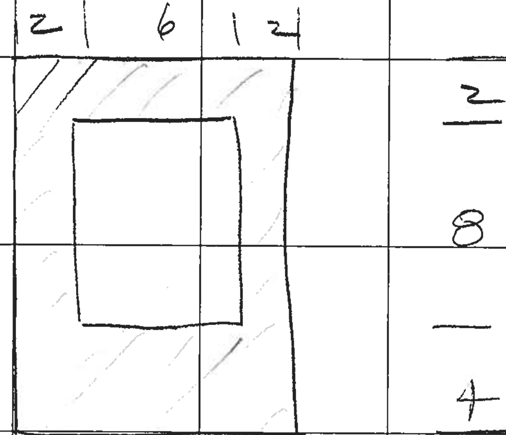
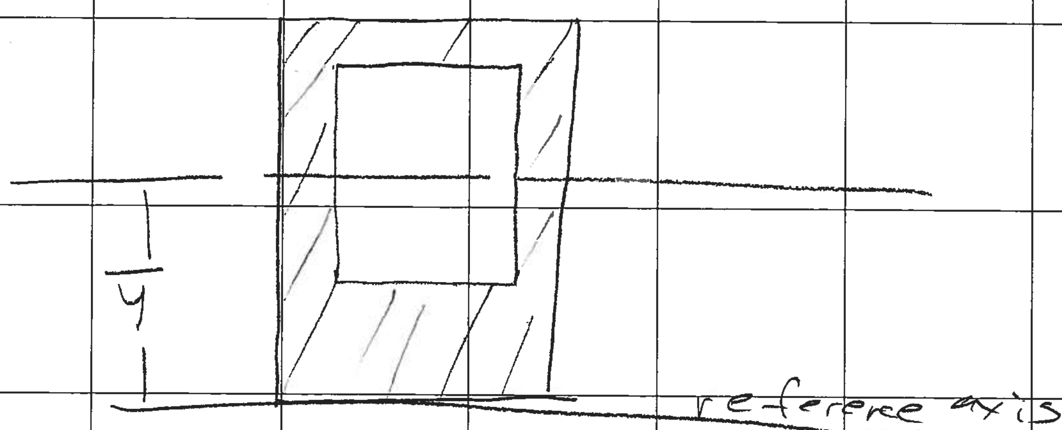
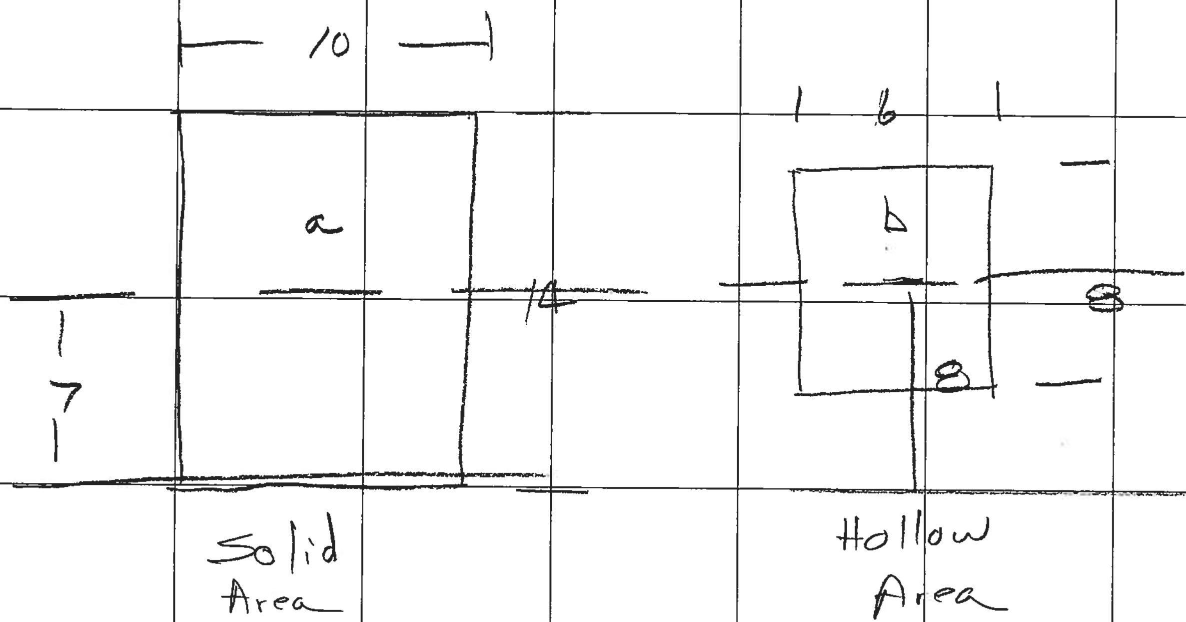
Locate the horizontal centroidal axis of the beam cross-section shown and calculate the area moment of inertia about this axis.



First we have to establish a reference axis. In this case the reference axis will be located at the base of the cross-section as shown



Then divide the cross-section into pieces with known centroids. In this case rectangle a and rectangle b as shown



Then calculate $\bar{y}$ using the following formula for composite areas

$$\bar{y} = \frac{\sum A_i y_i}{\sum A_i} \qquad (1)$$

$$\bar{y} = \frac{(10)(14)(7) - (6)(8)(8)}{(10)(14) - (6)(8)} \qquad (2)$$

$$\bar{y} = \frac{596}{92} \qquad (3)$$

$$\bar{y} = 6.48 \qquad (4)$$

Then calculate the area moment of inertia of the composite area as follows with the parallel axis theorem for composite areas

$$I = \sum \left[\bar{I}_i + A_i d_i^2 \right] \quad (5)$$

(6) $$I = \left[\frac{1}{12}(10)(14)^3 + (10)(14)(7-6.48)^2 \right] - \left[\frac{1}{12}(6)(8)^3 + (6)(8)(8-6.48)^2 \right]$$

(7) $$I = 2286.7 + 37.9 - 256 - 110.9$$

(8) $$I = 1957.7$$

in^4 or m^4 or mm^4