

1) $V_i = 30 \frac{m}{s}$
 $h_i = 0 \text{ m}$
 $h_f = 40 \text{ m}$
 $V_f = \frac{m}{s}$

$V_f = 5 \frac{m}{s}$
 $h_f = \text{--- m}$

$K_i + U_{gi} = K_f + U_{gf}$
 $\frac{1}{2} m V_i^2 = \frac{1}{2} m V_f^2 + 2 m g h$
 $V_f = \sqrt{V_i^2 - 2 g h}$
 $= \sqrt{(30 \frac{m}{s})^2 - 2(9.8 \frac{m}{s^2}) 40 \text{ m}}$

a) $V_f = 10.8 \frac{m}{s}$
 b) $h_f = 44.6 \text{ m}$

OR $h_{top} = \frac{V_i^2}{2g}$
 $= \frac{(30 \frac{m}{s})^2}{2(9.8 \frac{m}{s^2})}$
 $h_{top} = 45.9 \text{ m}$

$K_i + U_{gi} = K_f + U_{gf}$
 $\frac{1}{2} m V_i^2 = \frac{1}{2} m V_f^2 + 2 m g h$
 $h = \frac{V_i^2 - V_f^2}{2g}$
 $= \frac{(30 \frac{m}{s})^2 - (5 \frac{m}{s})^2}{2(9.8 \frac{m}{s^2})}$

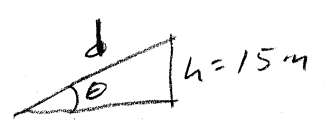
$h_f = \frac{2g h_{top} - V_f^2}{2g}$
 $= \frac{2(9.8 \frac{m}{s^2})(45.9 \text{ m}) - (5 \frac{m}{s})^2}{2(9.8 \frac{m}{s^2})}$
 b) $h_f = 44.6 \text{ m}$

2) $h = 15 \text{ m}$
 $\theta = 30^\circ$
 $V_f = \frac{m}{s}$
 $\mu_k = 0.2$
 $V_f = \frac{m}{s}$

$K_i + U_{gi} = K_f + U_{gf}$
 $2 m g h = \frac{1}{2} m V_f^2$
 $V_f = \sqrt{2 g h}$
 $= \sqrt{2(9.8 \frac{m}{s^2})(15 \text{ m})}$

a) $V_f = 17.1 \text{ m}$

$h = d \sin \theta$
 $d = \frac{h}{\sin \theta}$



$E_{lost} = \mu_k F_N d$
 $= \mu_k m g (\cos \theta) d$

$K_i + U_{gi} = K_f + U_{gf} + E_{lost}$
 $2 m g h = \frac{1}{2} m V_f^2 + 2 \mu_k m g \frac{h}{\sin \theta} \cos \theta$

$V_f = \sqrt{2 g h (1 - \frac{\mu_k}{\tan \theta})}$
 $= \sqrt{2(9.8 \frac{m}{s^2})(15 \text{ m})(1 - \frac{0.2}{\tan 30^\circ})}$

b) $V_f = 13.9 \frac{m}{s}$

$$2) m = 0.35 \text{ kg}$$

$$\Delta x = 0.25 \text{ m}$$

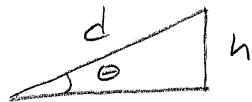
$$k = 150 \frac{\text{N}}{\text{m}}$$

$$\theta = 25^\circ$$

$$d = \text{--- m}$$

$$\mu_k = 0.33$$

$$d = \text{--- m}$$



$$h = d \sin \theta$$

$$K_i + U_{g_i} + U_{s_i} = K_f + U_{g_f} + U_{s_f}$$

$$\frac{1}{2} k x^2 = 2 m g h$$

$$k x^2 = 2 m g d \sin \theta$$

$$d = \frac{k x^2}{2 m g \sin \theta}$$

$$= \frac{150 \frac{\text{N}}{\text{m}} (0.25 \text{ m})^2}{2 (0.35 \text{ kg}) (9.8 \frac{\text{m}}{\text{s}^2}) \sin 25^\circ}$$

$$\boxed{d = 3.23 \text{ m}}$$

$$E_L = \mu_k F_N d = \mu_k m g \cos \theta d$$

EC)

$$K_i + U_{g_i} + U_{s_i} = K_f + U_{g_f} + U_{s_f} + E_{\text{lost}}$$

$$\frac{1}{2} k x^2 = 2 m g d \sin \theta + 2 \mu_k m g d (\cos \theta)$$

$$d = \frac{\frac{1}{2} k x^2}{2 m g (\sin \theta + \mu_k \cos \theta)}$$

$$= \frac{150 \frac{\text{N}}{\text{m}} (0.25 \text{ m})^2}{2 (0.35 \text{ kg}) (9.8 \frac{\text{m}}{\text{s}^2}) (\sin 25^\circ + 0.33 (\cos 25^\circ))}$$

$$\boxed{d = 1.89 \text{ m}}$$