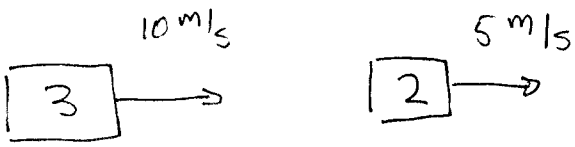
SITUATION 1: Two blocks are sliding on a frictionless surface. A 2 kg block is moving to the right at 5 m/s. Behind it a 3 kg block is approaching, moving at 10 m/s (toward the right). The blocks undergo a totally elastic collision. Find the velocities of both blocks after the collision.

DRAW A PICTURE OF THE BLOCKS BEFORE THE COLLISION and indicate their velocity vectors.

LAB FRAME



DETERMINE THE CM VELOCITY OF THE SYSTEM

$M_{Tot} V_{cm} = m_1 V_1 + m_2 V_2$

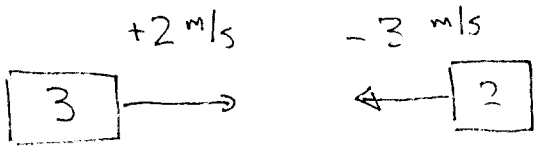
$5 V_{cm} = 3(10) + 2(5)$

$= 40$

$V_{cm} = 8$

TRANSFORM TO THE CM FRAME BY SUBTRACTING v_{cm} FROM EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

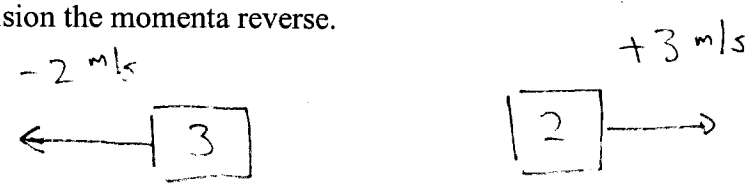
CM FRAME



==== COLLISION ===== COLLISION ===== COLLISION =====COLLISION ===

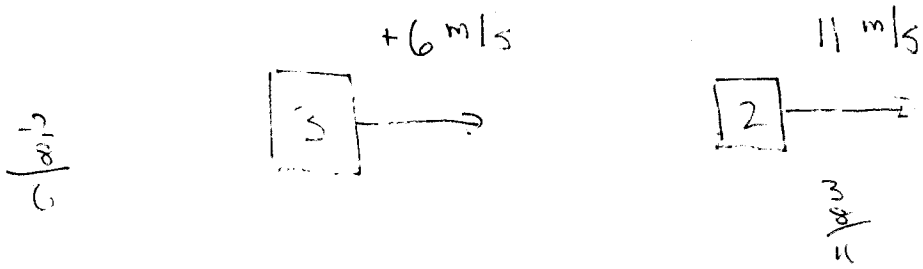
DRAW A PICTURE OF THE BLOCKS JUST AFTER THE COLLISION. Recall in a totally elastic collision the momenta reverse.

CM FRAME



TRANSFORM BACK TO THE LAB FRAME BY ADDING v_{cm} TO EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

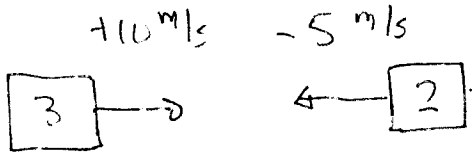
LAB FRAME



SITUATION 2: Two blocks are sliding on a frictionless surface. A 2 kg block is moving to the left at 5 m/s. In front of it, a 3 kg block is approaching, moving at 10 m/s (toward the right). The blocks undergo a totally elastic collision. Find the velocities of both blocks after the collision.

DRAW A PICTURE OF THE BLOCKS BEFORE THE COLLISION and indicate their velocity vectors.

LAB FRAME



DETERMINE THE CM VELOCITY OF THE SYSTEM

$m_{Tot} v_{cm} = m_1 v_1 + m_2 v_2$

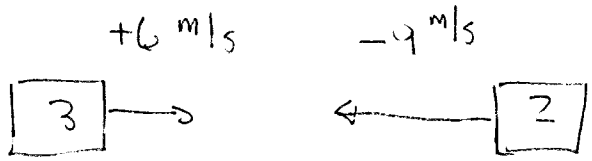
$5 \; v_{cm} = 3(10) + 2(-5)$

$= 20$

$v_{cm} = 4$

TRANSFORM TO THE CM FRAME BY SUBTRACTING v_{cm} FROM EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

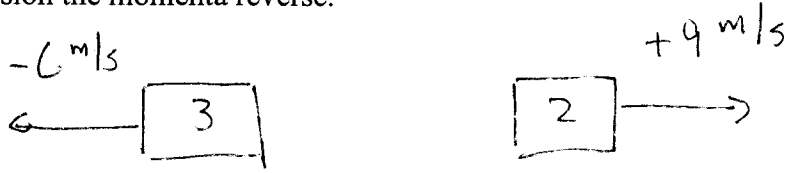
CM FRAME



==== COLLISION ===== COLLISION ===== COLLISION =====COLLISION ===

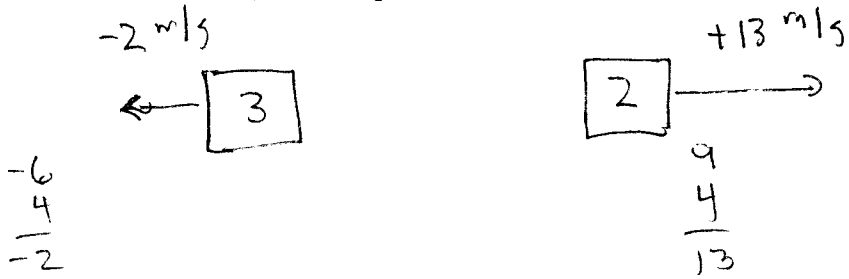
DRAW A PICTURE OF THE BLOCKS JUST AFTER THE COLLISION. Recall in a totally elastic collision the momenta reverse.

