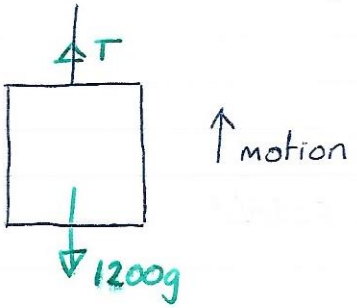
RF = ma Lifts : Answers to Exam 1

1) a)



(i) when acc is $\uparrow 2 m/s^2$

$RF = ma$

$T - 1200g = 1200(2)$

$T = 2400 + 1200g$

$T = 14\,160\ N$

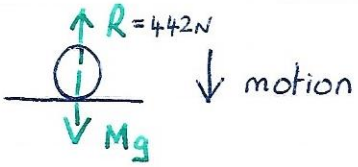
(ii) when moving up at constant speed

zero acc

$\therefore \quad T = 1200g\ N$

$T = 11\,760\ N$

b)



when acc is $\downarrow 3 m/s^2$

$RF = ma$

$Mg - 442 = M(3)$

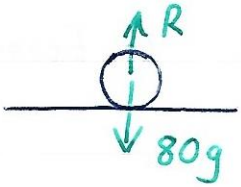
$9.8M - 3M = 442$

$6.8M = 442$

$M = \frac{442}{6.8}$

$M = 65\ kg$

2)



a) motion down with acc $0.3 m/s^2$

$Rf = ma$

$80g - R = 80(0.3)$

$80g - 24 = R$

$760N = R$

b) moving up with acc $0.2 m/s^2$

$Rf = ma$

$R - 80g = 80(0.2)$

$R = 16 + 80g$

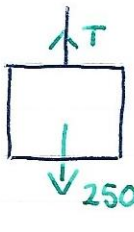
$R = 800N$

c) constant speed, zero acc

$R = 80g$

$R = 784N$

3)



↑motion ↑acc = $1.8 m/s^2$

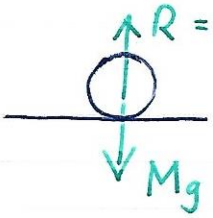
a) $Rf = ma$ whole system

$T - 2500g = 2500(1.8)$

$T = 4500 + 2500g$

$T = 29000N$

b)



↑acc $1.8 m/s^2$

$Rf = ma$

$R - Mg = M(1.8)$

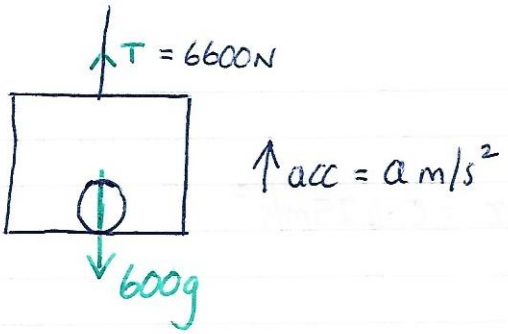
$696 = 1.8M + 9.8M$

$696 = 11.6M$

$\therefore \frac{696}{11.6} = M$

$60 kg = M$

4)



a) $Rf = ma$ for Lift and Person (Whole System)

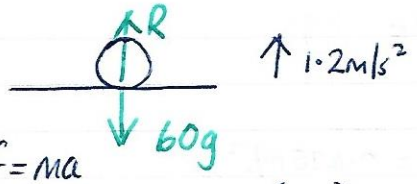
$T - 600g = 600a$

$6600 - 5880 = 600a$

$720 = 600a$

$1.2\,m/s^2 = a$

b)



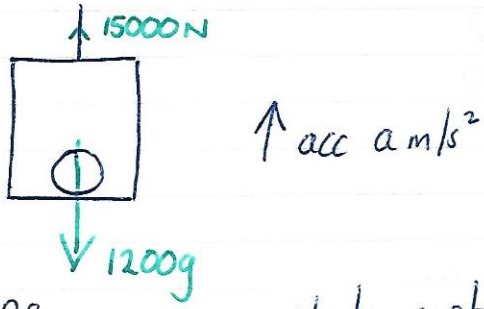
$Rf = ma$

$R - 60g = 60(1.2)$

$R = 72 + 588$

$R = 660N$

5)



a) $Rf = ma$ whole system

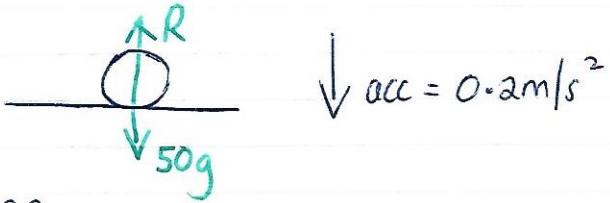
$15000 - 1200g = 1200(a)$

$15000 - 11760 = 1200a$

$\frac{3240}{1200} = a$

$2.7\,m/s^2 = a$

b)



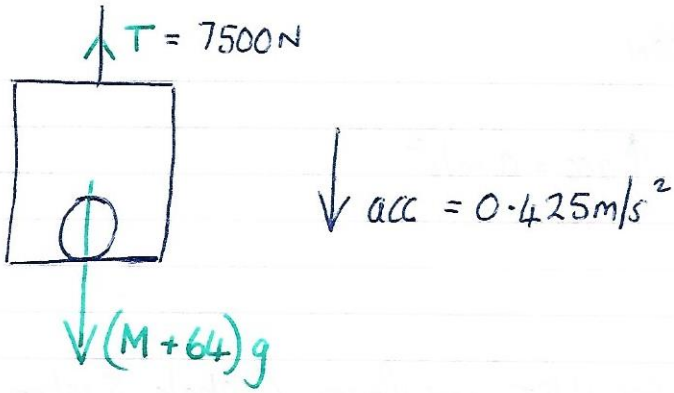
$Rf = ma$

$50g - R = 50(0.2)$

$490 = 10 + R$

$480N = R$

6)



a) $Rf = ma$ whole system

$(M+64)g - 7500 = (M+64)0.425$

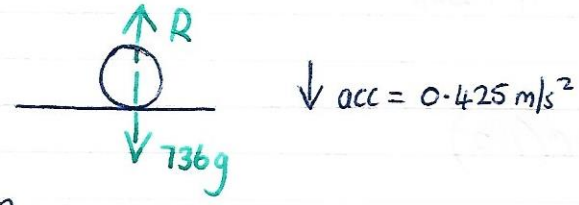
$9.8M + 627.2 - 7500 = 0.425M + 27.2$

$9.8M - 0.425M = 27.2 - 627.2 + 7500$

$9.375M = 6900$

$M = 736$ kg.

b)



$Rf = ma$

$736g - R = 736(0.425)$

$7212.8 - 312.8 = R$

$6900\ N = R$