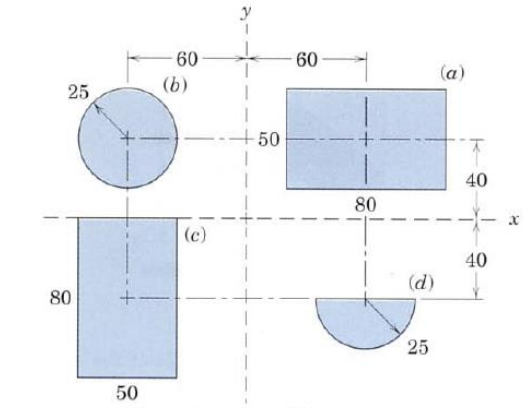
New Problem Sheet No. 6.3

(Products of Inertia and Transfer and Rotation of Axis)

1. Determine the product of inertia of each of the four areas about the x-y axes.

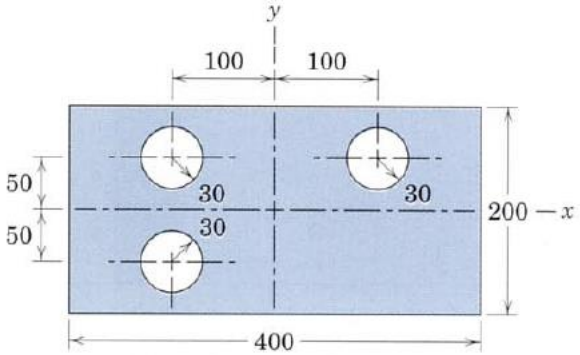
   Ans. (a) and (c) $I_{xy} = 9.60\ (10^6)\ mm^4$,
   (b) $I_{xy} = -4.71(10^6)\ mm^4$,
   (c) $I_{xy} = -2.98(10^6)\ mm^4$



Dimensions in millimeters

2. Determine I_x, I_y and I_{xy} for the rectangular plate with three equal circular holes.

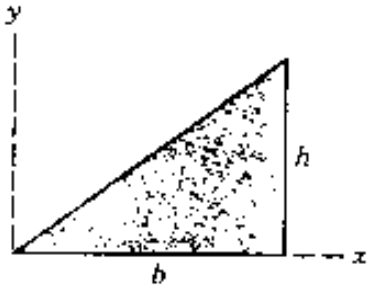
   Ans. $I_x = 2.44(10^8)\ mm^4$, $I_y = 9.80(10^8)\ mm^4$,
   $I_{xy} = -14.14(10^6)\ mm^4$



Dimensions in millimeters

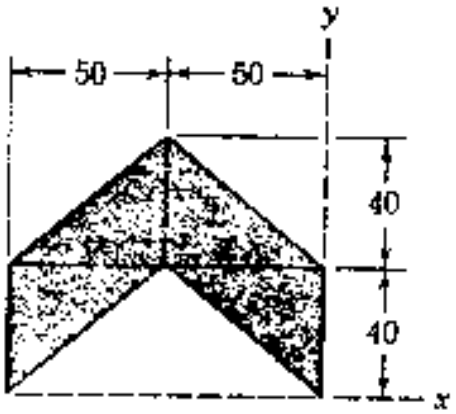
3. Derive the expression for the product of inertia of the right-triangular area about the x-y axes.

   Ans. $I_{xy} = b^2h^2/8$



4. Determine the product of inertia of the shaded area with respect to the assigned axes. (hint: locate the centroid of the symmetrical area).

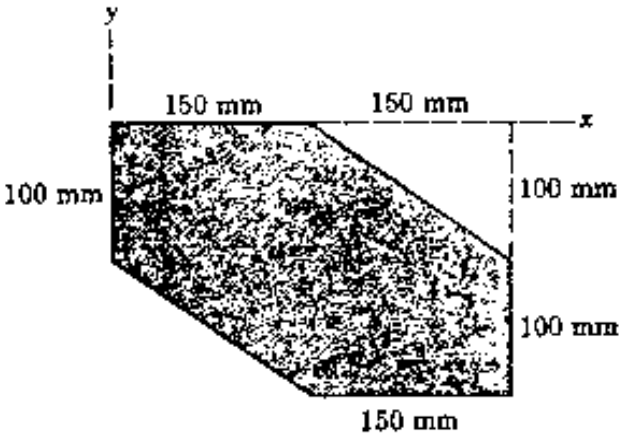
   Ans. $I_{xy} = -8(10^6)\ mm^4$



Dimensions in Millimeters

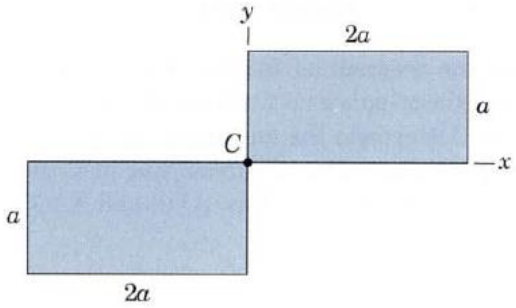
5. Calculate the product of inertia of the shaded area about the x-y axes. (Hint: Take advantage of the transfer-of-axes relations).

Ans. . $I_{xy} = -769(10^6)$ mm^4



6. Determine the maximum and minimum moments of inertia with respect to centroidal axes through C for the composite of the two rectangular areas shown. Find the angle α measured from the x-axis to the axis of maximum moment of inertia.

Ans. $I_{min} = 0.505a^4$, $I_{max} = 6.16a^4$, $\alpha = 112.5^0$



7. Determine the maximum moment of inertia anout an axis through O and the angle α to this axis for the triangular area shown. Also construct the Mohr circle of inertia.

Ans. $I_{max} = 71.7(10^6)$ mm^4, $\alpha = -16.85^0$