TAM 210/211 Written Assignment 3 (due Thursday, Mar 1st)

The **OBJECTIVE** of this written assignment is to practice **drawing free-body diagram (FBD)** and **writing equations of equilibrium (EoE)**.
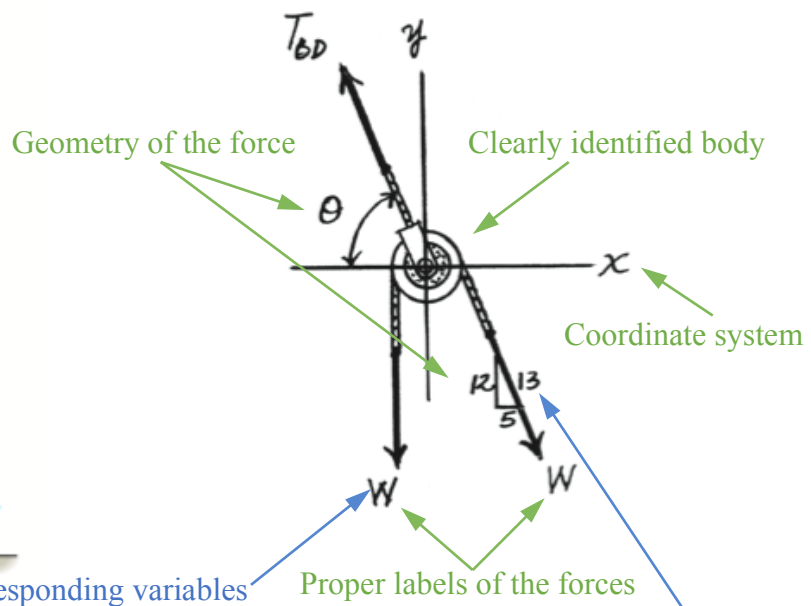
DIRECTION: On each problem solution page, use the <u>top half</u> to clearly draw out a large FBD of the specified body/bodies, and the <u>bottom half</u> to write the corresponding equations of equilibrium for the diagram. DO NOT SOLVE THE PROBLEM.

General "Written Assignment Instructions" applies. Additional grading criteria includes: 1) proper use of page space for FBD and EoE; 2) properly labeled external forces on the body; 3) properly labeled geometry of the forces; 4) coordinate system; 5) variables and geometry in EoE correspond to FBD.

Sample Problem: The cord BD can support a maximum load of T. Perform equilibrium analysis on pulley B for determining the maximum weight of the crate, and the angle θ for equilibrium. Assume the mass of the pulley is negligible.

Sample FBD Solution

Geometry of the force

Clearly identified body

Coordinate system

Corresponding variables   Proper labels of the forces

Include geometry
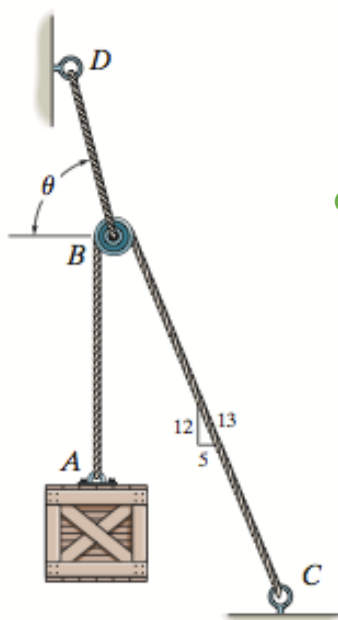
<u>Sample EoE Solution</u>

$$\sum F_x = 0 = -T_{BDx} + W_x = -T_{BD}(\cos\theta) + W\left(\frac{5}{13}\right) = 0$$

$$\sum F_y = 0 = T_{BDy} - W - W_y = T_{BD}(\sin\theta) - W - W\left(\frac{12}{13}\right) = 0$$

