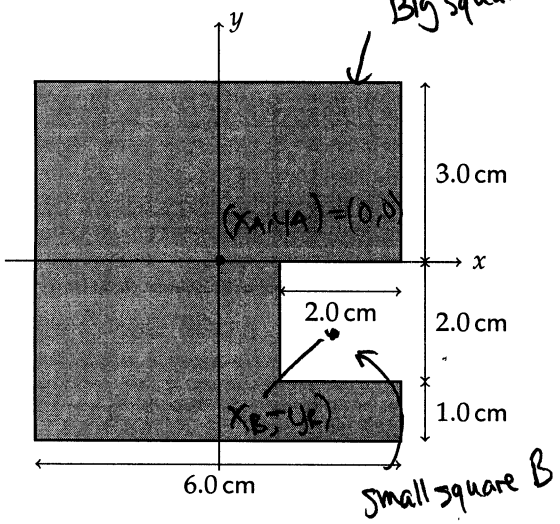
Student #: _____ Student Name: _____

AP Physics Class 4: Center of Mass

1. Find the center of mass of the plate shown below. Assume that the surface area mass density is uniform.



$m_A = 36$

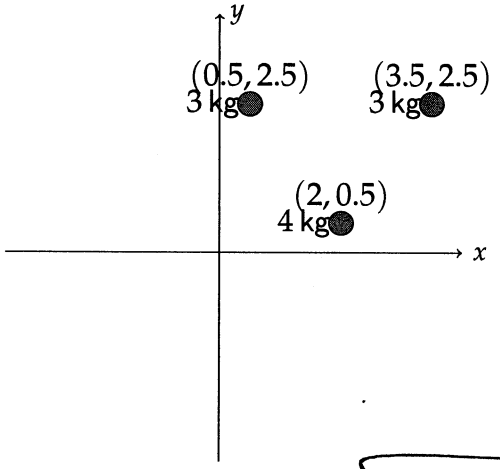
$m_B = -4$

$$X_{CM} = \frac{m_A x_A + m_B x_B}{m_A + m_B} = \frac{-(2)(4)}{36-4} = \frac{-6}{32}$$

$$y_{cm} = \frac{m_A y_A + m_B y_B}{m_A + m_B} = \frac{+(4)(-1)}{32} = \frac{+4}{32}$$

$$\vec{X}_{cm} = \left(\frac{-6}{32}, \frac{+4}{32}\right)$$

2. Three masses are located at the locations shown below. Where should a 5.0 kg mass is to be placed such that the center of mass is at the origin?



$$X_{cm} = \frac{(0.5)(3) + (3.5)(3) + (2)(4) + 5x}{15} = 0$$

$$16.5 + 5x = 0 \rightarrow x = -3.3$$

$$y_{cm} = \frac{(2.5)(3) + (2.5)(3) + (0.5)(4) + 5y}{15} = 0$$

$$17 + 5y = 0 \rightarrow y = -3.4$$

$$\vec{X}(-3.3, -3.4)$$