Class 16

Collisions
Review

• Surviving in this course
  – Do the reading before class. Try and understand the concepts
  – In class, challenge your understanding
  – Especially for problem solving, use the resources:
    • Helproom
    • Tutorial sessions
    • Your colleagues
  – Talk, and keep talking till you understand*
  – Get enough sleep (sleep helps learning!)
  – Don’t leave it till the last minute and try and cram

*except, no talking while I am talking!
Course mods

• Based on feedback I will try and do some problem solving on Mondays
• To encourage you to do the reading and really think about the concept quizzes, they will now be for grade.
  – Registering a click => 1pt
  – Get the question right => 2pts
• These replace the reading quizzes
Concepts overview

1. Collisions
   1. Forget your intuition
   2. Use conservation of momentum
   3. Where appropriate, use conservation of energy
Problem Solving Overview

1. Collisions
   1. Forget your intuition
   2. Use conservation of momentum
   3. Where appropriate, use conservation of energy
Elastic and Inelastic collisions

- Elastic: kinetic energy is conserved
- Inelastic: kinetic energy is not conserved
- Perfectly inelastic: objects stick together (have the same velocity) after the collision
- Momentum is always conserved*

*Unless the system is not isolated. Be aware of this, but in general we won’t give you such questions
Problem solving

1. Figure out the total momentum of the system initially
   1. \( \mathbf{p}_{\text{init}} = \mathbf{p}_{\text{final}} \)
   2. \( m \mathbf{v}_{\text{init}} = m \mathbf{v}_{\text{final}} \)
   3. Nb: get the sign of the velocities right

2. Get the initial kinetic energy of the system.

3. Get final kinetic energy
   1. Elastic collisions \( \mathbf{K}_{\text{ei}} = \mathbf{K}_{\text{ef}} \)
   2. Perfectly inelastic: both objects have same final velocity
Consider two carts, of masses $m$ and $2m$, at rest on an air track. If you push first one cart for 3 s and then the other for the same length of time, exerting equal force on each, the kinetic energy of the light cart is

1. larger than
2. equal to
3. smaller than

the kinetic energy of the heavy car.