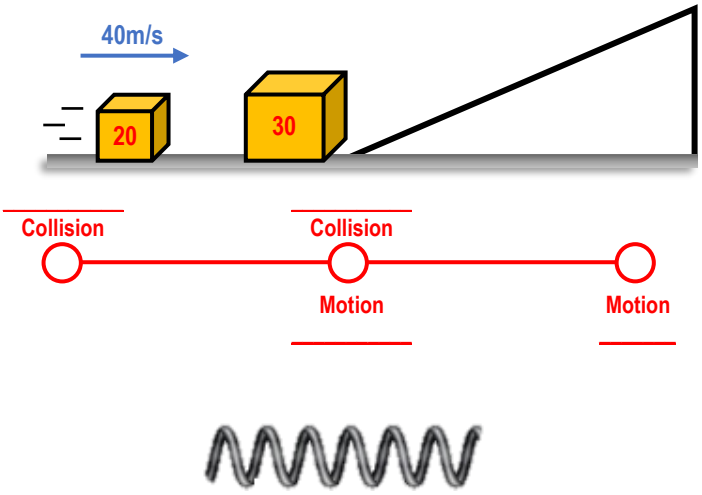
CONCEPT: COLLISION PROBLEMS WITH MOTION/ENERGY

- Some problems involve a collision AND motion with changing speeds/heights after the collision.
  - In these problems, we'll use BOTH Conservation of _____ AND Conservation of _____.
    (during collision part) (during motion part)
  - You'll often start with one of these EQs, but have to use the other to fully solve.

EXAMPLE: A 20-kg crate moving with 40m/s to the right on a smooth surface collides and sticks to 30-kg crate initially at rest. After the collision, the crates move together up a frictionless incline. How high do the crates travel before stopping?



CONSERVATION OF MOMENTUM WITH ENERGY

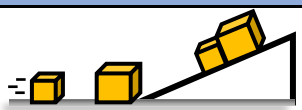
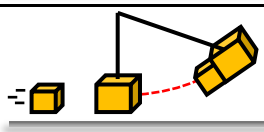
1) Draw Diagrams, label points of interest
(Points of Interest: Before/After Collision, end of motion)
2) Write Momentum & Energy Conservation EQs
3) Plug in values & solve

CONSERVATION EQUATIONS

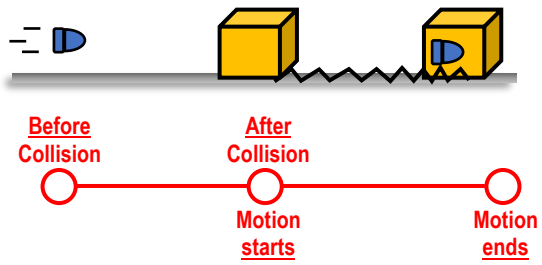
$m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$ **(C.O.M)**

$K_i + U_i + W_{NC} = K_f + U_f$ **(C.O.E)**

- In Comp. Inelastic Collisions, Energy isn't conserved *during* collision (A→B), but is conserved *after* (B→C) (if W_{NC} = __.)
- Most problems solved using this method have one of these 4 setups:

Situation	Diagram
1) Collision → Incline	
2) Collision → Spring	
3) Collision → Friction	
4) Collision → Pendulum	

PROBLEM: A 300g bullet is fired horizontally into a 10-kg wooden block initially at rest on a horizontal surface. The coefficient of kinetic friction between block and surface is 0.6. The bullet remains embedded in the block, which then slides 35 m along the surface before stopping. What was the initial speed of the bullet?



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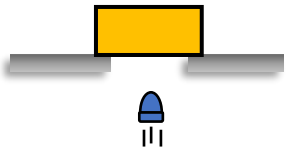
PROBLEM: A 6g bullet is fired *upwards* at 800 m/s into the *bottom* of a 1.2-kg wooden block at rest. The bullet travels through the center of the block and emerges moving upwards at 150m/s. What maximum height does the block reach?



CONSERVATION OF MOMENTUM WITH ENERGY

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(*Points of Interest: Before/After Collision, end of motion)*
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