11. (a) We note that the pool has uniform cross-section (as viewed from above); this allows us to relate the pressure at the bottom simply to the total weight of the liquid. Thus,

$$F_{\text{bottom}} = mg = \rho g V = \left(1000\,\text{kg/m}^3\right)\left(9.8\,\text{m/s}^2\right)\left(540\,\text{m}^3\right) = 5.3 \times 10^6 \text{ N} .$$

(b) The average pressure due to the water (that is, averaged over depth h) is

$$p_{\text{avg}} = \rho g \left(\frac{h}{2}\right)$$

where $h = 2.5$ m. Thus, the force on a short side (of area $A = 9.0 \times 2.5$ in SI units) is

$$F_{\text{short side}} = \rho g \left(\frac{h}{2}\right) A = 2.8 \times 10^5 \text{ N} .$$

(c) The area of a long side is $A' = 24 \times 2.5$ in SI units. Therefore, the force exerted by the water pressure on a long side is

$$F_{\text{long side}} = \rho g \left(\frac{h}{2}\right) A' = 7.4 \times 10^5 \text{ N} .$$

(d) If the pool is above ground, then it is clear that the air pressure outside the walls “cancels” any contribution of air pressure to the water pressure exerted by the liquid in the pool. If the pool is, as is often the case, surrounded by soil, then the situation may be more subtle, but our expectation is under normal circumstances the push from the soil certainly compensates for any atmospheric contribution to the water pressure (due to a “liberal interpretation” of Pascal’s principle).