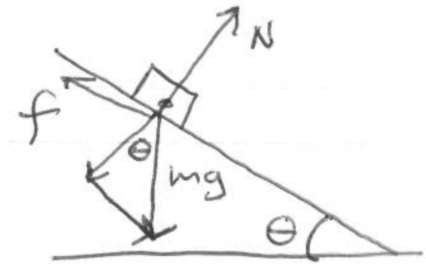
PENGUIN.



(a) CONSTANT $\underset{\sim}{v} \Rightarrow \underset{\sim}{a} = 0$.

ALONG SLOPE: $\underset{\sim}{f} + \underset{\sim}{F_g} \sin\theta = 0$

$f = \mu N$

$= \mu mg\cos\theta$

SO,

$-\mu mg\cos\theta + mg\sin\theta = 0$

$\mu = \tan\theta$

$\mu = 0.12$

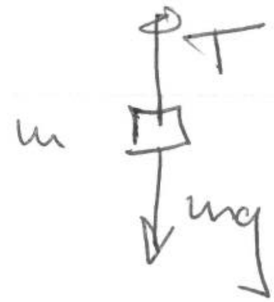
(b) NET FORCE ON PENGUIN.

$m \frac{\Delta v}{\Delta t} = -\mu mg$ — FRICTION FORCE OPPOSITE TO MOTION

$\Delta t = \left(\mu g / v_i \right)^{-1}$

$\Delta t = 1.2 \text{ sec}$

HELICOPTER



(a) $T - mg = ma$

$$T = ma + mg = m(a+g)$$

$$T = 829.5\ N$$

~ DISPLACEMENT

T = const.

(b) $Work = \underset{\sim}{F} \cdot \underset{\sim}{s} = +829.5 * 11$ Joules

$$W_T = 9{,}124.5\ J$$

(c) $W_G = \underset{\sim}{F}_g \cdot \underset{\sim}{s}$

$= -mgs$

$$W_G = -8{,}516.2\ J$$

└ IMPORTANT ∇

HELICOPTER

(d) $W_{NET} = \Delta KE = \frac{1}{2} m V_f^2 - \frac{1}{2} m V_i^2$

~~+9,124.52 J + -8,516.2 J = $\frac{1}{2} m V_f^2$~~

$W_T + W_G = \frac{1}{2} m V_f^2$

$$V_f = \left[\frac{2}{m}(W_T + W_G)\right]^{1/2}$$

$$= \left[\frac{2}{79}(9{,}124.5 - 8{,}516.2)\right]^{1/2}$$

$$\boxed{V_f = 3.92 \text{ m/s}}$$

HOSE

+y ↑

$$l = V_0 \cos\theta \cdot t \quad (1)$$

$$-h = V_0 \sin\theta \cdot t - \frac{1}{2} g t^2 \quad (2)$$

$$(1) \Rightarrow t = l / V_0 \cos\theta$$

$$(1)+(2) \Rightarrow -h = V_0 \sin\theta \cdot \frac{l}{V_0 \cos\theta} - \frac{1}{2} g \frac{l^2}{V_0^2 \cos^2\theta}$$

$$-h = l \tan\theta - \frac{g}{2} \frac{l^2}{V_0^2 \cos^2\theta}$$

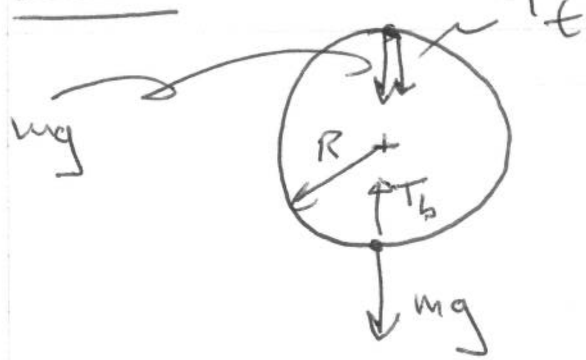
$$\frac{g l^2}{2 V_0^2 \cos^2\theta} = l \tan\theta + h$$

$$V_0^2 = \frac{g l^2}{2 \cos^2\theta} \left[l \tan\theta + h \right]^{-1}$$

$$V_0 = \left[\frac{g l^2}{2 \cos^2\theta \, (l \tan\theta + h)} \right]^{1/2}$$

$$V_0 = 5.8 \text{ m/s}$$

BOLO!



$v = \text{const}$

$$T_b - mg = mv^2/R \qquad (1)$$

$$T_t + mg = mv^2/R \qquad (2)$$

$$T_b = 1.5\,T_t \qquad (3)$$

(1)+(3): $1.5\,T_t - mg = mv^2/R$

(2): $T_t + mg = mv^2/R$

ADD: $2.5\,T_t = 2\,mv^2/R$

$$T_t = \frac{4}{5}\,mv^2/R$$

$$\frac{4}{5}\,mv^2/R + mg = mv^2/R$$

$$mg = \frac{1}{5}\,mv^2/R$$

$$v^2 = 5gR$$

$$\boxed{v_0 = \sqrt{5gR}}$$