Problems 1: Draw the free body diagram and write the equations of equilibrium for the copper bent rod. It is supported by a smooth surface at B and by a collar at A, which is fixed to the rod and is free to slide over the fixed inclined rod.
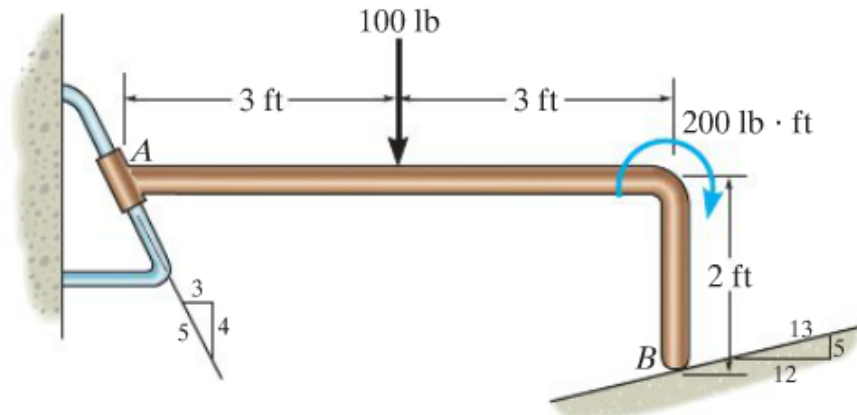
Problem 2: Draw the free body diagram and write the equations of equilibrium for the smooth uniform bar that weighs W.
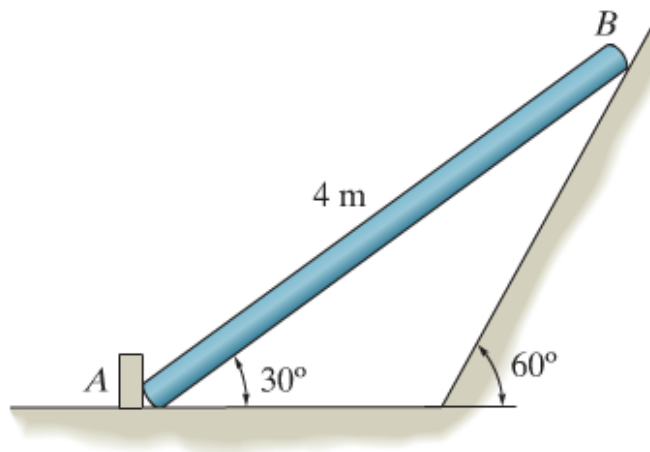
Problem 3: A man having a weight of W attempts to hold himself using one of the two methods shown. Draw the free-body diagram of the man and write the equations of equilibrium in both configurations.

(a)

(b)
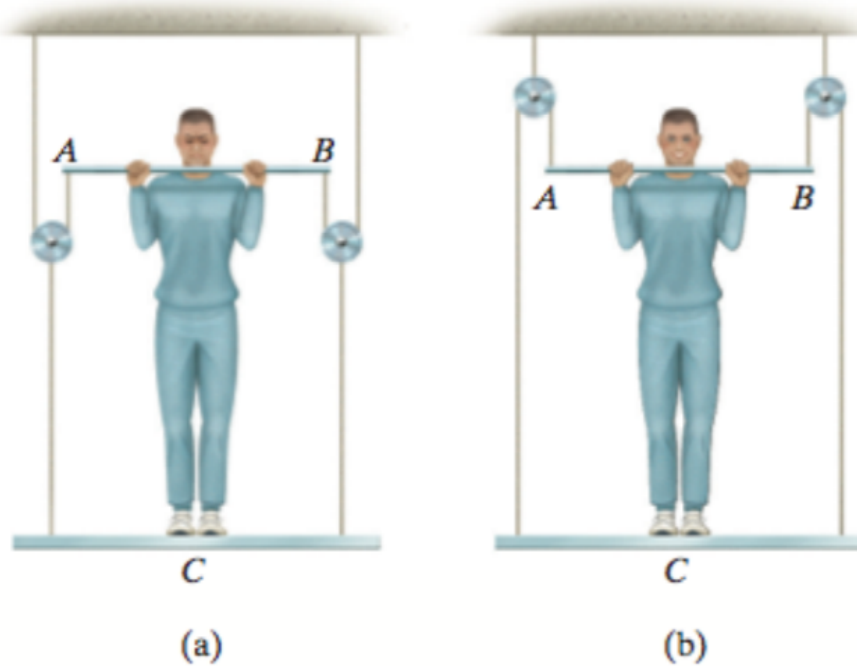
Problem 4: Draw the free body diagram of the members AD, BF and CE and write the equations of equilibrium. Identify any two or three force member(s) and be sure to draw the corresponding FBD accordingly.