Chapter 3 Problem 56 [†]

Given
$v_0 = 8.00\ m/s$
$t_0 = 0\ s$
$v_f = 40.0\ m/s$
$t_f = 3.33 \times 10^{-2}\ s$

Solution
What is the distance over which the puck accelerates?

Since change in velocity and time are provided, the first kinematic equation is useful for finding acceleration.

$$v_f = v_0 + at$$

Solving for acceleration gives

$$a = \frac{v_f - v_0}{t} = \frac{40.0\ m/s - 8.00\ m/s}{3.33 \times 10^{-2}\ s} = 961\ m/s^2$$

Since the given values are good to 3 sig. figs., I will give my answers good to 3 sig. figs.

Now that we have the velocity, we can use the third kinematic equation that relates position to time.

$$\Delta x = v_0 t + \tfrac{1}{2}at^2 = (8.00\ m/s)(3.33 \times 10^{-2}\ s) + \tfrac{1}{2}(961\ m/s^2)(3.33 \times 10^{-2}\ s)^2$$

$$\Delta x = 0.2664\ m + 0.5328\ m = 0.7992\ m$$

To three significant digits, the distance is $0.799\ m$

[†]Problem from University Physics by Ling, Sanny and Moebs (OpenStax)