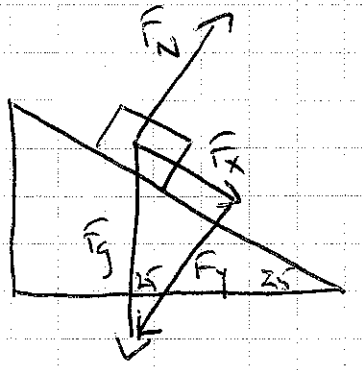
Dynamics 2

① 

$F_g = mg$

$\sin\theta = \frac{F_x}{F_g}$

$F_x = F_g \sin\theta$

$F_x = mg\sin\theta$

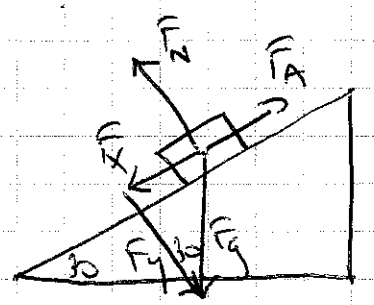
$\Sigma F = F_x$

$ma = mg\sin\theta$

$a = g\sin\theta$

$= 9.8 \sin 25$

$a = \boxed{4.14 \text{ m/s}^2}$

② 

$F_g = mg = (250)(9.8) = 2450 \text{ N}$

$\sin\theta = \frac{F_x}{F_g}$

$F_x = F_g \sin\theta$

$= 2450 \sin 30$

$F_x = 1225 \text{ N}$

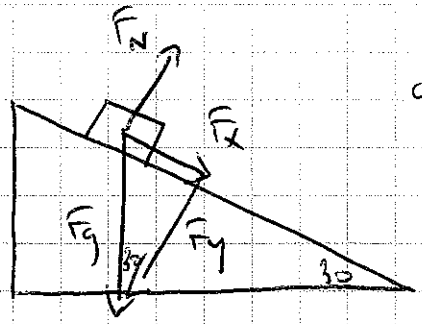
$\Sigma F = F_A - F_x$

$ma = F_A - F_x$

$(250)(3.27) = F_A - 1225$

$817.5 = F_A - 1225$

$F_A = \boxed{2042.5 \text{ N}}$

③ 

a) 20 kg

$F_g = mg$

$= (20)(9.8)$

$= 196 \text{ N}$

$\Sigma F = F_x = F_g \sin\theta$

$= 196 \sin 30$

$= 98 \text{ N}$

$a = \frac{\Sigma F}{m} = \frac{98}{20}$

$a = \boxed{4.9 \text{ m/s}^2}$

40 kg

$F_g = mg$

$= (40)(9.8)$

$= 392 \text{ N}$

$\Sigma F = F_x = F_g \sin\theta$

$= 392 \sin 30$

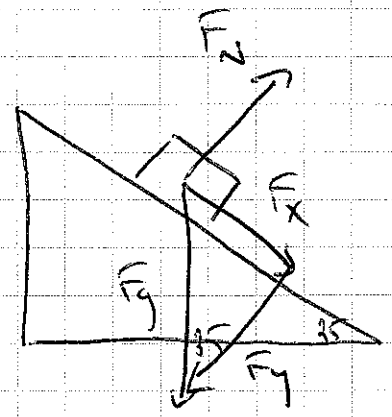
$= 196 \text{ N}$

$a = \frac{\Sigma F}{m} = \frac{196}{40}$

$a = \boxed{4.9 \text{ m/s}^2}$

b) They reach the bottom at the same time.

