**Equilibrium – 2 – Rotation and Torques at 90°**

A body in translational equilibrium will have no acceleration in the *x* or *y* directions. However, the object could be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Consider this teeter totter:**

What is the motion of the teeter totter like?

What are the net translational forces?

FNetX=

FNetY=

We would say the teeter totter is in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ equilibrium, but not in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ equilibrium.

An object in **Equilibrium** must be in both \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ AND \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ equilibrium.

**Torque** is the measure of

It is calculated using the following formula:

Units:

Torque is a *vector* quantity with directions of:

Forces applying torques are \_\_\_\_\_\_\_ to the direction of the rotating object.

A couple more important terms:

**Center of Mass:**

**Uniform Beam:**

**Fulcrum:**

Ex. A 350N uniform beam hangs from a hinge and a string as shown.

1. What is the tension in the rope?

*Steps:*

1. *Identify if it is in equilibrium*
2. *Free Body Diagram*
3. *Mark your fulcrum*
4. *Net Torque and/or Net Force equations*

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1. What is the force provided by the hinge?

Ex. A torque of 1000Nm is required to turn a nut on a rusted bolt. How long is the wrench that Weak Wesley needs to use if he can exert a maximum of 200N of force?

Ex. A torque of 1000Nm is required to turn a nut on a rusted bolt. How long is the wrench that Strong Steve needs to use if he can exert a maximum of 1500N of force?

Ex. A 3500kg truck parks 5m from the end of a 24m bridge. The bridge itself has a mass of 6500kg and is supported by resting on two posts, one at each end of the bridge. Determine the force provided by each post.

Ex. Two kids are on a teeter totter as shown. The 45kg student is at the end of the teeter totter. How far forward should the other kid sit to balance the system?

