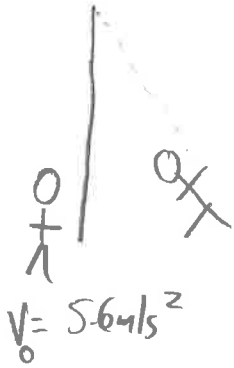
LAW OF CONSERVATION OF ENERGY

35.



$V_0 = 5.6\ m/s$

$V = 0\ m/s$

$h = ?$

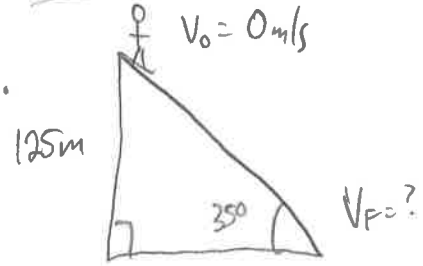
$$E_i = E_F$$

$$\cancel{E_{Pi}} + E_{Ki} = E_{Pf} + \cancel{E_{Kf}}$$

$$\frac{1}{2}\cancel{m}V_0^2 = \cancel{m}gh$$

$$h = \frac{V_0^2}{2g} = \frac{(5.6\ m/s)^2}{2(9.80\ m/s^2)} = \boxed{1.6\ m}$$

36.



$h = 125\ m$

$V_0 = 0\ m/s$

$V = ?$

$$E_i = E_F$$

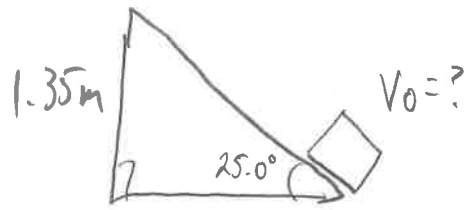
$$E_{Pi} + \cancel{E_{Ki}} = \cancel{E_{Pf}} + E_{Kf}$$

$$\cancel{m}gh = \frac{1}{2}\cancel{m}V^2$$

$$\therefore V = \sqrt{2gh} = \sqrt{2(9.80\ m/s^2)(125\ m)}$$

$$= \boxed{49.5\ m/s}$$

37.



$h = 1.35\,m$

$V_0 = ?$

$V = 0\,m/s$

$$E_i = E_F$$

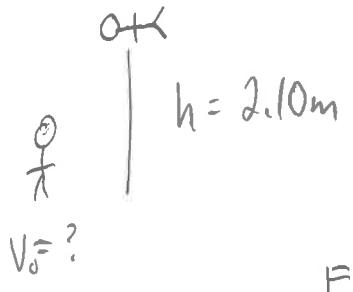
$$E_{Pi} + E_{Ki} = E_{PF} + E_{KF}$$

$$\tfrac{1}{2}mv_0^2 = mgh$$

$$v_0 = \sqrt{2gh} = \sqrt{2(9.80\,m/s^2)(1.35\,m)}$$

$$= 5.14\,m/s$$

38.



$h = 2.10\,m$

$V_0 = ?$

$V = 0.70\,m/s$

$$E_i = E_f$$

$$E_{Pi} + E_{Ki} = E_{Pf} + E_{Kf}$$

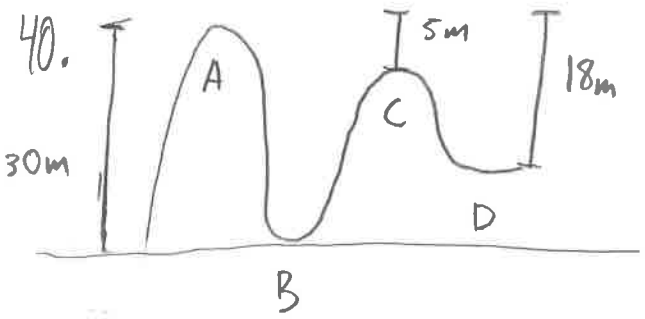
$$\tfrac{1}{2}mv_0^2 = mgh + \tfrac{1}{2}mV^2$$

$$v_0^2 = 2gh + V^2$$

$$v_0 = \sqrt{2(9.80\,m/s^2)(2.10\,m) + (0.70\,m/s^2)}$$

$$v_0 = 6.45\,m/s$$

40.



