1. The force of air resistance F on a falling body can be modeled as depending on the density ρ the surface area A and the speed v. Suppose the relationship is

$$F = k\rho^x A^y v^z \ ,$$

where k is a dimensionless proportionality constant and x, y and z are exponents. Use dimensional analysis to determine the coefficients x, y and z. [Note the units of force are kg·m/s^2 and the units of density are kg/m^3].

2. There are three fundamental constants in physics that involve dimensions of mass, length and time. They are the speed of light $c = 3.00 \times 10^8$ m/s, which governs the behaviour of objects which go very fast, Plank's constant $h = 6.63 \times 10^{-34}$ kg·m^2/s, which governs the behaviour of objects that are very small, and the universal gravitational constant $G = 6.67 \times 10^{-11}$ m^3/(s^2·kg) which governs the strength of the gravitational interaction between two bodies.

Suppose we could define a length scale L that depends c, h, and G in the following way

$$L = c^x h^y G^z$$

Using dimensional analysis find the exponents x, y and z so that L has dimensions of length. Then evaluate L given the values for c, h, and G. This tiny length scale is called the Planck Length and is believed to be the sized of superstrings which are proposed as the fundamental constituents of matter.