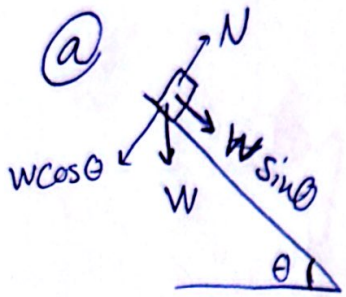
Q2

chapter 2

$\theta = 15°$

$m_c = 2200\ kg$

(a)



→ if there is no sliding and frictional force

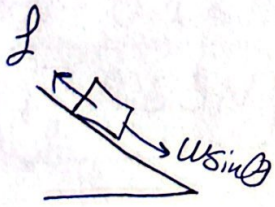
$\Sigma F_x = ma_x$

$W \sin\theta = ma_x$

$\frac{mg \sin\theta}{m} = a = \frac{2200 \times 10 \times \sin(15)}{2200}$

$= 2.588 \approx 2.6\ m/s^2$

(b) with friction force



$f = 5000\ N$

$\Sigma F_x = ma$

$-f + W \sin\theta = ma$

$\frac{-5000 + 5694}{2200} = a$

$a = 0.315\ m/s^2$

Q8

$m_b = 65\ kg$

$V_i = 50\ km/h = 13.88\ m/s$

$V_f = 0$

$\Delta t = 0.15\ s$

$m_h = 4.5\ kg$

$\Sigma F_h = ?!$ acting on the head

@ $F = ma = m\frac{\Delta V}{\Delta t}$

$\Rightarrow F = \frac{4.5 \times (13.88)}{0.15}$

$F = 416.4\ N$ on the head only

(b)

$W = 65 \times 10 = 650\ N$

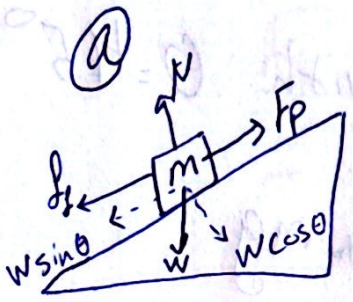
$\frac{416.4}{650} = 0.64 \Rightarrow 64\%$ of the weights force acting on the person.

Q9

$m = 10\ kg \quad \theta = 10^\circ$

$\mu_k = 0.1$ between the box and the ramp.

@



$\Sigma F_y = 0$

$N - W\cos\theta = 0$

$$\boxed{N = mg\cos\theta}$$

$N = 10 * 10\cos(10)$

$$\boxed{N = 96.51\ N}$$

$\Sigma F_x = ma$

$F_p - F_f - W\sin\theta = ma$

$a_x = 0$

→ since it's moving with steady speed.

$F_f = \mu N = 0.1 * 96.5$

$$\boxed{F_f = 9.65\ N}$$

$F_p = F_f + W\sin\theta$

$= 9.65 + 100 * \sin(10)$

$= 26.67 \approx 27\ N$

(b) The fraction of the weight

$$\frac{26.67}{98} = 0.272$$

(c), (d) repeat the same steps with $\theta = 45^\circ$

(c) 78 N (d) $0.78 \times mg$.

Q10 The answer we want is the Normal force = F_W which is the amount of force that the wind is exerting on the chicken to hold it to the wall.

→ $F_g = F_f$

$F_g = \mu F_N$

$F_W = F_N = \frac{1.6 \times 10}{0.25} = 64$

$F_f = F_g$

$\mu F_N = F_g$