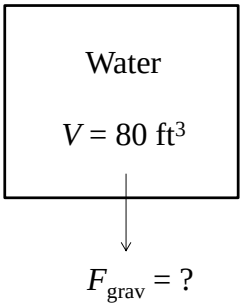
1.9 Water with a density of 62.3 lb/ft^3 completely fills an 80-ft^3 vessel. If the local acceleration of gravity is 32.08 ft/s^2, determine the weight of the water, in lbf.

KNOWN: Water of known density completely fills a vessel of known volume.

FIND: Determine weight of the water.

SCHEMATIC AND GIVEN DATA:

ρ_{Water} = 62.3 lb/ft^3
g = 32.08 ft/s^2



ENGINEERING MODEL:
1. Local gravitational acceleration is constant at 32.08 ft/s^2.
2. Standard gravitational acceleration is constant at 32.174 ft/s^2.

ANALYSIS: From Eq. 1.1 the weight of the water is the mass of water times the local acceleration of gravity.

$$F_{grav} = mg \tag{1}$$

The mass is determined using the volume of the water in the full vessel and the water density.

$$\rho = m/V \rightarrow m = \rho V$$

Solving for the mass

$$m = \left(62.3 \frac{\text{lb}}{\text{ft}^3}\right)(80\ \text{ft}^3) = 4984\ \text{lb}$$

Solving (1) for the water weight

$$F_{grav} = (4984\ \text{lb})\left(32.08 \frac{\text{ft}}{\text{s}^2}\right)\left|\frac{1\ \text{lbf}}{32.174\ \text{lb}\cdot\text{ft/s}^2}\right| = \underline{\mathbf{4969\ lbf}}$$

Since the water is located in an area where the local acceleration of gravity is less than the standard acceleration of gravity, the water weighs less than an equivalent volume of water located where the acceleration of gravity is the standard value.