TUTORIAL PROBLEM SET #1 SOLUTION (WEEK 37: SEPTEMBER 9, 2007)

The problem set provides a representative sample of questions on relevant courses material and concepts covered in the lectures. The tutorial problems sets are intended to develop good study habits and become engaged in the learning process.

1: Problem 1-4 Hibbeler (page 15)

Represent each of the following combinations of units in the correct SI form: (a) Mg/ms, (b) N/mm, (c) mN/kg-μs.

Solution:

(a) \( \frac{Mg}{ms} = \frac{10^3 \text{ kg}}{10^{-3} \text{ s}} = \frac{10^6 \text{ kg}}{\text{ s}} = \frac{\text{ Gg}}{\text{ s}} \)

\[ \frac{Mg}{ms} = \frac{\text{ Gg}}{\text{ s}} \]

(b) \( \frac{N}{mm} = \frac{1 \text{ N}}{10^{-3} \text{ m}} = 10^3 \frac{\text{ N}}{\text{ m}} = \frac{\text{ kN}}{\text{ m}} \)

\[ \frac{N}{mm} = \frac{\text{ kN}}{\text{ m}} \]

(c) \( \frac{mN}{kg-\mu s} = \frac{10^{-3} \text{ N}}{10^{-6} \text{ kg} \cdot \text{ s}} = \frac{\text{ kN}}{\text{ kg} \cdot \text{ s}} \)

\[ \frac{mN}{kg-\mu s} = \frac{\text{ kN}}{\text{ kg} \cdot \text{ s}} \]
2: Problem 1-8 Hibbeler (page 15)

If a car is traveling at speed 55 mi/h, determine its speed in kilometers per hour and meters per second.

Given:
\[ v = 55 \text{ mi/hr} \]

Solution:
\[ v = 88.51 \text{ km/hr} \]
\[ v = 24.6 \text{ m/s} \]

3: Problem 1-12 Hibbeler (page 15)

The specific weight (weight/volume) of brass is 520 lb/ft\(^3\). Determine its density (mass/volume) in SI units. Use an appropriate prefix.

Given:
\[ \rho = 520 \text{ lb/ft}^3 \]

Solution:
\[ \rho = 8.33 \text{ Mg/m}^3 \]
4: Problem 1-16 Hibbeler (page 15)

Two particles have masses 8 kg and 12 kg, respectively. If they are a distance 800 mm apart, determine the force of gravity acting between them. Compare this result with the weight of each particle.

Units Used:

\[ G = 6.67 \times 10^{-12} \frac{m^3}{kg \cdot s^2} \]

\[ nN = 10^{-9} \text{ N} \]

Given:

\[ m_1 = 8 \text{ kg} \]
\[ m_2 = 12 \text{ kg} \]
\[ d = 800 \text{ mm} \]

Solution:

\[ F = \frac{G m_1 m_2}{d^2} \]

\[ F = 10.0 \text{ nN} \]

\[ W_1 = m_1 g \quad W_1 = 78.5 \text{ N} \]
\[ \frac{W_1}{F} = 7.84 \times 10^9 \]

\[ W_2 = m_2 g \quad W_2 = 118 \text{ N} \]
\[ \frac{W_2}{F} = 1.18 \times 10^{10} \]
5: Problem 1-20 Hibbeler (page 15)

Evaluate each of the following to three significant figures and express each answer in SI units using an appropriate prefix: (a) \( \frac{0.631 \text{ Mm}}{8.60 \text{ kg}^2} \) (b) \((35 \text{ mm})^2 (48 \text{ kg})^3\).

Given:

\[ a_1 = 0.631 \text{ Mm} \]
\[ b_1 = 8.60 \text{ kg} \]
\[ a_2 = 35 \text{ mm} \]
\[ b_2 = 48 \text{ kg} \]

Solution:

(a) \[ \frac{a_1}{b_1^2} = 8.53 \frac{\text{km}}{\text{kg}^2} \]

(b) \[ a_2^2 b_2^3 = 135.48 \text{ kg}^3 \cdot \text{m}^2 \]

6: Self-Study Quiz Problem 1

Static's deals with bodies that have constant velocity. True or False?

Answer: True

7: Self-Study Quiz Problem 2

Equilibrium means at rest or moving with constant velocity. True or False?

Answer: True

8: Self-Study Quiz Problem 3

A particle has a mass but its size can be neglected. True or False?

Answer: True
9: Self-Study Quiz Problem 7

The weight of a body remains constant regardless of its location. True or False?

Answer: False

10: Self-Study Quiz Problem 16

The accuracy of a number is indicated by the number of significant figures it contains. True or False?

Answer: True