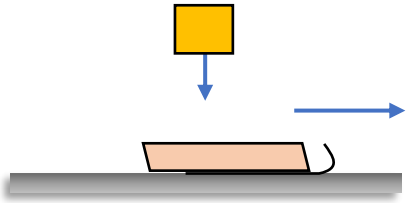
CONCEPT: ADDING MASS TO A MOVING OBJECT/SYSTEM

- In some problems, mass is added to an object that's *already moving*.
  - When this happens, both objects in the system (old mass + new mass) have the same *final velocity.*
  - Because momentum is conserved, whenever 1 object gains/loses momentum, the other loses/gains *the same amount*.

EXAMPLE: A 70-kg sled is moving 10m/s to the right on smooth ice when a 30-kg box is dropped vertically onto it. Calculate the **a)** final speed of the system; **b)** change in momentum of the box; **c)** change in momentum of the sled.



PROBLEM**:** A 40-kg skater runs parallel to a 3-kg skateboard**.** Both are moving to the right at 10m/s**.** The skater jumps on the board, and they move continue moving right (i.e. no change in direction)**.** Calculate the final speed of the system**.**

CONSERVATION OF MOMENTUM
1) Draw Diagrams for Before & After **2)** Write **Conservation of Momentum** EQ **3)** Plug in values & solve