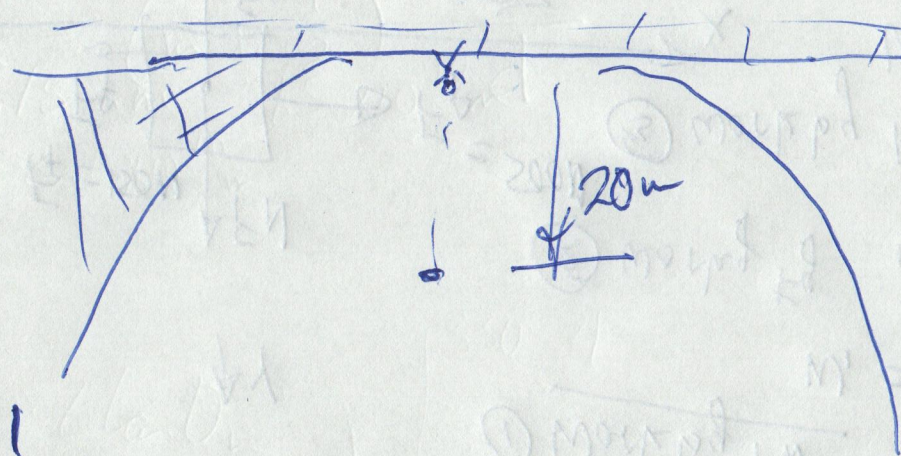
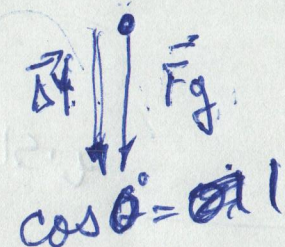


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4.

$$m = 60 \text{ kg}$$



$$y_i = 20 \text{ m}$$

$$y_f = 0 \text{ m}$$

$$\Delta y = y_f - y_i = 0 \text{ m} - 20 \text{ m}$$

$$\Delta y = -20 \text{ m}$$

$$W = \vec{F} \cdot \Delta \vec{y} = F \cdot \Delta y \cos \theta$$

$$= mg \cdot \Delta y \cos 0^\circ$$

$$= (60 \text{ kg})(9.8 \text{ m/s}^2) \cos 0^\circ (20 \text{ m})$$

$$W = 11,760 \text{ J} \quad (1 \text{ N} \cdot \text{m} = 1 \text{ J})$$

15.17 Kinetic Energy

$v = 13 \text{ m/s}$

0

$m = 10 \text{ kg}$

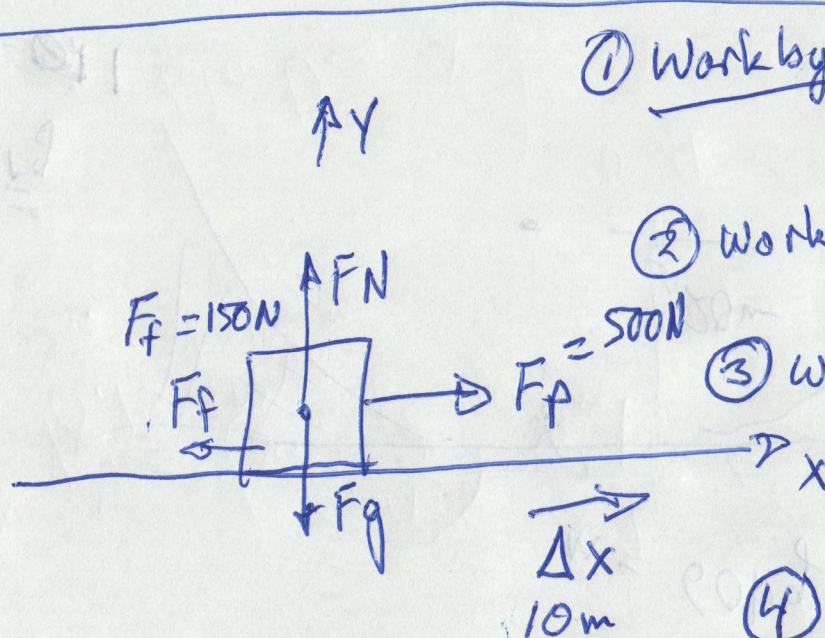
$$E_k = \frac{1}{2} m v^2$$

$$E_k = \frac{1}{2} (10 \text{ kg}) (13 \text{ m/s})^2$$

$$E_k = 845 \text{ kg m}^2/\text{s}^2$$

$$(\text{kg m/s}^2) \cdot \text{m} = \text{N} \cdot \text{m} = \text{J}$$

15.17



① Work by FN

$$W_1 = F_N \Delta x \cos 90^\circ = 0$$

② Work by Fg

$$W_2 = F_g \cdot \Delta x \cos 90^\circ = 0$$

③ Work by Fp

$$W_3 = F_p \cdot \Delta x \cos 0^\circ$$

$$W_3 = F_p \cdot \Delta x$$

④ Work by Ff

$$W_4 = F_f \cdot \Delta x \cos 180^\circ$$

$$W_4 = -F_f \cdot \Delta x$$

$$\textcircled{3} \quad W_3 = 500\text{N} \cdot 10\text{m} = 5000\text{J}$$

$$W_4 = -(150\text{N}) \cdot 10\text{m} = -1500\text{J}$$

$$W_{\text{tot}} = 5000\text{J} - 1500\text{J} = 3500\text{J}$$

$$W_{\text{tot}} = 3500\text{J}$$

$$F_{Ry} = F_N - F_g = 0 \textcircled{3}$$

$$F_{Rx} = F_p - F_f =$$

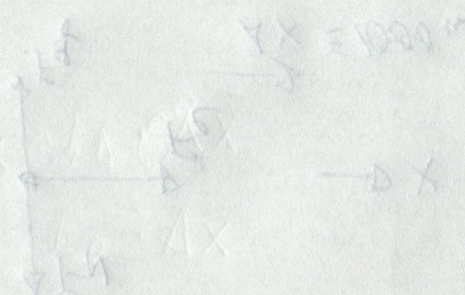
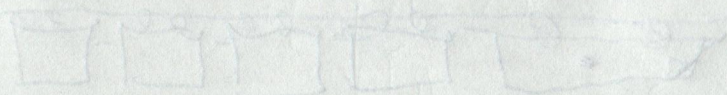
$$500\text{N} - 150\text{N} = 350\text{N}$$

