Analyzing Motion using the Particle and System Model

A Box moving under a constant force
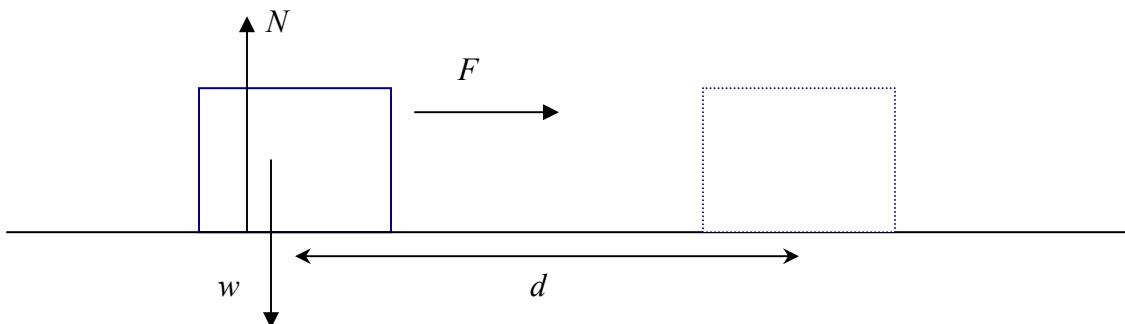
$v_i = 0$	F = 12 N
m = 6 kg	d = 3 m

* What is the final speed of the block?

Particle Model:

$$v_i, \ d, \ a \ | \ v_f \qquad \rightarrow \qquad v_f^2 = v_i^2 + 2ad$$

$$a = \frac{F}{m} = 3 \ \frac{m}{s^2}$$

$$v_f^2 = 0 + 2ad$$

$$v_f = \sqrt{2ad}$$

$$v_f = 3.46 \ \frac{m}{s^2}$$

System Model:

$$W = \tfrac{1}{2}mv_f^2 - \tfrac{1}{2}mv_i^2 \qquad \& \qquad W = Fd$$

$$Fd = \tfrac{1}{2}mv_f^2 - 0$$

$$v_f = \sqrt{\frac{2Fd}{m}}$$

$$v_f = 3.46 \ \frac{m}{s^2}$$

Since the answers are the same, either model can be used to solve the problem. However, the system model is better for situations that involve friction directly. The particle model would require additional force values in order to determine what a is for the system.