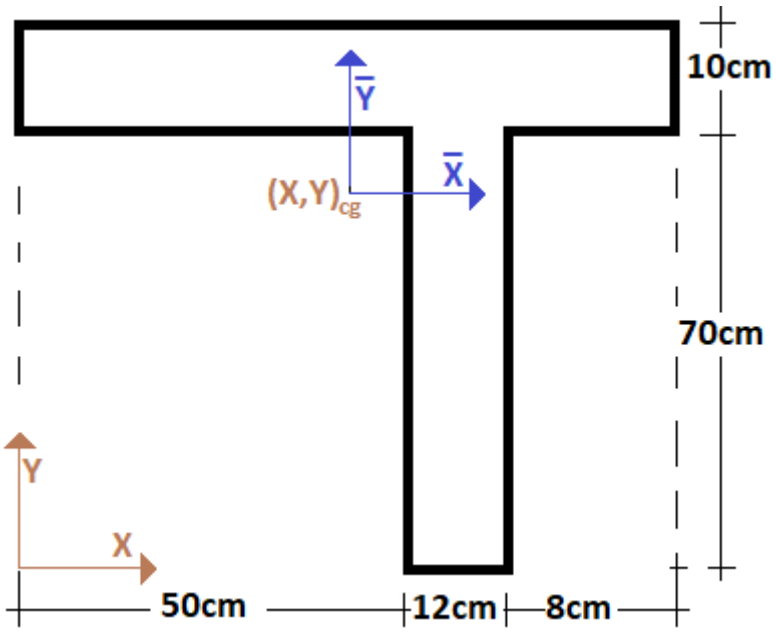
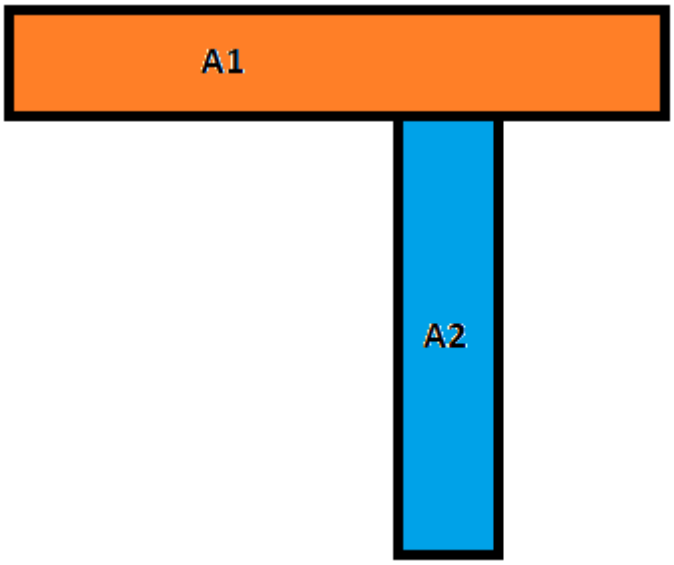
Inercia de la sección en Te no simétrica



#1: [CaseMode := Sensitive, InputMode := Word]

División en figuras geométricas conocidas:



Áreas, en cm2:

#2: [A1 := 10·(50 + 12 + 8), A2 := 12·70, A := A1 + A2]

#3: [A1 := 700, A2 := 840, A := 1540]

Centroides de cada área, en cm:

#4:
$$\begin{bmatrix} Xcg1 := \dfrac{50 + 12 + 8}{2} & Ycg1 := 70 + \dfrac{10}{2} \\ Xcg2 := 50 + \dfrac{12}{2} & Ycg2 := \dfrac{70}{2} \end{bmatrix}$$

#5:
$$\begin{bmatrix} Xcg1 := 35 & Ycg1 := 75 \\ Xcg2 := 56 & Ycg2 := 35 \end{bmatrix}$$

#6:
$$\begin{bmatrix} Xcg1 := 35 & Ycg1 := 75 \\ Xcg2 := 56 & Ycg2 := 35 \end{bmatrix}$$

Centroide de toda la figura, en cm:

