Name:_____

TAM 210/211 Written Assignment 1 (due on Sep 22)

The **OBJECTIVE** of this written assignment is to practice **drawing free-body diagrams**.

DIRECTION: This is a <u>free-body diagram only assignment</u>. Draw a free body diagram of the specified part, or the most appropriate part for solving the problem. Grading criteria includes: 1) Clearly identified body of interest; 2) properly labeled external forces on the body; 3) geometry of the forces; 4) coordinate system.


Springs: The magnitude of force exerted on a linearly elastic spring which has a stiffness k and is deformed a distance $s = l - l_0$, measured from its unloaded position, is

$$F_{spring} = ks$$

Cables: All cables will be assumed to have negligible weight and they cannot stretch. A cable can support only a tension or "pulling" force, and this force always acts in the direction of the cable.

Pulleys: The tension force developed in a continuous cable which passes over a frictionless pulley must have a constant magnitude to keep the cable in equilibrium.
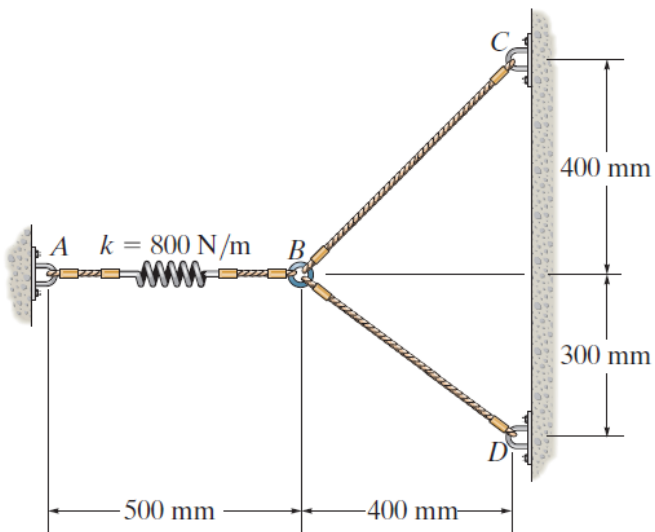

