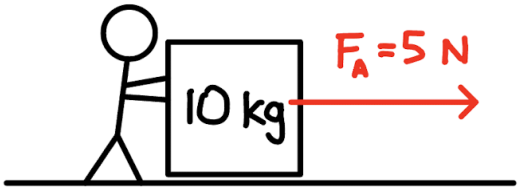
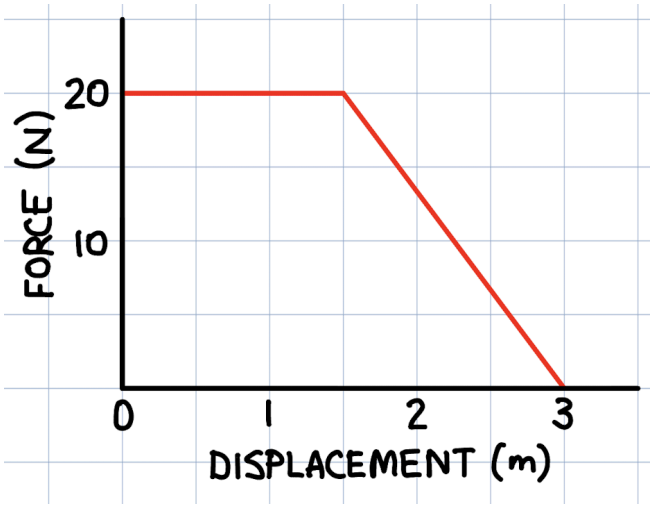
A 10 kg box is pushed with an applied force of 5 N. There is no friction between the box and the floor. If the initial speed of the box is 2 m/s, determine the speed of the box after it has moved 10 m.

a) Solve using work and energy.
b) Solve using kinematics and dynamics.



A 10 kg box is initially at rest and is pushed with a force with a magnitude as shown on the graph. If the box slides without friction, determine its final speed.



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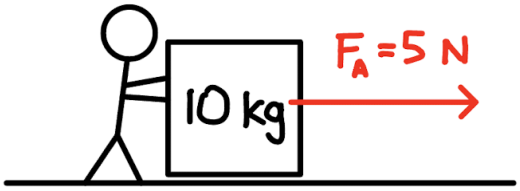


$W = Fd$

$= (5)(10)$

$= 50$ J

$W = \Delta E_k$

$= E_{k_f} - E_{k_i}$

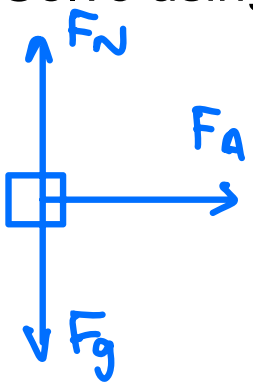
$= \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$

$v_f = \sqrt{v_i^2 + \frac{2W}{m}}$

$= \sqrt{(2)^2 + \frac{2(50)}{10}}$

$= \boxed{3.74 \frac{m}{s}}$

b) Solve using kinematics and dynamics.



$F_{NET} = ma$

$F_A = ma$

$a = \frac{F_A}{m} = \frac{5}{10} = 0.5 \frac{m}{s^2}$

$v_f^2 = v_i^2 + 2ad$

$v_f = \sqrt{v_i^2 + 2ad}$

$= \sqrt{(2)^2 + 2(0.5)(10)}$

$= \boxed{3.74 \frac{m}{s}}$

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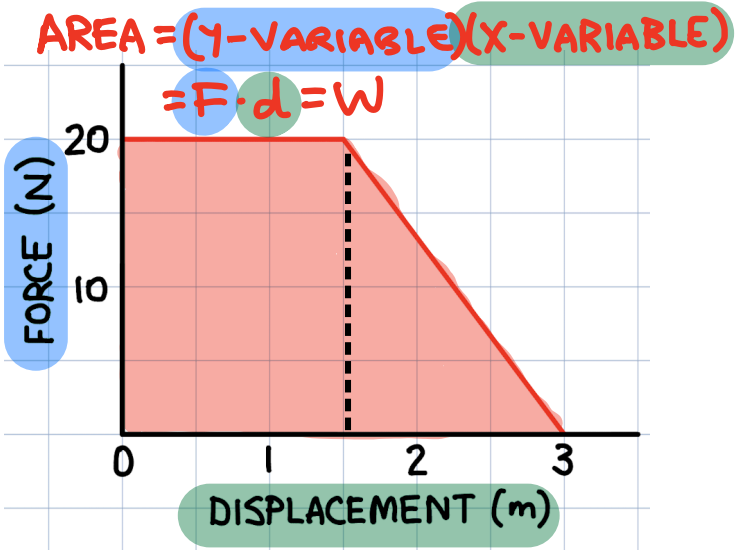

$W = \text{AREA}$

$= (1.5)(20) + \frac{1}{2}(1.5)(20)$

$= 45\ \text{J}$

$W = \Delta E_K$

$= E_{Kf} - E_{Ki}$ ($E_{Ki} = 0$)

$= \frac{1}{2} m v_f^2$

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

$= \sqrt{\frac{2(45)}{10}}$

$= \boxed{3\ \frac{\text{m}}{\text{s}}}$