Example: compute hydrostatic force

A triangular plate of height 6 m and base 4 m is shown. The top is 1 m above water level. Find the hydrostatic force on one side of the plate (use $\rho \text{ kg/m}^3$ for the density of water and $g \text{ m/s}^2$ for the gravitational constant).

Strip at $y$: area $A \times dy$.

Similar $\Delta$: $\frac{x}{4} = \frac{y}{6} \implies x = \frac{2}{3} y$

Area = $\frac{2}{3} y \, dy \text{ m}^2$

Depth = $5 - y \text{ m}$

Pressure = $\rho g (5-y) \text{ N/m}^2$

Force on strip = $\rho g (5-y) \cdot \frac{2}{3} y$

Total force: $\int_0^5 \rho g (5-y) \cdot \frac{2}{3} y \, dy = \frac{2}{3} \rho g \int_0^5 (5-y) y \, dy$

$= \frac{125}{9} \rho g \text{ N}$