Sample Problem: The cords ABC and BD can each support a maximum load of 100 lb. Determine the maximum weight of the crate, and the angle u for equilibrium.
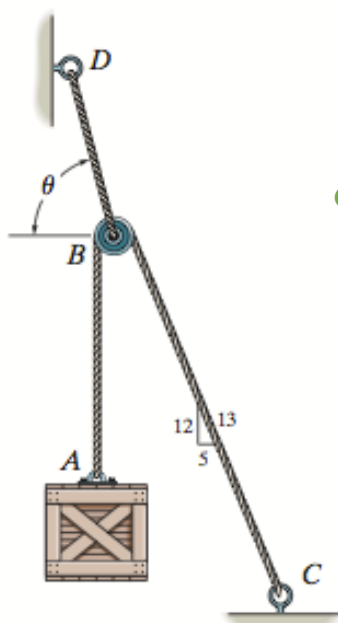
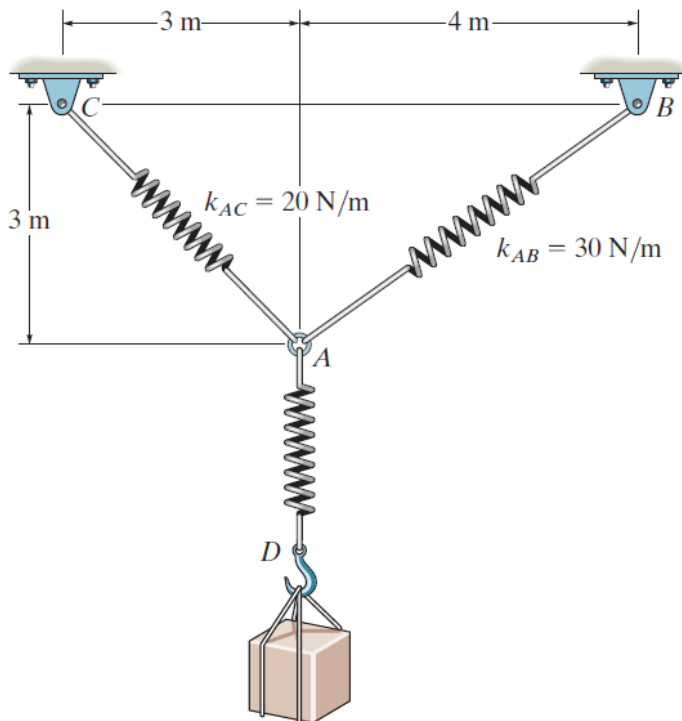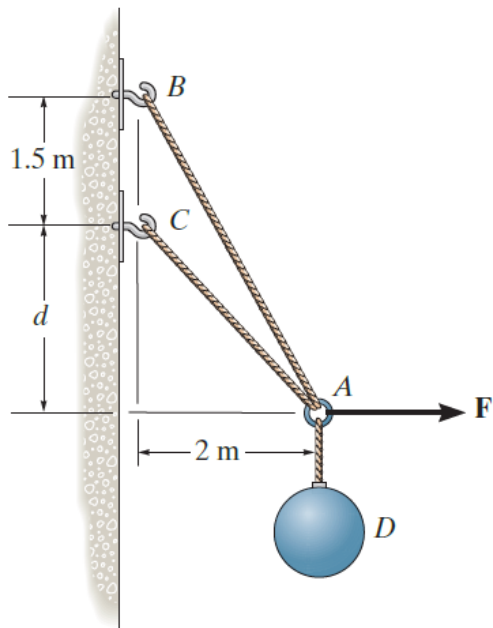**Sample Solution**
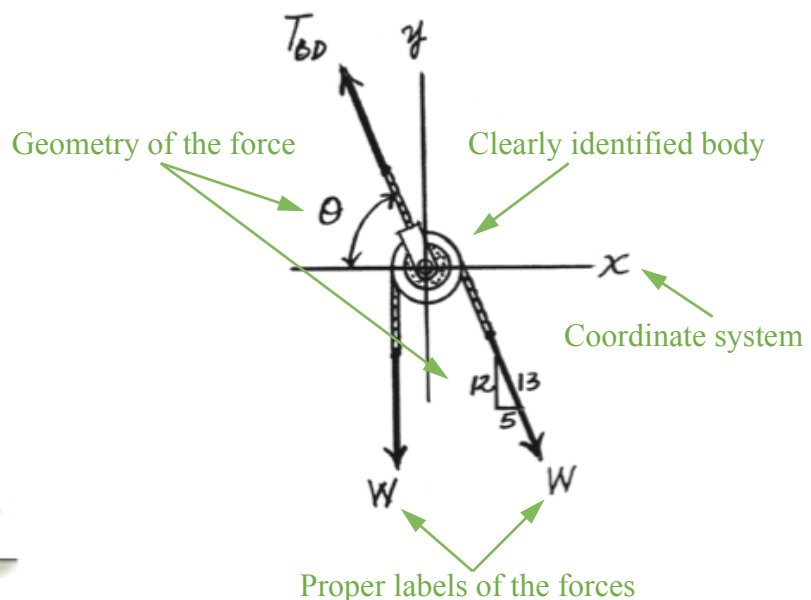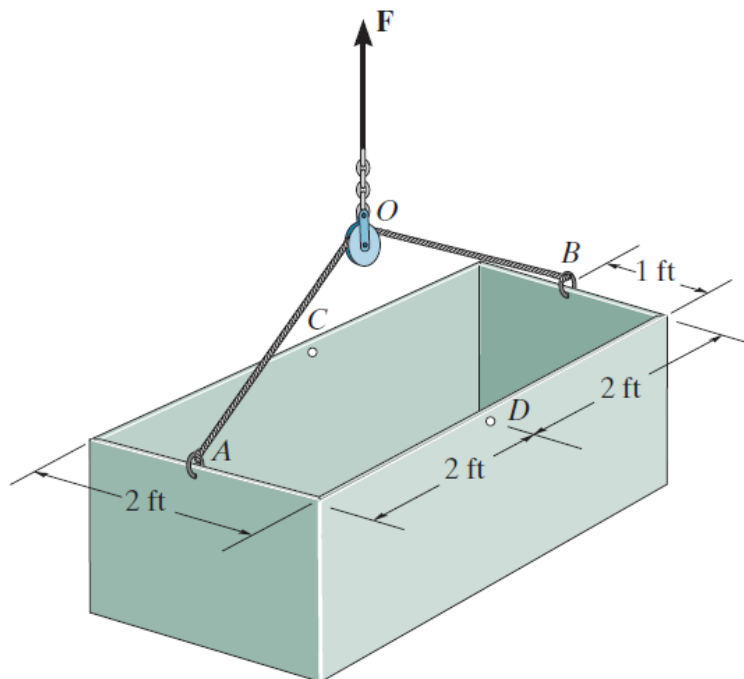
Problems 1: Draw a free-body diagram of the ring B.

