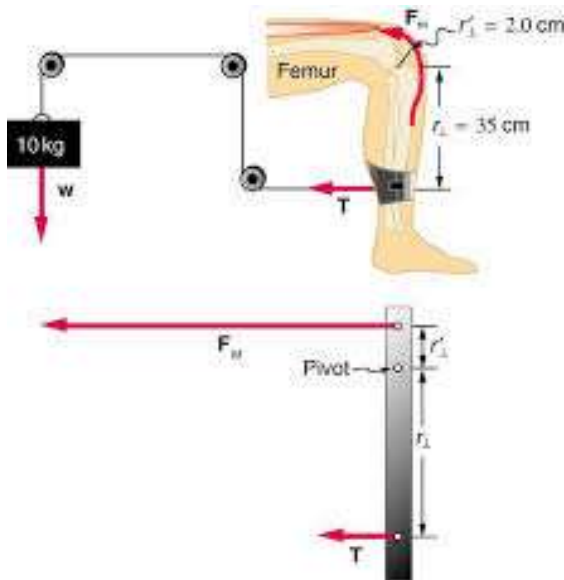
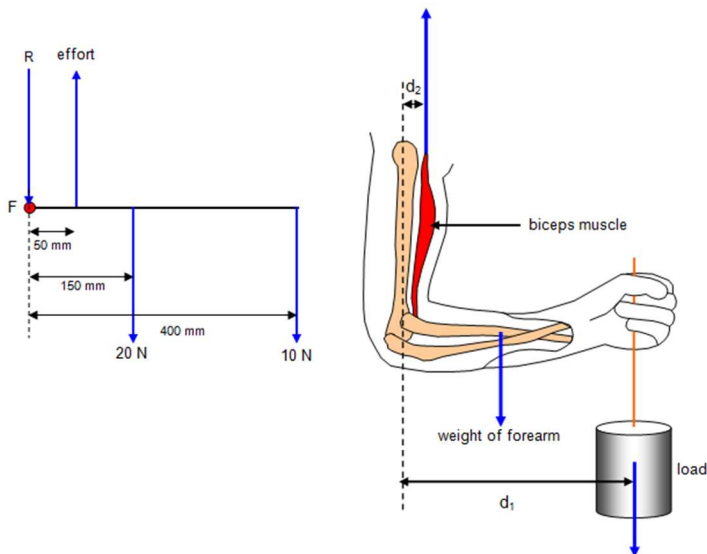


Problems in statics

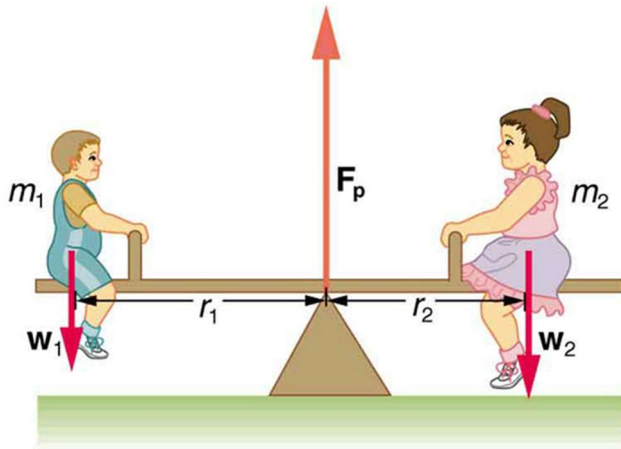
- 1) A device for exercising the upper leg muscle is shown together with a free body diagram representation of an equivalent lever system. Calculate the force exerted by the upper leg muscle to lift the mass $m = 10\text{kg}$ at a constant speed?



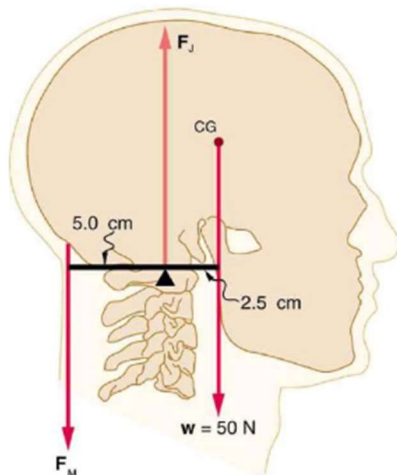
- 2) We can consider the forearm as a simple lever. The pivot (or fulcrum) is at the elbow joint. The load is held in the palm of the hand and the effort is applied in the biceps muscle. In the arrangement shown in the diagram the forearm is horizontal and the force in the biceps muscle acts vertically. Calculate the effort force in biceps muscle to support the forearm if the load weigh is 10N ?