#7: $$\left[Xcgf := \frac{A1 \cdot Xcg1 + A2 \cdot Xcg2}{A}, \; Ycgf := \frac{A1 \cdot Ycg1 + A2 \cdot Ycg2}{A}\right]$$

#8: $$[Xcgf := 46.45454545, \; Ycgf := 53.18181818]$$

#9: $$\left[Xcgf := \frac{511}{11}, \; Ycgf := \frac{585}{11}\right]$$

Inercias centroidales de cada área, en cm4:

#10: $$\begin{bmatrix} Ixcg1 := \frac{1}{12} \cdot (50 + 12 + 8) \cdot 10^3 & Iycg1 := \frac{1}{12} \cdot (50 + 12 + 8) \cdot 10^3 & Ixycg1 := 0 \\ Ixcg2 := \frac{1}{12} \cdot 12 \cdot 70^3 & Iycg2 := \frac{1}{12} \cdot 12^3 \cdot 70 & Ixycg2 := 0 \end{bmatrix}$$

#11: $$\begin{bmatrix} Ixcg1 := 5833.333333 & Iycg1 := 2.858333333 \cdot 10^5 \\ Ixcg2 := 3.43 \cdot 10^5 & Iycg2 := 1.008 \cdot 10^4 \end{bmatrix}$$

#12: $$\begin{bmatrix} Ixcg1 := \frac{17500}{3} & Iycg1 := \frac{857500}{3} \\ Ixcg2 := 343000 & Iycg2 := 10080 \end{bmatrix}$$

Inercias de cada área respecto a los ejes centroidales de toda la figura, en cm4:

#13: $$\begin{bmatrix} Ixcgf1 := Ixcg1 + A1 \cdot (Ycg1 - Ycgf)^2 & Iycgf1 := Iycg1 + A1 \cdot (Xcg1 - Xcgf)^2 & Ixycf1 := Ixycg1 + A1 \cdot (Xcg1 - Xcgf) \cdot (Ycg1 - Ycgf) \\ Ixcgf2 := Ixcg2 + A2 \cdot (Ycg2 - Ycgf)^2 & Iycgf2 := Iycg2 + A2 \cdot (Xcg2 - Xcgf)^2 & Ixycf2 := Ixycg2 + A2 \cdot (Xcg2 - Xcgf) \cdot (Ycg2 - Ycgf) \end{bmatrix}$$

#14: $$\begin{bmatrix} Ixcgf1 := 3.390564738 \cdot 10^5 & Iycgf1 := 3.776779614 \cdot 10^5 & Ixycf1 := -1.749421487 \cdot 10^5 \\ Ixcgf2 := 6.206859504 \cdot 10^5 & Iycgf2 := 8.661719008 \cdot 10^4 & Ixycf2 := -1.457851239 \cdot 10^5 \end{bmatrix}$$

#15: $$\begin{bmatrix} Ixcgf1 := \frac{123077500}{363} & Iycgf1 := \frac{137097100}{363} & Ixycf1 := -\frac{21168000}{121} \\ Ixcgf2 := \frac{75103000}{121} & Iycgf2 := \frac{10480680}{121} & Ixycf2 := -\frac{17640000}{121} \end{bmatrix}$$

Inercias respecto a los ejes centroidales de toda la figura, en cm4:

#16: $$\begin{bmatrix} Ixcgf := Ixcgf1 + Ixcgf2 \\ Iycgf := Iycgf1 + Iycgf2 \\ Ixycgf := Ixycf1 + Ixycf2 \end{bmatrix}$$

#17: $$\begin{bmatrix} Ixcgf := 9.597424242 \cdot 10^5 \\ Iycgf := 4.642951515 \cdot 10^5 \\ Ixycgf := -3.207272727 \cdot 10^5 \end{bmatrix}$$

#18:
$$\begin{bmatrix} Ixcgf := \frac{31671500}{33} \\ Iycgf := \frac{15321740}{33} \\ Ixycgf := -\frac{3528000}{11} \end{bmatrix}$$

Inercias de toda la figura respecto a los ejes X e Y:

#19:
$$\begin{bmatrix} Ixf := Ixcgf + A \cdot Ycgf^2 \\ Iyf := Iycgf + A \cdot Xcgf^2 \\ Ixyf := Ixycgf + A \cdot Xcgf \cdot Ycgf \end{bmatrix}$$

