

ENGINEERING MECHANICS: STATICS



COLLEGE OF
**ENGINEERING, ARCHITECTURE
AND TECHNOLOGY**



西南交通大学
Southwest Jiaotong University







Chapter 1: General Principles

Mechanics involves the rest or motion of bodies that are subjected to the action of forces.

3 branches of Mechanics:

1. Rigid Body Mechanics - Statics & Dynamics

Statics: Equilibrium at rest or at constant velocity

Dynamics: Accelerated motion of bodies

2. Deformable Body Mechanics - Strengths of Materials

3. Fluid Mechanics - Fluid Mechanics, Thermodynamics

We will deal with ***Statics*** - Rigid bodies at rest, in this course.

1.2: Fundamental Concepts

Quantities used in Rigid Body Mechanics include:

1. Length - Used to describe location and size.
2. Mass - Property that produces effects of gravitation force.
3. Force - "Push" or "Pull" exerted from one body to another.
4. Time - Not a Statics concern (used in Dynamics).

Models to visualize bodies in Rigid Body Mechanics include:

1. Particle - Element w/ mass where size is not important.
2. Rigid Body - Element w/ mass where size affects forces.
3. Concentrated Force - Load applied at fixed location(s).

1.3: Units

We will use ***SI*** as well as ***U.S. Customary*** units in this course.

S.I. Units

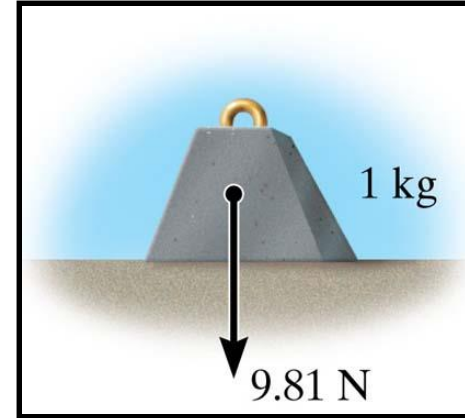
Mass is typically given, thus weight must be calculated by the equation:

$$W = m g \quad (\text{N} = \text{newton})$$

where,

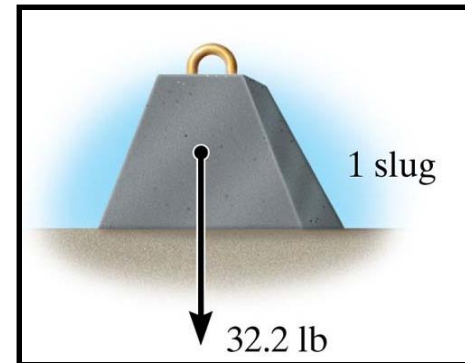
m = mass (kg)

g = gravitational constant (9.81 m/s^2)



U.S. Customary Units

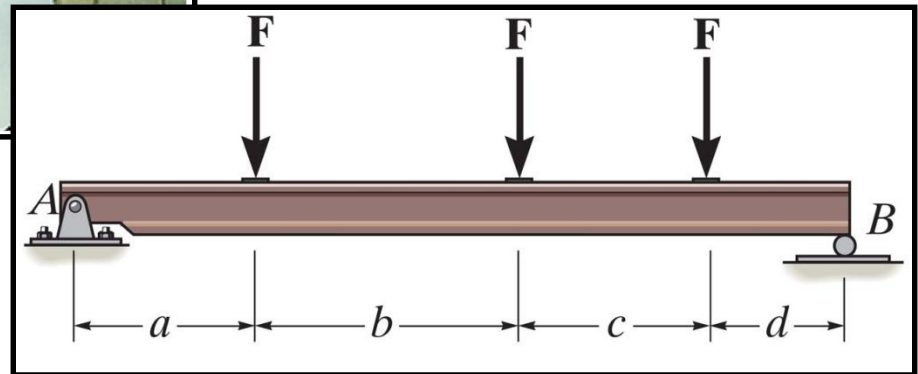
Typically given in pounds-force, thus no conversion is required



1.6: General Procedure for Analysis

The following is a guide for solving a Statics problem:

1. Read carefully to understand the problem.
2. Draw all diagrams & tabulate problem data.
3. Apply theory in equation form.
4. Solve equations and determine answer.
5. Review completed problem - ***Does answer make sense?***



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