

Dimensional Analysis Practice

Your name here:

1 Dimensional Analysis Extra Problems

Solve each problem below using dimensional analysis.

1. A planet orbits a star due to the effect of gravity. The orbital period can be reasonably expected to depend on the orbital radius, the gravitational constant (units $\frac{\text{N}\cdot\text{m}^2}{\text{kg}^2}$) and the mass of the star. If the second planet is twice as far away as the first, by what factor should the orbital period change. Hint: it might be easier to work with the square of the period than the period itself when doing the dimensional analysis.
2. A certain school has a total volume of 10^4 m^3 and has grades k-12 with the same number of students in each grade. If the density of students is $10^{-3} \frac{\text{students}}{\text{m}^3 \cdot \text{grade}}$ how many students are in the school?
3. In water, or any other liquid, as you go further below the surface, the pressure increases. If you were twice as far below the surface of a liquid with twice the density of water on a planet with twice the surface gravity of earth, by what factor would the pressure be higher?
4. Derive an equation that relates the momentum of a photon to the angular frequency (ω , units $\frac{1}{\text{s}}$) you may also need to use the speed of light (c) and the plank constant ($\hbar$, units $\text{J} \cdot \text{s}$)