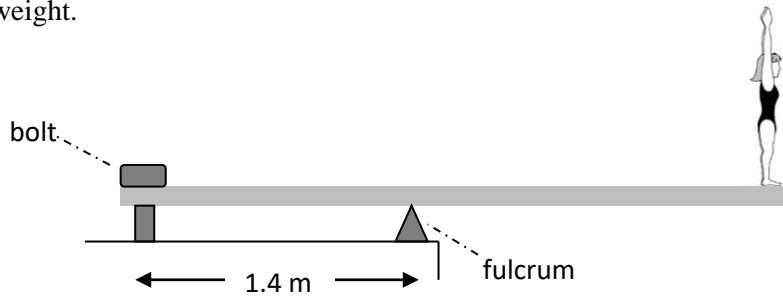# UNIT V: Worksheet 2

1. A bicycle pedal assembly is shown below. The pedal has radius b while the small gear has radius a. A force F_P is applied perpendicular to the arm of the pedal. Derive the force provided by the chain (F_C) if the assembly fails to turn.

2. A woman with a weight of 530 N is ready to dive off of a 3.9 m diving board. The board has negligible weight.

bolt

1.4 m

fulcrum

a. Sketch a force diagram for the board.

b. Use a torque summation equation to solve for the force of the fulcrum on the board.

c. Use a force summation equation to solve for the force of the bolt on the board.

3. A person's bicep attaches 5cm from the elbow joint as shown.

a. If the bicep can exert a 700N force as shown, calculate the torque on the lower arm?

b. Calculate the heaviest object in kilograms the person can carry in his hand 35cm from the axis? Ignore the mass of the arm itself.

700 N

Axis at elbow

5.0 cm
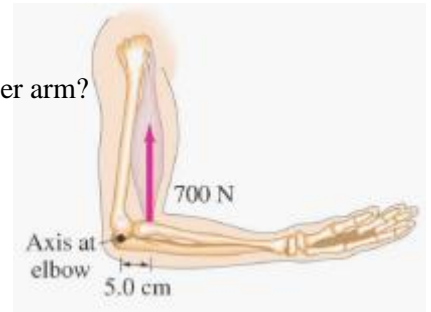
c. Calculate the magnitude and direction of the force the upper arm bone applies to the lower arm at the axis in this situation?

4. A ladder of length $L = 2.9$ m and mass $m = 21$ kg rests on a floor with coefficient of static friction $\mu_s = 0.48$, and is placed such that it just avoids slipping. Assume the wall is frictionless.

a. Draw and label all of the forces on the picture to the right.

b. Write summations equations for (1) all torques, (2) all forces in the x-direction, (3) all forces in the y-direction.

c. Solve for the normal force the floor exerts on the ladder.

d. Solve for the force of friction between the ladder and the floor.

θ
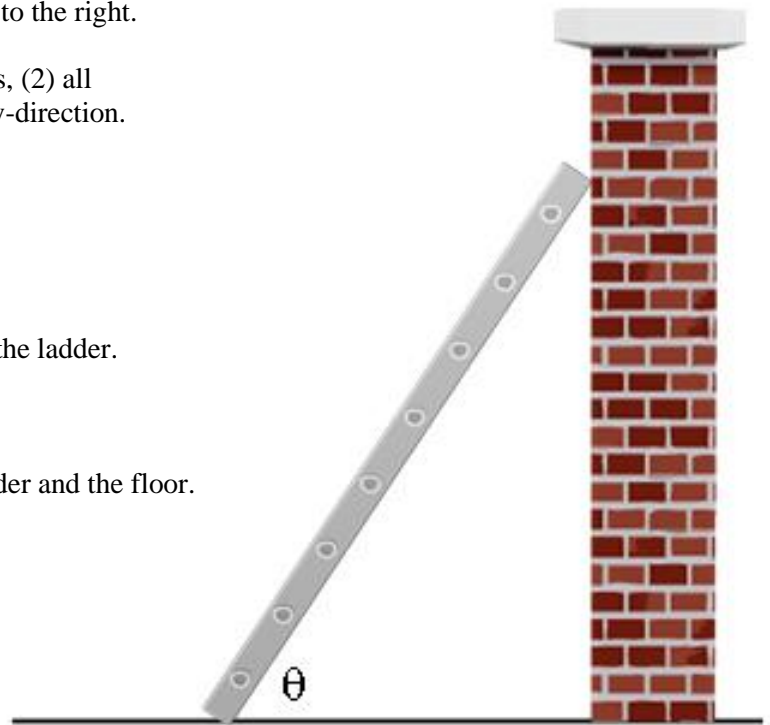
e. Calculate the minimum angle the ladder must make with the floor to not slip.