Mechanics 001.

The following discussion can be found in any high school or introductory college physics book. But a particularly clear and readable explanation that I consulted is Understanding Physics by Issac Asimov (Dorset Press, 1966). You may find separately bound the section called: Motion, Sound, and Heat.

1. Discuss the following quote from Asimov's book (page 21) 'On again, consider the importance of units. It is improper and incorrect to that "the value of g is 32" or "the value of g is 9.8". The number by itself has no meaning in this connection. One must say either $32\frac{ft}{sec^2}$ or $9.8\frac{m}{sec^2}$. These last two values are absolutely equivalent. The numerical portions of the expressions may be different, taken by themselves, but with the units added they are identical values. One is by no means "more true" or "more accurate" than the other; the expression in metric units is merely more useful.'

2. Newton's law is rendered mathematically by the equation:

$$F = ma.$$

   What do F, m, a stand for? What are their (English) units?

3. Newton's law of universal gravitation asserts:

$$F = \frac{Gm_1m_2}{d^2}.$$

   What do F, m_1, m_2, d, G stand for? What are their (English) units?

4. The value of G can be calculated in metric units as $6.67 \times 10^{-11}\frac{m^3}{kg-sec^2}$. Do the units correspond to your answer to the previous question?

5. Compute the acceleration due to gravity on Earth and on Jupiter from Newton's laws. Asimov and my physics book tell me the mass of the earth is 6.0×10^{24} kilograms. Google tells me the mass of Jupiter is 1.8987×10^{27} kilograms.

6. Weight versus mass. mass is a measure of inertia; the English units are pounds, metric kilograms. Weight is the gravitational force that acts on an object; $w = mg$. so the units are? An object has the same mass no matter where is it is in the universe. But it's weight changes from planet to planet. Do we have information that allows us to calculate the weight of the rock in Problem II.4? (Put another way, how long would it take a pea to drop 200 feet on earth (on Jupiter)?