A drag racing car accelerates from rest at a constant rate of 17.0 m/s² and reaches maximum speed after traveling 402 m. Three small parachutes are then deployed and slow the car at a rate of 6.10 m/s².

a.) How fast is the car traveling 350 m after the parachutes are deployed?

Break the problem up into two parts: before, and after, the parachutes. 1 pt.

List knowns: \( a_1 = 17 \frac{m}{s^2}, \Delta x_1 = 402 m, v_{i1} = 0 \frac{m}{s}, a_2 = -6.1 \frac{m}{s^2}, \Delta x_2 = 350 m, v_{f1} = v_{i2} \) 1 pt.

\[
v_f^2 = v_i^2 + 2 * a * \Delta x
\]

\[
v_{f1} = \sqrt{0^2 + 2 * 17 * 402} = \sqrt{13668} = 116.9102 \frac{m}{s}
\]

\[
v_{f2} = \sqrt{(116.9102)^2 + 2 * (-6.1) * 350} = \sqrt{9398} = 96.94 \frac{m}{s}
\]

b. How much time elapses between when the car begins to speed up and when it is 350 m past the point where the parachutes were deployed?

Now that we have \( v_{i2} \) we can use \( \Delta x = v_i \Delta t + \frac{1}{2} a (\Delta t)^2 \) 1 pt.

\[
402 = 0 + \frac{1}{2}(17) (\Delta t_1)^2
\]

\[
\Delta t_1 = \sqrt{\frac{804}{17}} = \sqrt{47.294} = 6.8771 s
\]

\[
350 = 116.9102 \Delta t_2 + \frac{1}{2} (-6.1) (\Delta t_2)^2
\]

\[-3.05 (\Delta t_2)^2 + 116.9102 \Delta t_2 - 350 = 0
\]

use quadratic formula \( \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \) to get \( \Delta t_2 = 3.27328s \) and 35.05787s 1 pt.

Only the first one makes sense because the car would have stopped and started reversing if it had kept a deceleration of 6.1 \( \frac{m}{s^2} \) for 35 seconds. 1 pt.

This gives a total time of 6.8771 + 3.2732 = 10.15 s. 1 pt.