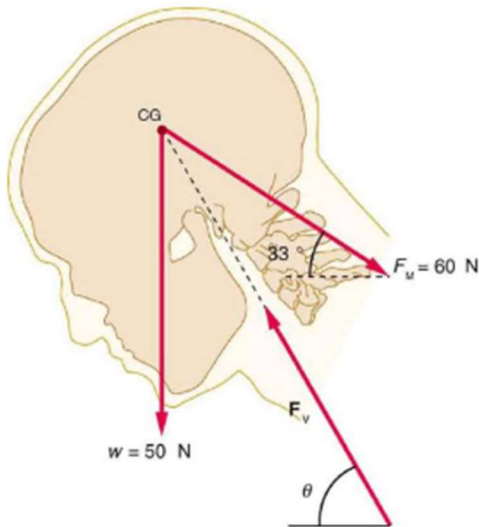
- 3) The boy is 20kg and 2.1m from the center of the seesaw. how far does the girl need to be sit from the pivot to make the seesaw balanced if she is 35kg ?



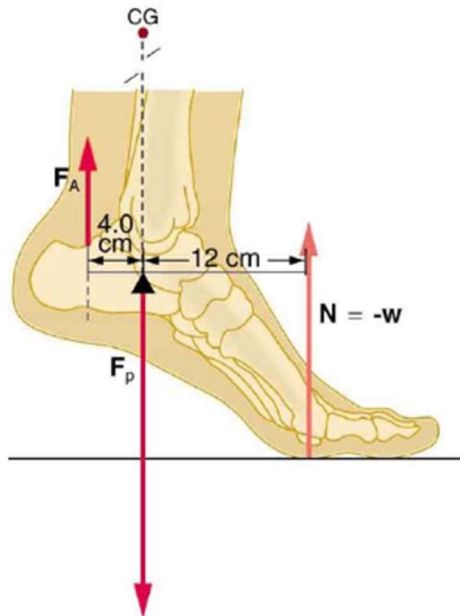
- 4) When the head is held erect its center of mass is not directly over the principal point of support (the atlanto-occipital joint). The muscles at the back should therefore exert a force to keep the head erect That is why your head falls forward when you fall asleep in the class
- Calculate the force exerted by these muscles using the information in the figure?
 - What is the force exerted by the pivot on the head?



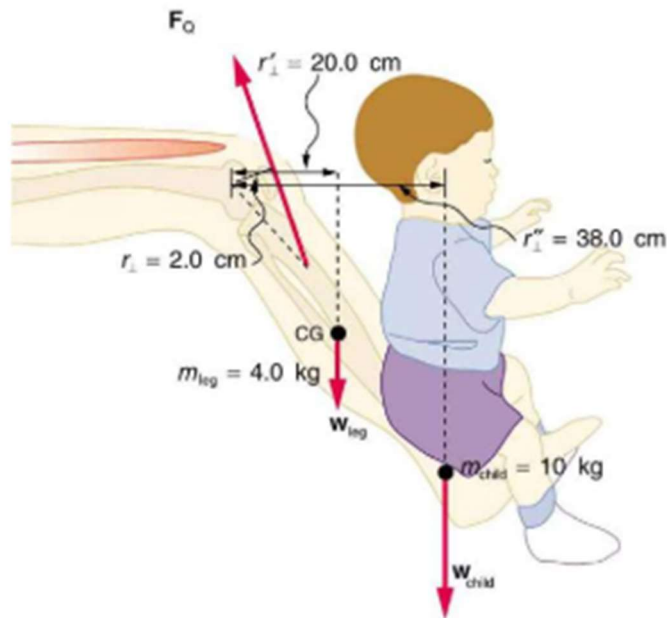
- 5) A person working at a drafting board may hold her head as shown, requiring muscle action to support the head. The three major acting forces are shown. Calculate the direction and magnitude of the force supplied by the upper vertebrae F_V to hold the head stationary assuming that this force acts along a line through the center of mass as do the weight and muscle force? Useful trigonometric formula $\sin(x \pm y) = \sin x \cos y \pm \sin y \cos x$ and $\sin(90 - \theta) = \cos \theta$.



- 6) A 75 – kg man stands on his toes by exerting an upward force through the Achilles as shown.
- What is the force in the Achilles tendon if he stands on one foot?
 - Calculate the force at the pivot of the simplified lever system shown- that force is representative of forces in the ankle joint?



- 7) A father lifts his child as shown. What force should the upper leg muscle exert to lift the child at constant speed?



- 8) Unlike most of the other muscles in our bodies, the masseter muscle in the jaw is attached relatively far from the joint, enabling large force to be exerted by the back teeth
- Using information in the figure calculate the force exerted by the lower teeth on the bullet?
 - Calculate the force on the joint?

