

59. Since the raindrops fall vertically relative to the train, the horizontal component of the velocity of a raindrop is $v_h = 30 \text{ m/s}$, the same as the speed of the train. If v_v is the vertical component of the velocity and θ is the angle between the direction of motion and the vertical, then $\tan \theta = v_h/v_v$. Thus $v_v = v_h/\tan \theta = (30 \text{ m/s})/\tan 70^\circ = 10.9 \text{ m/s}$. The speed of a raindrop is $v = \sqrt{v_h^2 + v_v^2} = \sqrt{(30 \text{ m/s})^2 + (10.9 \text{ m/s})^2} = 32 \text{ m/s}$.