400 mm

A $k = 800$ N/m B

300 mm

500 mm   400 mm

Problem 2: Draw a free-body diagram of the ring A.

3 m   4 m

C B

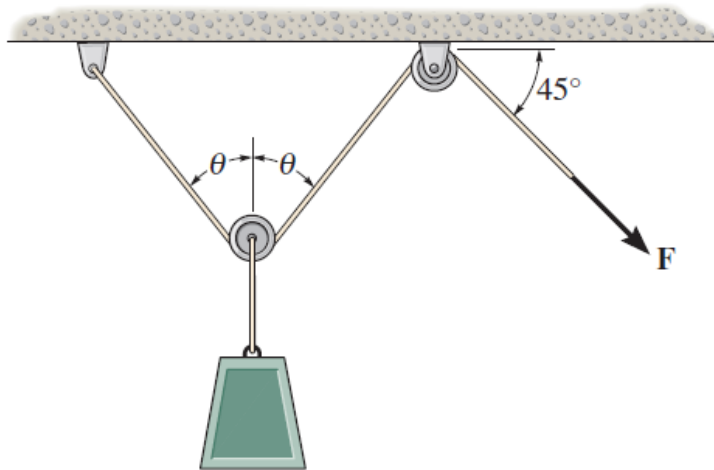$k_{AC} = 20$ N/m

3 m

$k_{AB} = 30$ N/m

A

D

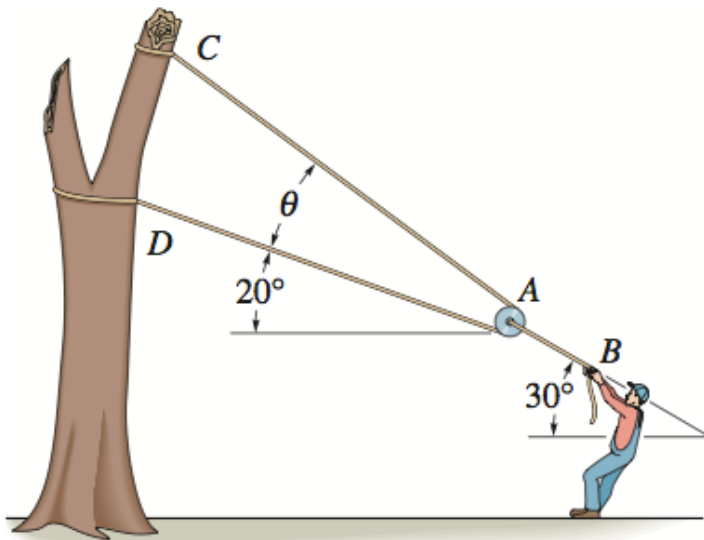**Problem 3:** Draw a free-body diagram of the ring A.

**Problem 4:** Draw a free-body diagram of the pulley O.

**Problem 5:** Draw a free-body diagram of both pulleys.

Problem 6: The man attempts to pull down the tree using the cable and small pulley arrangement shown. If the tension in AB is T_A, draw the free-body diagram for determining the tension in cable AD and the angle θ.

