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 has shown.

\[
\begin{array}{c}
\text{Solid Area} \\
10 \quad 1 \\
7 \\
\text{Hollow Area} \\
\end{array}
\]

Then calculate \( \bar{y} \) using the following formula for composite areas.

\[
\bar{y} = \frac{\sum A_i y_i}{\sum A_i}
\]

\[
\bar{y} = \frac{(10)(14)(7) - (6)(8)(8)}{(10)(14) - (6)(8)}
\]

\[
\bar{y} = \frac{536}{82}
\]

\[
\bar{y} = 6.48
\]
Then calculate the area moment of inertia of the composite area as follows with the parallel axis theorem for composite areas.

\[ I = \sum \left[ I_{ij} + A_i d_i^2 \right] \]

(5)

\[
\begin{align*}
(6) \quad I &= \left[ \frac{1}{12} (10)(4)^3 + (10)(4)^4 - 6A_i \right] \\
&= \left[ \frac{1}{12} (6)(8)^3 + (6)(8)(8 - 6.48) \right]
\end{align*}
\]

(7)

\[
I = 2280.7 + 37.9 - 256 - 110.9
\]

(8)

\[
I = 1957.7 \quad \text{in}^4 \text{ or m}^4 \text{ or mm}^4
\]