$h_B = 30.m$

$h_C = 5.0m$

$h_d = 18m$

$E_i = E_F$

$E_{Pi} + E_{Ki} = E_{Pf} + E_{kf}$

$mgh_i = \frac{1}{2}mV^2$

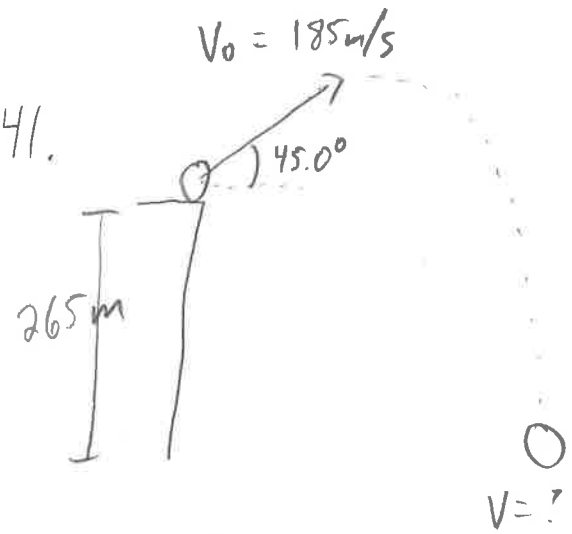
$\therefore \quad V = \sqrt{2gh_i}$

$V_B = \sqrt{2(9.80 m/s^2)(30m)} = \boxed{24 m/s}$

$V_C = \sqrt{2(9.80 m/s^2)(5.0m)} = \boxed{9.9 m/s}$

$V_d = \sqrt{2(9.8 m/s^2)(18m)} = \boxed{19 m/s}$

41.



NO KINEMATICS - gravity is conservative !!

$V_0 = 185 m/s$

$V = ?$

$h = 265 m$

$E_i = E_f$

$E_{Pi} + E_{Ki} = E_{Pf} + E_{Kf}$

$mgh_i + \frac{1}{2}mV_0^2 = \frac{1}{2}mV^2$

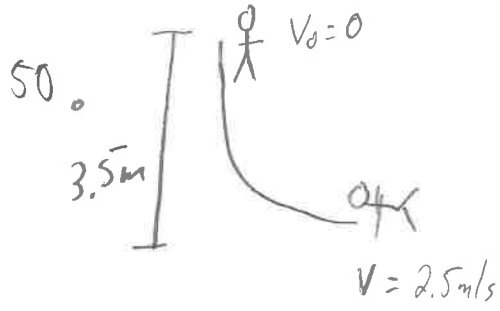
$2gh_i + V_0^2 = V^2$

$\therefore V = \sqrt{V_0^2 + 2gh_i}$

$= \sqrt{(185 m/s)^2 + 2(9.80 m/s^2)(265 m)}$

$= 199 m/s$

50.



$V_0 = 0 m/s$

$h = 3.5 m$

$V = 2.5 m/s$

$m = 17 kg$

$E_H = ?$

$$E_i = E_f$$

$$E_{pi} + \cancel{E_{ki}} = \cancel{E_{pf}} + E_{kf} + E_H$$

$$mgh = \frac{1}{2}mv^2 + E_H$$

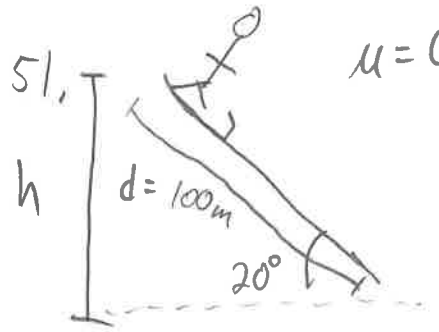
$$\therefore E_H = mgh - \frac{1}{2}mv^2$$

$$= (17kg)(9.80 m/s^2)(3.5m) - \frac{1}{2}(17kg)(2.5 m/s)^2$$

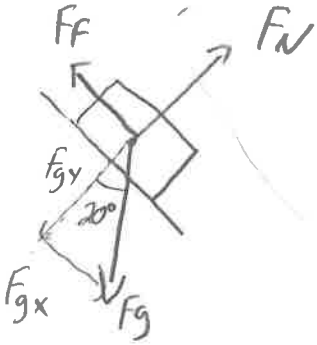
$$= 529.975$$

$$= \boxed{530\ J}$$

51.



$\mu = 0.090$



$\Sigma F_y = 0$

$F_N = F_{gy}$

$= F_g \cos\theta$

$F_N = mg\cos\theta$

$F_F = \mu F_N$

$F_F = \mu mg\cos\theta$

$h = d\sin\theta$

$E_i = E_f$

a)

$E_{pi} + E_{ki} = E_{pf} + E_{kf} + E_H$

$mgh = \frac{1}{2}mv^2 + F_F \cdot d$

$mgd\sin\theta = \frac{1}{2}mv^2 + \mu mg\cos\theta d$

$2gd\sin\theta = v^2 + 2\mu g\cos\theta d$

$v^2 = 2gd\sin\theta - 2\mu g\cos\theta d$

$v = \sqrt{2gd(\sin\theta - \mu\cos\theta)}$

$v = \sqrt{2(9.80\,m/s^2)(100m)(\sin 20° - 0.090\cos 20°)}$

$= 22.4632$

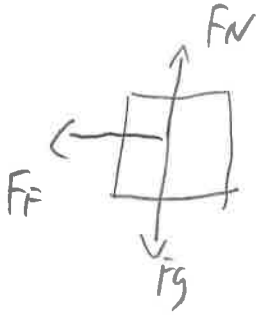
$\boxed{= 22\ m/s}$

b)

