

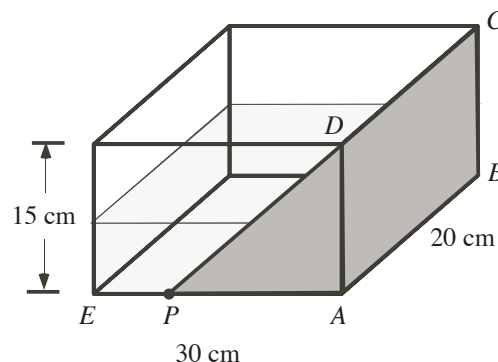
Problem of the Week

Grade 9 and 10

Tilted Tank Solution

Problem

An aquarium is 20 cm wide, 30 cm long, and 15 cm high. The aquarium is tilted along AB until the water completely covers the end $ABCD$. At this point, it also covers $\frac{4}{5}$ of the base. Determine the depth of the water, in centimetres, when the aquarium is level.



Solution

Let E be the unnamed corner point on the bottom front of the aquarium such that $EA = 30$ cm. Let P be a point on AE such that $AP = \frac{4}{5}(AE) = \frac{4}{5}(30) = 24$ cm.

When the tank is tilted so that the water completely covers end $ABCD$, a triangular prism with base ADP and height 20 cm is created. Note that $\triangle ADP$ is right angled so when finding the area of $\triangle ADP$ we can use AP as the base and AD as the height.

$$\begin{aligned}
 \text{Volume of triangular prism} &= \text{Area of base } \triangle APD \times \text{height} \\
 &= \frac{1}{2}(AP)(AD) \times (AB) \\
 &= \frac{1}{2}(24)(15) \times (20) \\
 &= 3600 \text{ cm}^3
 \end{aligned}$$

Let h represent the height of the water when the tank is sitting level. The volume of the rectangular prism h cm high by 30 cm long by 20 cm wide is the same as the volume of the triangular prism formed when the tank is tilted.
 $\therefore 30 \times 20 \times h = 3600$ and $h = 6$ cm follows.

Therefore the water is 6 cm deep when the aquarium is sitting level.

