_b v_{b2x} \Rightarrow v_{pc2} = -\frac{m_b}{m_{pc}} v_{b2x} < 0$$