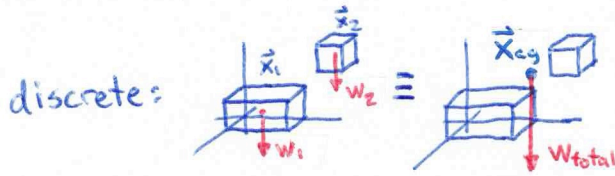


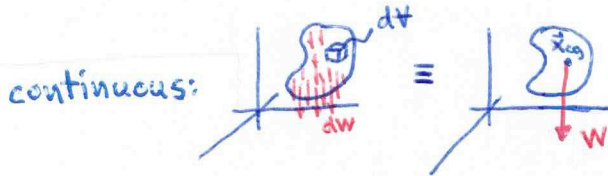
# Centre of Gravity ( $\vec{x}_{cg}$ )

no assumptions, both density ( $\rho$ ) and gravity ( $g$ ) can vary.

## 3 dimensional (3D):



$$\vec{x}_{cg} = \frac{\sum \vec{x}_i w_i}{\sum w_i} = \frac{\sum \vec{x}_i m_i g_i}{\sum m_i g_i}$$

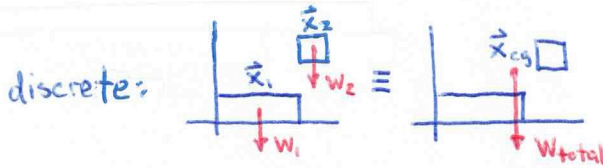


$$\vec{x}_{cg} = \frac{\int \vec{x} dW}{\int dW} = \frac{\int \vec{x} \rho g dV}{\int \rho g dV} \quad \text{where:}$$

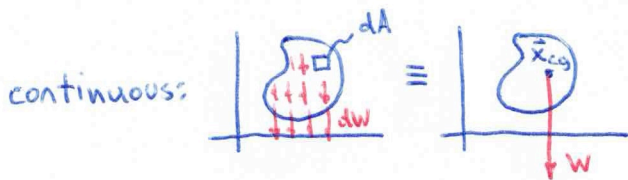
$$\rho = \rho(x, y, z)$$

$$g = g(x, y, z)$$

## 2 dimensional (2D):



$$\vec{x}_{cg} = \frac{\sum \vec{x}_i w_i}{\sum w_i} = \frac{\sum \vec{x}_i m_i g_i}{\sum m_i g_i}$$

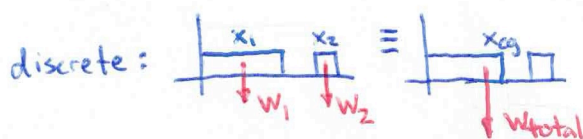


$$\vec{x}_{cg} = \frac{\int \vec{x} dW}{\int dW} = \frac{\int \vec{x} \rho g dA}{\int \rho g dA} \quad \text{where:}$$

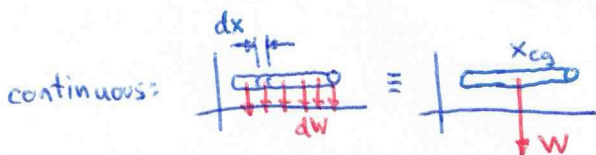
$$\rho = \rho(x, y)$$

$$g = g(x, y)$$

## 1 dimensional (1D):



$$x_{cg} = \frac{\sum x_i w_i}{\sum w_i} = \frac{\sum x_i m_i g_i}{\sum m_i g_i}$$



$$x_{cg} = \frac{\int x dW}{\int dW} = \frac{\int x \rho g dx}{\int \rho g dx} \quad \text{where:}$$

$$\rho = \rho(x)$$

$$g = g(x)$$