Chapter 3   Problem 30 [†]

Given
$\vec{d_1} = 20\ m$ right
$t_1 = 5\ s$
$\vec{d_2} = 10\ m$ left or $d_2 = -10\ m$
$t_2 = 3.0\ s$

Solution
a) Find the average velocity of the wookchuck.

Displacement is the sum of all the distances traveled, taking into account the directions right (+) and left (-).

$$\vec{d} = \vec{d_1} + \vec{d_2} = 20 - 10 = 10\ m$$

The total time is

$$t = t_1 + t_2 = 5 + 3 = 8\ s$$

Since velocity is the time rate of change of displacement, the average velocity is then the change in position divided by the total time.

$$\vec{v}_{avg} = \frac{\vec{d}}{t} = \frac{10\ m}{8\ s} = 1.3\ m/s$$

b) Find the average speed.

Speed is calculated by the total distance traveled. All the distances are cumulative and do not cancel as with displacement. (Think of it as the distance traveled in your car and recorded on your odometer.) Total distance traveled is

$$d = 20\ m + 10\ m = 30\ m$$

The average speed is then

$$v = \frac{\vec{d}}{t} = \frac{30\ m}{8\ s} = 3.8\ m/s$$