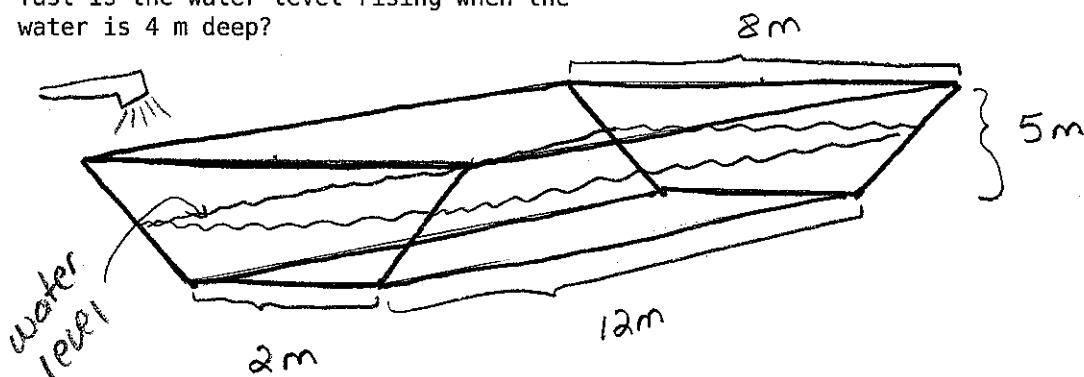
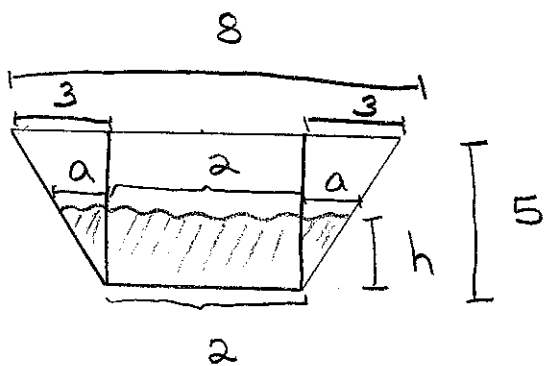


A water trough is 12 m long and has a cross-section in the shape of an isosceles trapezoid that is 8 m wide at the top, 2 m wide at the bottom, and has a height of 5 m. If the trough is being filled with water at the rate of 0.3 cubic meters per minute, how fast is the water level rising when the water is 4 m deep?



Given:  $\frac{dV}{dt} = 0.3$  Find  $\frac{dh}{dt} \Big|_{h=4}$



$$V = (A_{\text{rectangle}} + 2A_{\text{triangle}})(12)$$

$$V = (2h + 2 \cdot \frac{1}{2} ah)(12)$$

$$= (2h + ah)(12)$$

$$= (2h + \frac{3}{5} h^2)(12)$$

$$V = 24h + \frac{36}{5} h^2$$

$$\frac{dV}{dt} = 24 \frac{dh}{dt} + \frac{72}{5} h \frac{dh}{dt}$$

$$0.3 = 24 \frac{dh}{dt} + \frac{72}{5} (4) \frac{dh}{dt}$$

$$0.3 = \frac{408}{5} \frac{dh}{dt} \Rightarrow \boxed{\frac{dh}{dt} = \frac{1}{272} \frac{m}{m}}$$

by similar triangles,

$$\frac{3}{5} = \frac{a}{h}$$

$$a = \frac{3}{5} h$$