WIHA

WHAT IS TORQUE?

Torque **is a measure of how much a force acting on an object causes that object to rotate.** The object rotat the **pivot point**, and will label 'O'. We will call the force '**F**'. The distance from the pivot point to the point whe and is denoted by '**r**'. Note that this distance, '**r**', is also a vector, and points from the axis of rotation to the poin a pictorial representation of these definitions.)

Torque is defined as $\tau = \mathbf{r} \times \mathbf{F} = \mathbf{r}\,\mathbf{F} \sin(\theta)$.

In other words, torque is the cross product between the distance vector (the distance from the pivot point to the between **r** and **F**.

Using the **right hand rule**, we can find the direction of the torque vector. If we put our fingers in the direction of the torque vector.

Imagine pushing a door to open it. The force of your push (**F**) causes the door to rotate about its hinges (the piv the hinges (**r**) (and several other things, but let's ignore them now). The closer you are to the hinges (i.e. the sm open a door on the wrong side. The torque you created on the door is smaller than it would have been had you

Note that the force applied, **F**, and the moment arm, **r**, are independent of the object. Furthermore, a force appl (**r** = 0).

Another way of expressing the above equation is that torque is the product of the magnitude of the force and th point).

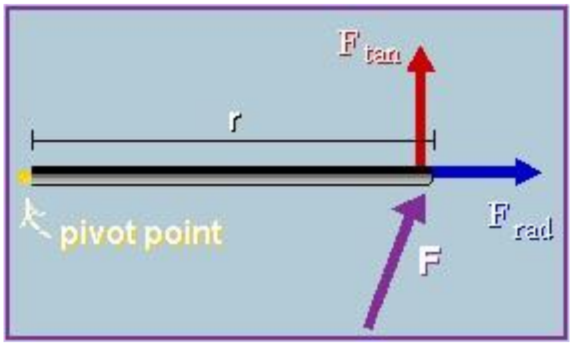

Figure 2 Tangential and radial components of force **F**

Let the force acting on an object be broken up into its tangential (Ftan) and radial (Frad) components (see Figu
arm, while the radial component is parallel to the moment arm.) The radial component of the force has no cont
the tangential component of the force which affects torque (since it is perpendicular to the line between the poi

There may be more than one force acting on an object, and each of these forces may act on different point on th
the individual torques.

Rotational Equilibrium is analogous to translational equilibrium, where the sum of the forces are equal to zero.
words, there is no net torque on the object.

$$\sum \tau = 0$$

Note that **the SI units of torque is a Newton-meter**, which is also a way of expressing a Joule (the unit for en
units N.m, and not J. The distinction arises because energy is a scalar quantity, whereas torque is a vector.