$V_0 = 22.4632\ m/s$

$V = 0\ m/s$

$\mu = 0.090$



$F_N = F_g = mg$

$F_F = \mu F_N$

$F_F = \mu mg$

$$E_i = E_F$$

$$\cancel{E_{Pi}} + E_{Ki} = \cancel{E_{Pf}} + \cancel{E_{Kf}} + E_H$$

$$E_{Ki} = E_H$$

$$\frac{1}{2}mv_0^2 = F_F \cdot d$$

$$mv_0^2 = 2\mu mgd$$

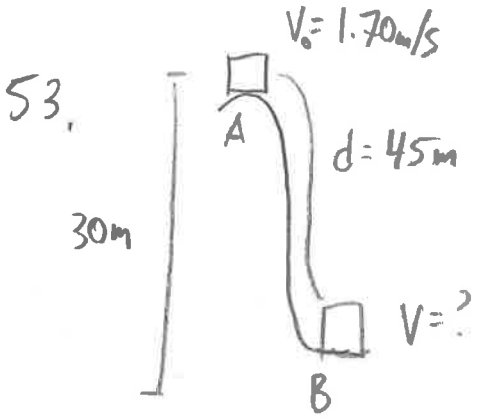
$$\therefore d = \frac{v_0^2}{2\mu g}$$

$$= \frac{(22.4632\ m/s)^2}{2(0.090)(9.80\ m/s^2)}$$

$$= 286.05\ldots$$

$$= \boxed{290\ m}$$

53.



$h = 30m$

$d = 45m$

$F_F = \frac{1}{5} F_g = 0.2mg$

$V_0 = 1.70 m/s$

$$E_{Pi} + E_{Ki} = E_{PF} + E_{KF} + E_H$$

$$mgh + \frac{1}{2}mV_0^2 = \frac{1}{2}mV^2 + F_F \cdot d$$

$$2mgh + mV_0^2 = mV^2 + 2(0.2mg)d$$

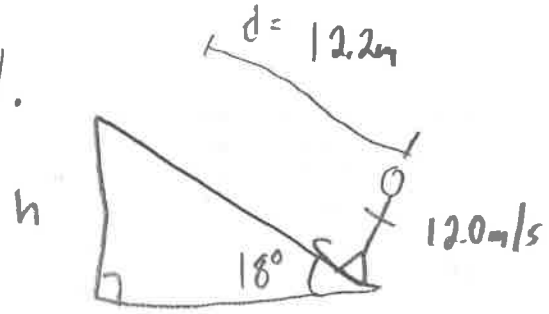
$$V^2 = 2gh + V_0^2 - 0.4gd$$

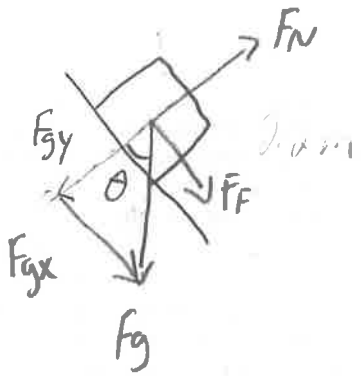
$$V = \sqrt{2(9.8 m/s^2)(30m) + (1.70 m/s)^2 - 0.4(9.80 m/s^2)(45m)}$$

$$= 20.3590$$

$$= \boxed{20 m/s}$$

54.





$F_N = F_{gy}$

$F_N = mg\cos\theta$

$F_F = \mu F_N$

$F_F = \mu mg\cos\theta$

$h = d\sin\theta$

$d = 12.2\text{m}$

$\theta = 18°$

$V_0 = 12.0\text{m/s}$

$V = 0\text{ m/s}$

$$E_i = E_F$$

$$E_{Pi} + E_{Ki} = E_{Pf} + E_{Kf} + E_H$$

$$\frac{1}{2}mV_0^2 = mgh + F_F \cdot d$$

$$\frac{1}{2}mV_0^2 = mgd\sin\theta + \mu mg\cos\theta\, d$$

$$\therefore \mu = \frac{\frac{1}{2}V_0^2 - gd\sin\theta}{g\cos\theta\, d}$$

$$\mu = \frac{(0.5)(12.0\text{m/s})^2 - (9.80\text{m/s}^2)(12.2\text{m})(\sin 18°)}{(9.80\text{m/s}^2)(\cos 18°)(12.2\text{m})}$$

$$= 0.30827$$

$$= \boxed{0.31}$$