

## Extra Questions

These are some extra questions for you to work through. The style is very similar to what you will encounter in the exam.

1. A 72kg man is standing on a force plate. Draw a free body diagram indicating the forces acting. He catches a 0.2kg ball dropped from 10m above him and decelerates the ball in 0.4m. Draw a graph showing the vertical force trace recorded by the forceplate. The man then throws the ball 2m up. What velocity does the ball have when it leaves his hand?
2. A 47kg woman does a bungee jump from a 50m crane. The bungee rope has a length of 20m. What spring constant must the rope have so that the woman just misses the ground. What is the maximum speed the woman will reach. What velocity will a 65kg man hit the ground at if he used the same rope?
3. A 40kg woman is carrying a 15kg suitcase. Draw a diagram indicating the forces acting on the joints in the upper limb. She now lifts the suitcase above her head to put it on the luggage rack of a train. What are the joint reaction forces on the upper limb now? The case slips out of her hands and hits her on the head. There is 0.005m of cushioning so what is the average force of impact?

Body segment		Body segment	
Head and neck	8.10%	Hand	0.60%
Trunk	49.70%	Thigh	10.00%
Upper arm	2.80%	Lower leg	4.65%
Forearm	1.60%	Foot	1.45%

Proportional percentage of body segment to total body weight (Winter 1990)

4. A man kicks a 1.5kg ball at an angle of  $45^\circ$  and a velocity of  $3\text{ms}^{-1}$ . How far up does it travel? How long does it stay in the air? How far does it go forward? He repeats the kick but this time at an angle of  $30^\circ$ . How far up and forward does it go now?
5. A 50kg woman is standing wearing a 20kg rucksack. What forces are acting on the woman? She enters a lift which accelerates upwards at  $3.5\text{ms}^{-2}$ . What forces are acting on her now? The lift's emergency break activates when the lift was travelling at  $8\text{ms}^{-1}$  and decelerates the lift at  $15\text{ms}^{-2}$ . What forces are acting on the woman? What acceleration does she feel?