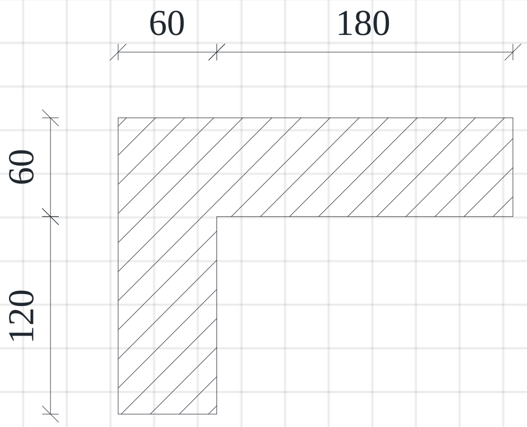
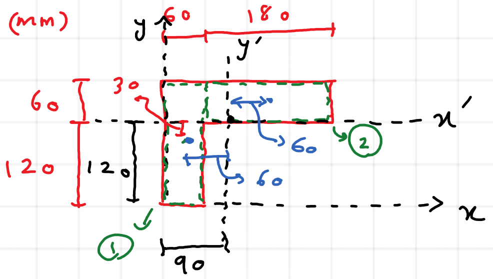
In this instructional video, we will walk you through the process of calculating the moment of inertia around the planar axis of an asymmetric cross-section, a fundamental concept in mechanics. The cross-section's dimensions are illustrated in the figure below, and we will use these measurements to perform the calculation.

The moment of inertia is a crucial property that helps determine an object's resistance to rotational motion. It is calculated by determining the distribution of mass in the object and the distance of each mass element from the axis of rotation.

In the following videos, we will delve deeper into the topic and calculate the moment of inertia around the principal axis, which is another essential concept in mechanics. Stay tuned to learn more!





$$\bar{x} = \frac{\Sigma A_i x_i}{\Sigma A_i} = \frac{\overset{mm^2}{180 \times 60} \times \overset{mm}{30} + \overset{mm^2}{180 \times 60} \times \overset{mm}{150}}{180 \times 60 + 180 \times 60} = 90 \text{ mm}$$

$$\bar{y} = \frac{\Sigma A_i y_i}{\Sigma A_i} = \frac{\overset{mm^2}{180 \times 60} \times \overset{mm}{90} + \overset{mm^2}{180 \times 60} \times \overset{mm}{150}}{\underset{mm^2}{180 \times 60 + 180 \times 60}} = 120 \text{ mm}$$

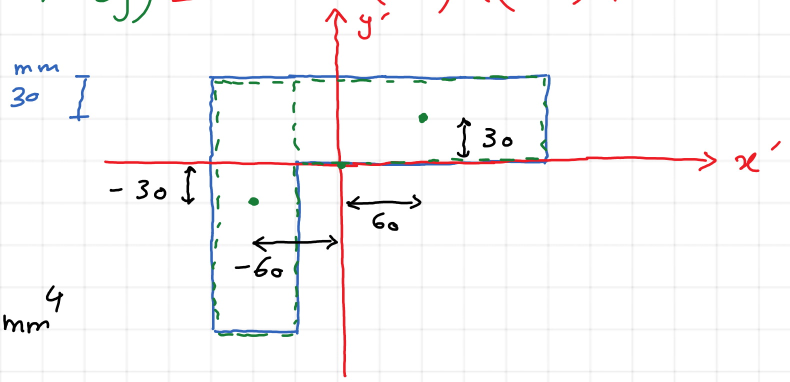
R1
$x = 30$ mm
$y = 90$ mm
$A = 180 \times 60$ mm^2

R2
$x = 150$ mm
$y = 150$ mm
$A = 180 \times 60$ mm^2

$$I_{x'} = \Sigma\left(\frac{bh^3}{12} + A\, d_y^2\right) = \frac{60 \times 180^3}{12} + 60 \times 180\,(30)^2 + \frac{180 \times 60^3}{12} + 180 \times 60 \times (30)^2 = 5.2 \times 10^7 \text{ mm}^4$$

$$I_{y'} = \Sigma\left(\frac{bh^3}{12} + A \cdot d_x^2\right) = \frac{180 \times 60^3}{12} + 180 \times 60\,(60)^2 + \frac{60 \times 180^3}{12} + 180 \times 60 \times (60)^2 = 11 \times 10^7 \text{ mm}^4$$

$$I_{x'y'} = \Sigma\left(I_{x'_o y'_o} + A \cdot d_x \cdot d_y\right) = 180 \times 60 \times (-60) \times (-30) + 180 \times 60 \times (60)(30)$$



$$I_{x'y'} = 3.9 \times 10^7 \text{ mm}^4$$