$$F_{Rx} = 350\text{N}$$

$$W = F_R \cdot \Delta s \cos \theta$$

$$W = F_{Rx} \cdot \Delta x \cos 0^\circ$$

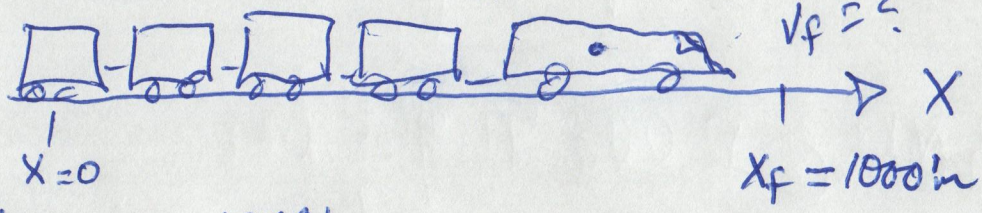
$$W = (350\text{N})(10\text{m}) = 3500\text{J}$$



$m_c = 15,000 \text{ kg}$

$m_e = 240,000 \text{ kg}$

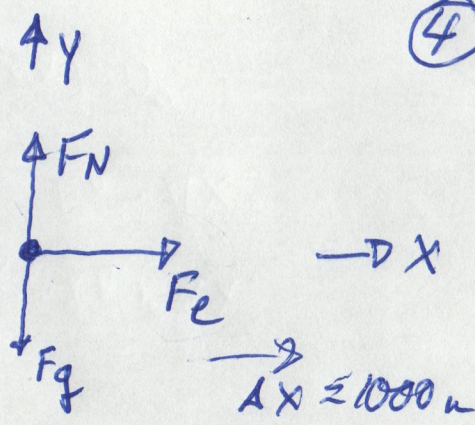
$v_i = 0$



1 tonne = 1000 kg

$M_{tot} = 100,000 \text{ kg}$

$F_e = 20,000 \text{ N}$



$F_{Ry} = F_N - F_g = 0$

$F_{Rx} = F_e =$

$M = (20,000 \text{ N})(10^4) = 200,000$

a) $W_e = F_e \cdot \Delta X \cos \theta$

$W_e = (20,000 \text{ N})(1000 \text{ m}) \cos 0^\circ$

$W_e = 2.0 \times 10^7 \text{ J}$

c) $v_i = 0 \text{ m/s}$ $v_f = ?$

$W_{tot} = \Delta E_k$
 $= E_{kf} - E_{ki}$

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

b) $\vec{F}_R = \vec{F}_e \Rightarrow W_{tot} = W_e$

$W_N = F_N \cdot \Delta X \cos 90^\circ = 0$

$W_g = F_g \cdot \Delta X \cos 90^\circ = 0$

$W_{tot} = 2.0 \times 10^7 \text{ J}$

$v_f = \sqrt{\frac{2 W_{tot}}{m}}$
 $= \left[\frac{2(2.0 \times 10^7 \text{ J})}{100,000 \text{ kg}} \right]^{1/2}$

$v_f = 20 \text{ m/s}$

5

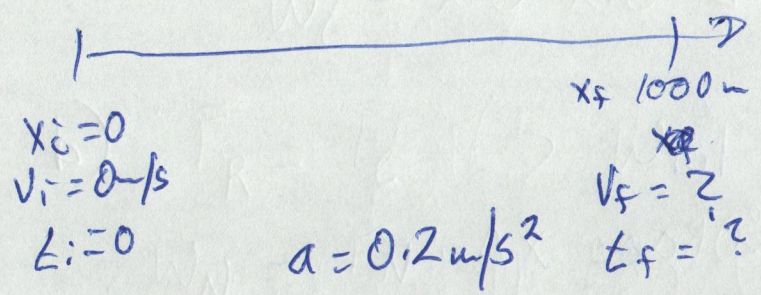
$$\frac{1 \text{ J}}{\text{kg}} = \frac{1 \text{ N} \cdot \text{m}}{\text{kg}} = \frac{1 (\text{kg m/s}^2)(\text{m})}{\text{kg}} = \text{m}^2/\text{s}^2$$

$$\sqrt{\frac{1 \text{ J}}{\text{kg}}} = \sqrt{1 \text{ m}^2/\text{s}^2} = \oplus 1 \text{ m/s}$$

$$\vec{F} = m \vec{a} \Rightarrow F_{Rx} = m a_x$$

$$a_x = \frac{F_{Rx}}{m} = \frac{20,000 \text{ N}}{100,000 \text{ kg}} = 0.2 \text{ m/s}^2$$

$$1 \text{ N} = \frac{1 \text{ kg m/s}^2}{\text{kg}}$$



$$v_f^2 = v_i^2 + 2a \Delta x$$

$$v_f = \pm [2(a) \Delta x]^{1/2}$$

$$v_f = \pm [2(0.2 \text{ m/s}^2)(1000 \text{ m})]^{1/2}$$

$$v_f = \pm 20 \text{ m/s}$$