#20:
$$\begin{bmatrix} Ixf := 5.315333333 \cdot 10^6 \\ Iyf := 3.787653333 \cdot 10^6 \\ Ixyf := 3.4839 \cdot 10^6 \end{bmatrix}$$

#21:
$$\begin{bmatrix} Ixf := \frac{15946000}{3} \\ Iyf := \frac{11362960}{3} \\ Ixyf := 3483900 \end{bmatrix}$$

Ix toda (cm4)=	**5 315 333.33**
Iy toda (cm4)=	**3 787 653.33**
Ixy toda (cm4)=	**3 483 900.00**

#	Lx (cm)	Ly (cm)	A (cm2)	Xcg (cm)	Ycg (cm)	A*Xcg (cm3)	A*Ycg (cm3)	Ix cg (cm4)	Iy cg (cm4)	Ixy cg (cm4)	Ix cg toda (cm4)	Iy cg to (cm4
1	70.00	10.00	700.00	35.00	75.00	24 500.00	52 500.00	5 833.33	285 833.33	0.00	339 056.47	377 677
2	12.00	70.00	840.00	56.00	35.00	47 040.00	29 400.00	343 000.00	10 080.00	0.00	620 685.95	86 617.
Toda			**1 540.00**	46.45	53.18	71 540.00	81 900.00				**959 742.42**	**464 295**

Ángulo (radianes) de rotación para inercias máximas y mínimas:

#22:
$$TAN(2 \cdot \theta) = \frac{2 \cdot Ixycgf}{Iycgf - Ixcgf}$$

#23:
$$\theta := \frac{1}{2} \cdot ATAN\left(\frac{2 \cdot Ixycgf}{Iycgf - Ixcgf}\right)$$

#24:
$$\theta := 0.4565623000$$

#25:
$$\theta := \frac{ATAN\left(\frac{239}{1861}\right)}{2} + \frac{\pi}{8}$$

Inercias máximas y mínimas:

#26:
$$\begin{bmatrix} Ixp = \frac{Ix - Iy}{2}\cdot COS(2\cdot\theta) - Ixy\cdot SIN(2\cdot\theta) + \frac{Ix + Iy}{2} \\ Iyp = \frac{Iy - Ix}{2}\cdot COS(2\cdot\theta) + Ixy\cdot SIN(2\cdot\theta) + \frac{Ix + Iy}{2} \end{bmatrix}$$

#27:
$$\begin{bmatrix} Ixp = \frac{Ixcgf - Iycgf}{2}\cdot COS\left(2\cdot\left(\frac{ATAN\left(\frac{239}{1861}\right)}{2} + \frac{\pi}{8}\right)\right) - Ixycgf\cdot SIN\left(2\cdot\left(\frac{ATAN\left(\frac{239}{1861}\right)}{2} + \frac{\pi}{8}\right)\right) + \\ Iyp = \frac{Iycgf - Ixcgf}{2}\cdot COS\left(2\cdot\left(\frac{ATAN\left(\frac{239}{1861}\right)}{2} + \frac{\pi}{8}\right)\right) + Ixycgf\cdot SIN\left(2\cdot\left(\frac{ATAN\left(\frac{239}{1861}\right)}{2} + \frac{\pi}{8}\right)\right) + \end{bmatrix}$$
$$\begin{bmatrix} \frac{Ixcgf + Iycgf}{2} \\ \frac{Ixcgf + Iycgf}{2} \end{bmatrix}$$

#28:
$$\begin{bmatrix} Ixp = 1.117275476\cdot 10^{6} \\ Iyp = 3.067620994\cdot 10^{5} \end{bmatrix}$$

#29:
$$\begin{bmatrix} Ixp = \frac{3360\cdot\sqrt{1760221}}{11} + \frac{23496620}{33} \\ Iyp = \frac{23496620}{33} - \frac{3360\cdot\sqrt{1760221}}{11} \end{bmatrix}$$

Rotación de ejes:	
θMaxMin (rad)=	0.46
θMaxMin (grados)=	26.16
Ix'=	1 117 275.48
Iy'=	306 762.10