HOMEWORK

You know from your own experience that the tendency for a force to cause a rotation about an axis depends on the amount of force applied and its distance from the axis of rotation. For example, it is easier to close a door by pushing on its outer edge than close to its hinges. Moreover, the harder you push, the faster the door will close. In physics, the tendency for a force vector **F** to cause rotational motion is a vector called ***torque*** (denoted by τ). It is defined as

$$\tau = \mathbf{F} \times \mathbf{d}$$

where **d** is the vector from the axis of rotation to the point at which the force is applied. It follows from Formula (6) that

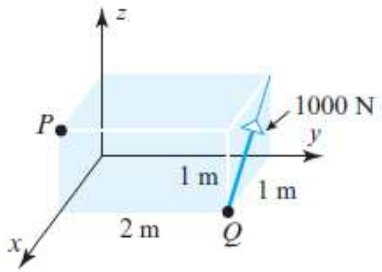
$$\|\tau\| = \|\mathbf{F} \times \mathbf{d}\| = \|\mathbf{F}\|\|\mathbf{d}\| \sin\theta$$

where θ is the angle between the vectors **F** and **d**. This is called the ***scalar moment*** of **F** about the axis of rotation and is typically measured in units of Newton-meters (Nm) or foot pounds (ft–lb).

1) The accompanying figure shows a force **F** of 1000 N applied to the corner of a box.

(a) Find the scalar moment of **F** about the point P.

(b) Find the direction angles of the vector moment of **F** about the point P to the nearest degree.



2) As shown in the accompanying figure, a force of 200 N is applied at an angle of 18° to a point near the end of a monkey wrench. Find the scalar moment of the force about the center of the bolt. [*Note:* Treat the wrench as two-dimensional.]