

80. Average speed, as opposed to average velocity, relates to the total distance, as opposed to the net displacement. The distance  $D$  up the hill is, of course, the same as the distance down the hill, and since the speed is constant (during each stage of the motion) we have  $\text{speed} = D/t$ . Thus, the average speed is

$$\frac{D_{\text{up}} + D_{\text{down}}}{t_{\text{up}} + t_{\text{down}}} = \frac{2D}{\frac{D}{v_{\text{up}}} + \frac{D}{v_{\text{down}}}}$$

which, after canceling  $D$  and plugging in  $v_{\text{up}} = 40$  km/h and  $v_{\text{down}} = 60$  km/h, yields 48 km/h for the average speed.