Problem 7: Determine the maximum weight of the crate that can be suspended from cables AB, AC, and AD so that the tension developed in any one of the cables does not exceed 250 lb. Draw the appropriate free-body diagram to solve this problem.
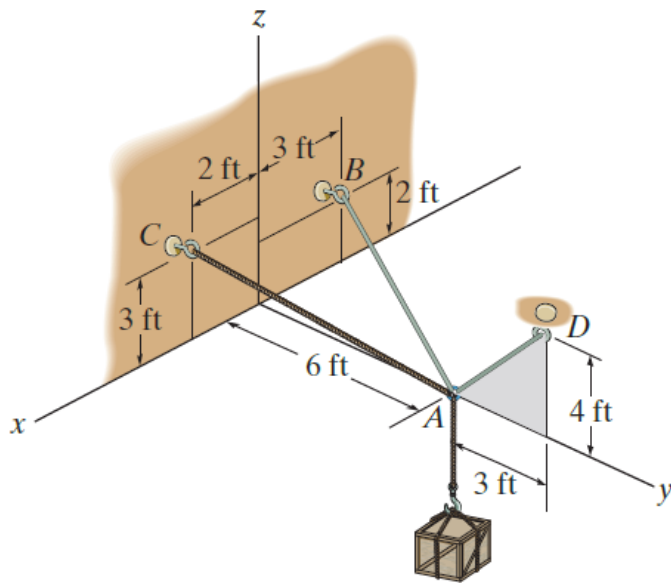
Problem 8: The man pulls with force F. Draw the free-body diagram for solving tension in cable AC.
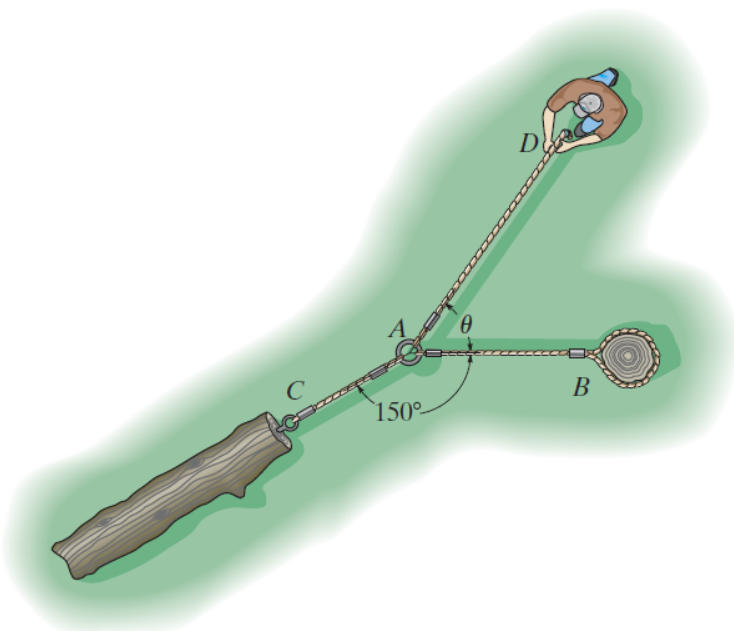
Problem 9: The load at A creates a force of 60 lb in wire AB. Draw the free-body diagram for determining the weight of the barrel.
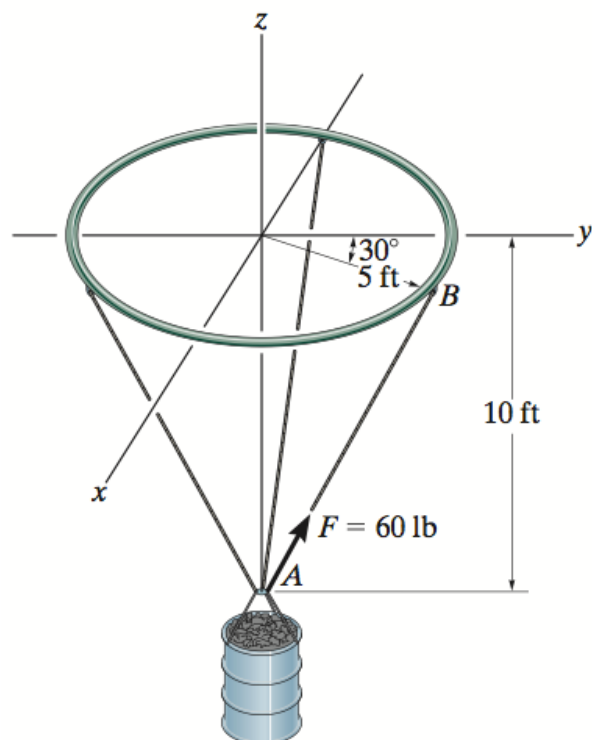
Problem 10: The lamp has a weight of W and is supported by the six cords connected together as shown. Draw the free-body diagram for determining the tension in cord AB. Cord BC is horizontal.