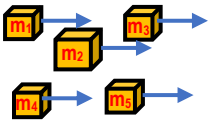


CONCEPT: CENTER OF MASS

- Sometimes it's useful to *simplify* a group/system of objects by replacing ALL objects with a single, equivalent object.

- This system  can be simplified/replaced with a **single** object . When combining objects:

- **MASS** of the combined object is the _____ of the masses of all objects: $M = \underline{\hspace{2cm}}$.

- **CENTER OF MASS (C.O.M)** of the combined object is the _____ of all objects in the system.

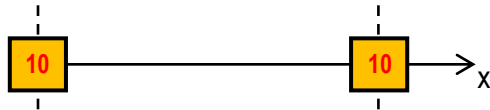
Single object:

Two Obj's (equal mass):

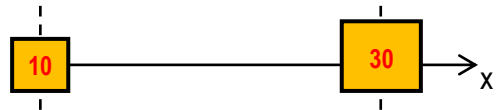
Two Obj's (unequal mass):

$$X_{com} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

EXAMPLE: Two objects ($m_1=10\text{kg}$, $m_2=10\text{kg}$) are placed on the x-axis. m_1 is placed at $x=0$ and m_2 is placed at $x=4$. Calculate the center of mass for the system of objects.



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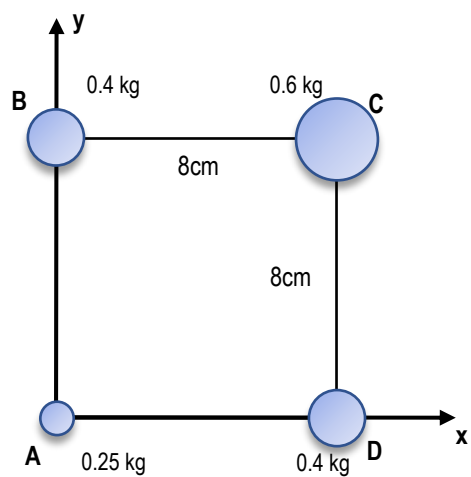
- The **C.O.M** is *NOT* necessarily in the middle of objs. When given different masses, it is often closer to _____ objects.

PROBLEM: Three weights are placed along the y axis: a 1.0-kg at +2.00 m, a 1.50-kg at the origin, and a 7.5-kg at -1.5 m. Where is the center of mass of these weights?

CENTER OF MASS

$$X_{com} = \frac{m_1x_1 + m_2x_2 + \dots}{m_1 + m_2 + \dots}$$

PROBLEM: Calculate the (x,y) coordinates of the center of mass (in cm) for the system of objects shown below.



CENTER OF MASS

$$X_{com} = \frac{m_1x_1 + m_2x_2 + \dots}{m_1 + m_2 + \dots}$$