CM FRAME



TRANSFORM BACK TO THE LAB FRAME BY ADDING v_{cm} TO EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

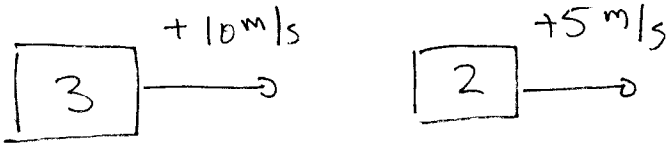
LAB FRAME



SITUATION 3: Two blocks are sliding on a frictionless surface. A 2 kg block is moving to the right at 5 m/s. Behind it a 3 kg block is approaching, moving at 10 m/s (toward the right). The blocks undergo a totally **inelastic** collision. Find the velocity of the combined block after the collision.

DRAW A PICTURE OF THE BLOCKS BEFORE THE COLLISION and indicate their velocity vectors.

LAB FRAME



DETERMINE THE CM VELOCITY OF THE SYSTEM

$M_{TOT} V_{cm} = m_1 v_1 + m_2 v_2$

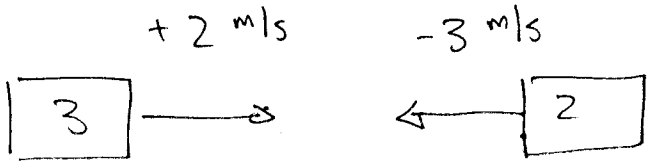
$= 3(10) + 2(5)$

$= 40$

$V_{cm} = 8$

TRANSFORM TO THE CM FRAME BY SUBTRACTING v_{cm} FROM EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

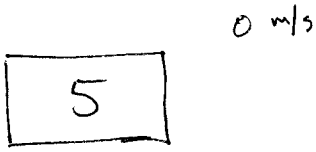
CM FRAME



==== COLLISION ===== COLLISION ===== COLLISION =====COLLISION ===

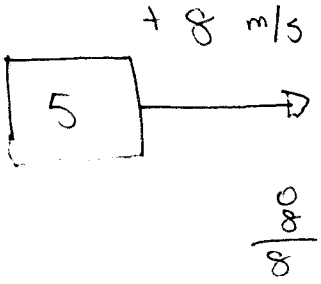
DRAW A PICTURE OF THE BLOCKS JUST AFTER THE COLLISION. Recall in a totally elastic collision the momenta reverse.

CM FRAME



TRANSFORM BACK TO THE LAB FRAME BY ADDING v_{cm} TO EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

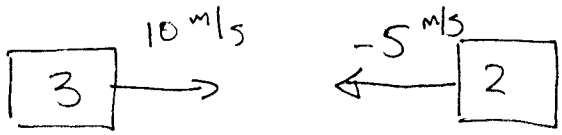
LAB FRAME



SITUATION 4: : Two blocks are sliding on a frictionless surface. A 2 kg block is moving to the left at 5 m/s. In front of it, a 3 kg block is approaching, moving at 10 m/s (toward the right). The blocks undergo a totally **inelastic** collision. Find the velocity of the combined block after the collision.

DRAW A PICTURE OF THE BLOCKS BEFORE THE COLLISION and indicate their velocity vectors.

LAB FRAME



DETERMINE THE CM VELOCITY OF THE SYSTEM

$M_{TOT} V_{cm} = m_1 V_1 + m_2 V_2$

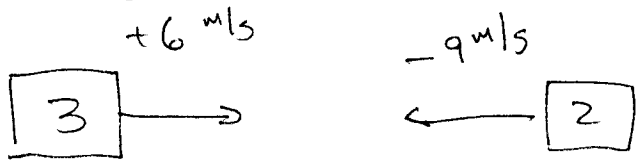
$5 \quad V_{cm} = 3(10) + 2(-5)$

$= 20$

$V_{cm} = 4$

TRANSFORM TO THE CM FRAME BY SUBTRACTING v_{cm} FROM EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

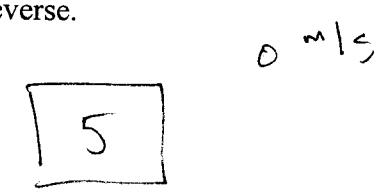
CM FRAME



==== COLLISION ==== COLLISION ==== COLLISION ====COLLISION ===

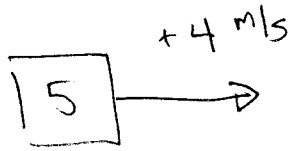
DRAW A PICTURE OF THE BLOCKS JUST AFTER THE COLLISION. Recall in a totally elastic collision the momenta reverse.

CM FRAME



TRANSFORM BACK TO THE LAB FRAME BY ADDING v_{cm} TO EACH BLOCK. Make sure you make the velocity vectors point in the correct directions.

LAB FRAME



$$\begin{array}{r} 0 \\ 4 \\ \hline 4 \end{array}$$