110. (Sixth problem of **Cluster 1**)
Both part 1 and part 2 of this problem involve uniformly accelerated motion, but at different rates a_1 and a_2. We take the coordinate origin at point A and direct the positive axis towards B and C. In these terms, we are given $x_A = 0$, $x_C = 1300$ m, $v_A = 0$, and $v_C = 50$ m/s. Further, the time-duration for each part is given: $t_1 = 20$ s and $t_2 = 40$ s.

(a) We have enough information to apply Eq. 2-17 ($\Delta x = \frac{1}{2}(v_0 + v)t$) to parts 1 and 2 and solve the simultaneous set:

$$x_B - x_A = \frac{1}{2}(v_A + v_B)\,t_1 \quad \Longrightarrow \quad x_B = \frac{1}{2}\,v_B\,(20)$$
$$x_C - x_B = \frac{1}{2}(v_B + v_C)\,t_2 \quad \Longrightarrow \quad 1300 - x_B = \frac{1}{2}(v_B + 50)\,(40)$$

Adding equations, we find $v_B = 10$ m/s.

(b) The other unknown in the above set of equations is now easily found by plugging the result for v_B back in: $x_B = 100$ m.

(c) We can find a_1 a variety of ways, using the just-obtained results. We note that Eq. 2-11 is especially easy to use.

$$v = v_0 + a_1 t_1 \quad \Longrightarrow \quad 10 = 0 + a_1(20)$$

This leads to $a_1 = 0.50$ m/s^2.

(d) To find a_2 we proceed as just as we did in part (c), so that Eq. 2-11 for part 2 becomes $50 = 10 + a_2(40)$. Therefore, the acceleration is $a_2 = 1.0\,\text{m/s}^2$.