Problem of the Week
Grade 7 and 8

Reach For The Top
Solution

Problem

A rectangular storage tank has a square base with sides of length 4 m and height of 5 m. The tank is filled with water to a height of 2.5 m. A solid cube with sides 2 m is then thrown into the tank. Does the water level reach the top of the tank? If not, how far below the top of the tank does the water reach?

Solution

First calculate the volume of water in the tank using

$$\begin{aligned}
Volume &= Length \times Width \times Height. \\
\text{Volume of Water} &= 4 \times 4 \times 2.5 \\
&= 40 \text{ m}^3
\end{aligned}$$

The volume of the solid cube is $2 \times 2 \times 2 = 8$ m^3. The total volume of water plus solid cube is $40 + 8 = 48$ m^3.

Let x represent the height of the water in the rectangular storage tank after the cube is thrown in.

$$\begin{aligned}
\text{New Volume} &= \text{Length} \times \text{Width} \times \text{Height} \\
48 &= 4 \times 4 \times x \\
48 &= 16 \times x \\
\therefore x &= 3 \text{ m}
\end{aligned}$$

The new water height is 3 m and the water is $5 - 3 = 2$ m from the top of the tank.