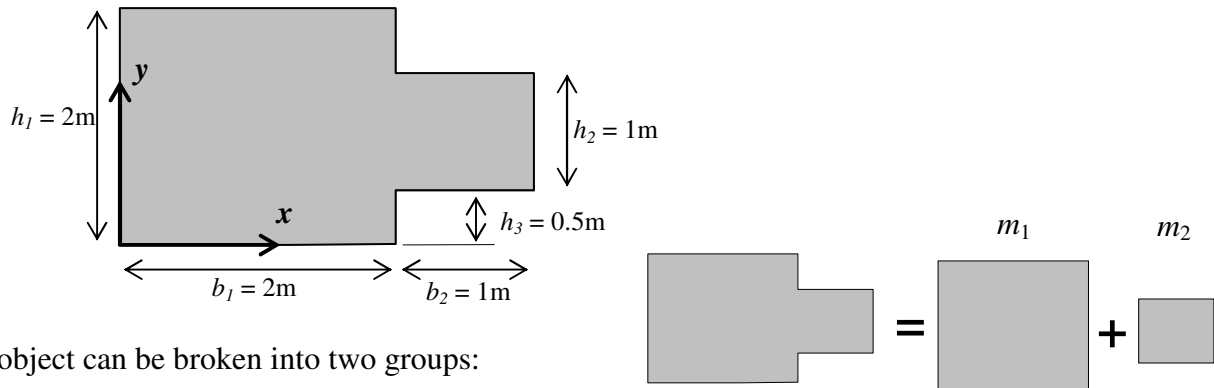


Center of Mass

What is the center of mass of these “objects”?

1.



This object can be broken into two groups:

$$A_1 = b_1 h_1 = 4.0 \text{ m}^2$$

$$A_2 = b_2 h_2 = 1.0 \text{ m}^2$$

$$A_{\text{total}} = A_1 + A_2 = 5.0 \text{ m}^2$$

$$x_{\text{cm1}} = (b_1)/2 = 1\text{m}$$

$$y_{\text{cm1}} = (h_1)/2 = 1\text{m}$$

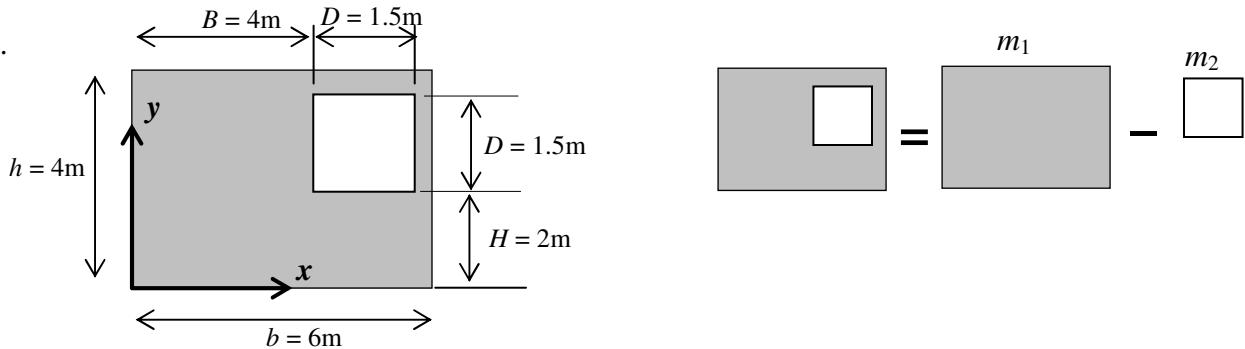
$$x_{\text{cm2}} = b_1 + (b_2)/2 = 2.5 \text{ m}$$

$$y_{\text{cm2}} = h_3 + (h_2)/2 = 1\text{m}$$

$$\text{So } x_{\text{CM}} = \frac{1}{5\text{m}^2} [(1\text{m})(4\text{m}^2) + (2.5\text{m})(1\text{m}^2)] = \boxed{x_{\text{CM}} = 1.3 \text{ m}}$$

$$\text{Also, } y_{\text{CM}} = \frac{1}{5\text{m}^2} [(1\text{m})(4\text{m}^2) + (1\text{m})(1\text{m}^2)] = \boxed{y_{\text{CM}} = 1.0 \text{ m}}$$

2.



$$A_1 = bh = 24.0 \text{ m}^2$$

$$A_2 = -D^2 = -2.25 \text{ m}^2 \text{ (because this is a hole, this area is negative!)}$$

$$A_{\text{total}} = A_1 + A_2 = 21.75 \text{ m}^2$$

$$x_{\text{cm1}} = b/2 = 3\text{m}$$

$$y_{\text{cm1}} = h/2 = 2\text{m}$$

$$x_{\text{cm2}} = B + \frac{1}{2}D = 4.75 \text{ m}$$

$$y_{\text{cm2}} = H + \frac{1}{2}D = 2.75 \text{ m}$$

$$\text{So } x_{\text{CM}} = \frac{1}{21.75\text{m}^2} [(3\text{m})(24\text{m}^2) + (4.75\text{m})(-2.25\text{m}^2)] = \boxed{x_{\text{CM}} = 2.8190 \text{ m}}$$

$$\text{Also, } y_{\text{CM}} = \frac{1}{21.75\text{m}^2} [(2\text{m})(24\text{m}^2) + (2.75\text{m})(-2.25\text{m}^2)] = \boxed{y_{\text{CM}} = 1.9224 \text{ m}}$$