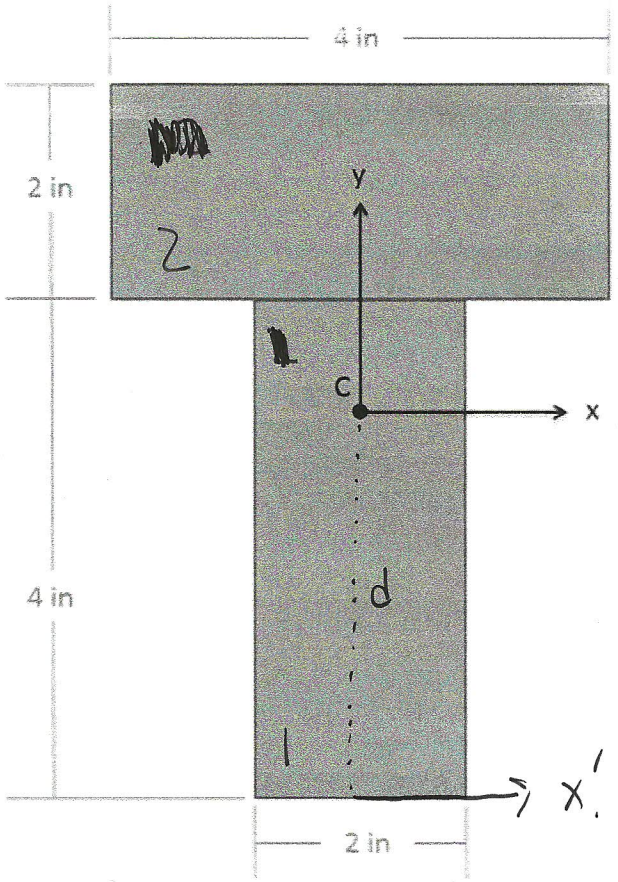
A beam is made by connecting two 2" x 4" beams in a T pattern with the cross section as shown below. Determine the location of the centroid of this combined cross section and then find the rectangular area moment of inertia about the x axis through the centroid point.



Shape	$\bar{X}$	$\bar{Y}$	Area	I_{xxc}	r	I_{xxadj}
1	0	2in	$8in^2$	$10.667in^4$	1.5in	$28.667in^4$
2	0	5in	$8in^2$	$2.667in^4$	1.5in	$20.667in^4$
Total	0	3.5in	$16in^2$			$49.334in^4$

Centroid location

$$\bar{Y}_{total} = \frac{A_1 Y_1 + A_2 Y_2}{A_{total}} = \frac{(8)(2) + (5)(8)}{16}$$

$$\boxed{\bar{Y}_{total} = 3.5\,in}$$

I_{xxc}

$$I_{xx1c} = \frac{1}{12} bh^3 = \frac{1}{12}(2in)(4in)^3$$

$$I_{xx1c} = 10.667\,in^4$$

$$I_{xx2c} = \frac{1}{12} bh^3 = \frac{1}{12}(4in)(2in)^3$$

$$I_{xx2c} = 2.667\,in^4$$

r

$$r_1 = 3.5 - 2 = 1.5\,in$$

$$r_2 = 5 - 3.5 = 1.5\,in$$

$I_{xx\,adj}$

$$I_{xx_1 adj} = I_{xx1c} + A_1 r_1^2$$

$$I_{xx_1 adj} = 10.667\,in^4 + (8in^2)(1.5in)^2$$

$$I_{xx_1 adj} = 28.667\,in^4$$

$$I_{xx_2 adj} = I_{xx_2 c} + A_2 r_2^2$$

$$I_{xx_2 adj} = 2.667\,in^4 + (8\,in^2)(1.5\,in)^2$$

$$I_{xx_2 adj} = 20.667\,in^4$$

Total

$$I_{xx\,total} = I_{xx1\,adj} + I_{xx2\,adj}$$

$$I_{xx\,total} = 28.667\,in^4 + 20.667\,in^4$$

$$\boxed{I_{xx\,total} = 49.334\,in^4}$$