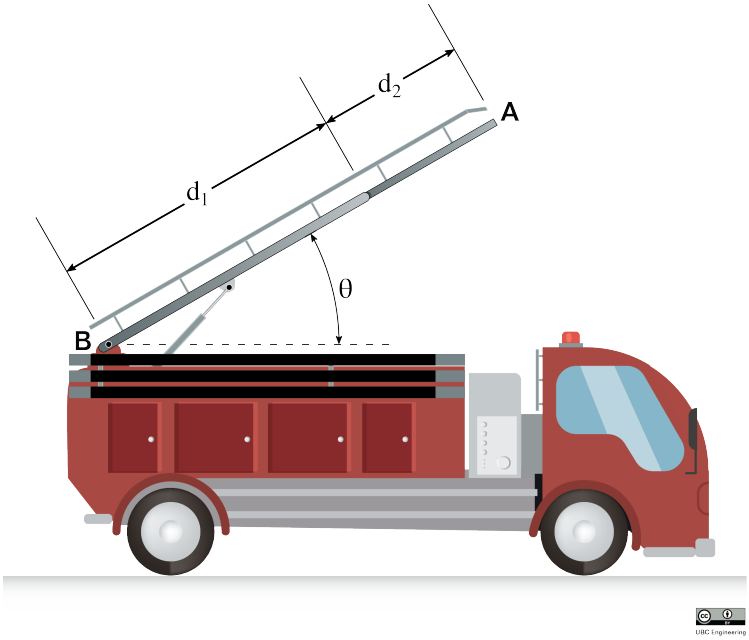
22-R-KM-TW-2



The fire truck is in the process of raising its ladder. It is able to lift the ladder with a constant angular velocity of $\omega = 0.05$ rad/s. If the combined length of d_1 and d_2 is 6 m and the ladder starts with an initial angle of $0°$, what is the rate at which the height of the ladder at point A is increasing, with respect to the ground, when $\theta = 55°$?

Solution:

$$
\begin{aligned}
d_1 + d_2 &= 6 \\
\sin\theta &= \frac{h}{d} \\
\frac{d}{dt}\sin\theta &= \frac{d}{dt}\cdot\frac{h}{d} \\
\omega\cos\theta &= \frac{\dot{h}}{d} \\
v_y = \dot{h} &= \omega d\cos\theta \\
v_y &= (0.04)(3)\cos(45°) = 0.085 \text{ m/s}
\end{aligned}
$$