On these sheets, no attempt is made to "model" real-life situations: no trains, cars, cyclists, lifts, etc. It is assumed that there are no "real" forces, such as air-resistance unless they are specifically mentioned. Most questions, but not all, avoid numbers and units, prefering general algebraic formulae with consistent dimensions.

Exercises for Lecture 4

1. Three particles of masses m_1, m_2 and m_3 are fixed to a light rod at distances d_1, d_2 and d_3 from one end. Find the distance of the centre of mass of the system from this end.

2. The density of a rod AB at a point x from A is $\rho_0 x/a$, where ρ_0 is a constant and a is the length of the rod. Find the mass of the rod and show that the centre of mass is a distance $\frac{2}{3}a$ from A. [You may treat the rod as 1-dimensional.]

3. A circular arc of radius a has constant density ρ and subtends an angle 2α at its centre. Show that its centre of mass is a distance $a\sin\alpha/\alpha$ from the centre. [You may treat the circular arc as 1-dimensional.]

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