1. The momentum, \( p \) of an object is given by \( p = mv \), where \( m \) is the mass in kilograms and \( v \) is the velocity in meters per second. The standard unit for momentum is the kg-mps, or 'kilogram-meter per second.'

(a) Find an equation that gives the mass of an object given its momentum and velocity. [This equation will look like \( m = \boxed{\text{}} \).]

(b) Solve the momentum equation for \( v \) in terms of \( p \) and \( m \).

(c) Use your answer to question 1a to answer the following: What is the mass, in kilograms, of an object traveling at 25 meters per second and with a momentum of 100 kg-mps?

2. After \( t \) seconds, an object traveling with constant acceleration \( a \), measured in \( \text{m/sec}^2 \), travels \( d \) meters, where these quantities are related by the equation \( d = \frac{1}{2}at^2 \).

(a) Find an equation for \( a \) and an equation for \( t \) in terms of the other variables.

(b) On Earth, an object dropped from a building 100 meters high takes 3.19 seconds to fall all the way to the ground. What is the acceleration of Earth’s gravity, in \( \text{m/sec}^2 \)?

(c) On planet Zwiboid, gravity’s acceleration is constant at 10 \( \text{m/sec}^2 \). How long would it take for the same object to fall from a 100-meter building?
3. The force, $F$, carried by an object, is given by $F = ma$, where $m$ is the mass of the object and $a$ is the acceleration of the object. The standard unit of measurement for $F$ is called the Newton, and the units for $m$ and $a$ are kilograms and m/sec$^2$, respectively.

(a) A Zwiboidal rock that weighs 15 kg is falling through the air. Using the information about Zwiboid’s gravity, find the force carried by this rock.

(b) A Zwiboidian created a table and placed on his table a decorative vase. The force the vase exerts on the table is 53 Newtons. What is the mass of this vase?

4. The period of a pendulum on Zwiboid is given by the equation

$$T = 2\pi \sqrt{\frac{\ell}{g}}$$

where $T$ is the period in seconds, $\ell$ is the length in meters, and $g$ is the Zwiboidian gravity constant 10 m/sec$^2$.

(a) Find an equation for $\ell$ in terms of $g$ and $T$.

(b) How long must a pendulum be that has a period of exactly one second?