④



$F_g = mg$

$= (95)(9.8)$

$F_g = 931\ N$

$F_x = F_g \sin\theta$

$= 931 \sin 35$

$F_x = 534\ N$

$\Sigma F = F_x$

$ma = F_x$

$95a = 534$

$a = 5.62\ m/s^2$

$v_i = 0 \quad d = 50\ m \quad v_f = ?$

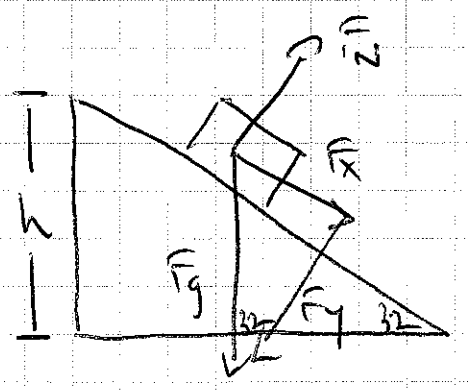
$v_f^2 = v_i^2 + 2ad$

$= 0^2 + 2(5.62)(50)$

$v_f^2 = 562$

$v_f = \boxed{23.7\ m/s}$

⑤



$F_g = mg$

$= (15)(9.8)$

$F_g = 147\ N$

$F_x = F_g \sin\theta$

$= 147 \sin 32$

$F_x = 77.9\ N$

$\Sigma F = F_x$

$ma = F_x$

$15a = 77.9$

$a = 5.19\ m/s^2$

$v_i = 0 \quad t = 4.5\ s \quad d = ?$

$d = v_i t + \frac{1}{2}at^2$

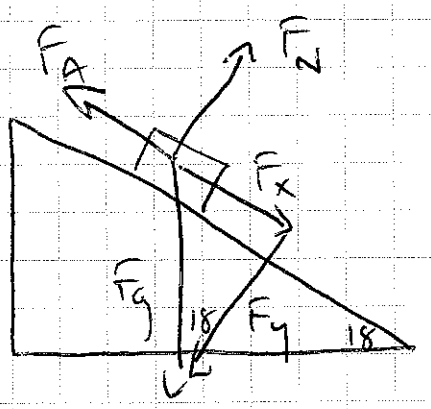
$= (0)(4.5) + \frac{1}{2}(5.19)(4.5)^2$

$d = 52.58\ m$

$\sin 32 = \frac{h}{52.58}$

$h = 52.58 \sin 32 = \boxed{27.9\ m}$

⑥



$F_g = mg$

$= (48)(9.8)$

$F_g = 470.4\ N$

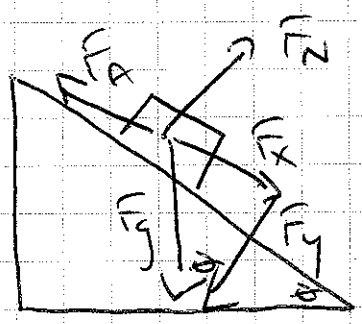
$F_x = F_g \sin\theta$

$= 470.4 \sin 18$

$F_x = 145.36\ N$

At rest, $\Sigma F = 0$. Thus, $F_A = F_x = \boxed{145.4\ N}$

⑦



$F_g = mg$

$= (25)(9.8)$

$F_g = 245\ N$

$F_x = F_A = 157\ N$

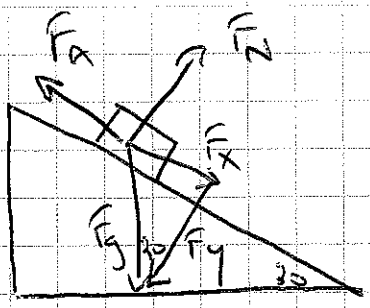
$\sin\theta = \frac{F_x}{F_g}$

$\sin\theta = \frac{157}{245}$

$\theta = \sin^{-1}\frac{157}{245}$

$\theta = \boxed{39.9°}$

⑧



$F_g = mg$

$F_x = mg\sin\theta$

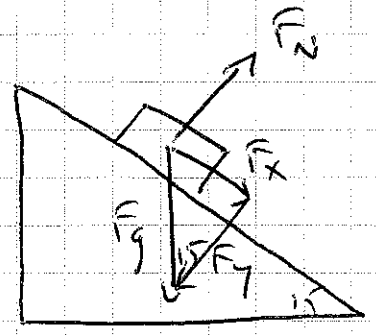
$F_x = F_A = 200\ N$

$F_x = mg\sin\theta$

$200 = m(9.8)\sin 30$

$m = \boxed{40.8\ kg}$

⑨ a)



$F_g = mg$

$= (2)(9.8)$

$F_g = 19.6\ N$

$\sin 15 = \frac{F_x}{19.6}$

$F_x = 19.6 \sin 15$

$F_x = 5.073\ N$

$\Sigma F = F_x = 5.073\ N$

$a = \frac{\Sigma F}{m}$

$= \frac{5.073}{2} = \boxed{2.54\ m/s^2}$

b) $d = v_i t + \frac{1}{2} a t^2$

$= (0)(1.5) + \frac{1}{2}(2.54)(1.5)^2$

$d = \boxed{2.85\ m}$