105. (First problem of **Cluster 1**)
The two parts of this problem are as follows. Part 1 (motion from A to B) consists of constant acceleration (so Table 2-1 applies) and involves the data $v_0 = 0$, $v = 10.0$ m/s, $x_0 = 0$ and $x = 40.0$ m (taking point A as the coordinate origin and orienting the positive x axis towards B and C). Part 2 (from B to C) consists of constant velocity motion (so the simple equation $\frac{\Delta x}{\Delta t} = v$ applies) with $v = 10.0$ m/s and $\Delta t = 10.0$ s.

(a) Eq. 2-16 is an efficient way of finding the part 1 acceleration:

$$v^2 = v_0^2 + 2a\,(x - x_0) \quad \Longrightarrow \quad (10.0)^2 = 0 + 2a(40.0)$$

from which we obtain $a = 1.25$ m/s^2.

(b) Using Eq. 2-17 avoids using the result from part (a) and finds the time readily.

$$x - x_0 = \frac{1}{2}\,(v_0 + v)\,t \quad \Longrightarrow \quad 40.0 - 0 = \frac{1}{2}(0 + 10.0)t$$

This leads to $t = 8.00$ s, for part 1.

(c) We find the distance traveled in part 2 with $\Delta x = v\Delta t = (10.0)(10.0) = 100$ m.

(d) The average velocity is defined by Eq. 2-2

$$v_{\text{avg}} = \frac{x_C - x_A}{t_C - t_A} = \frac{140 - 0}{18 - 0} = 7.78 \text{ m/s}\ .$$