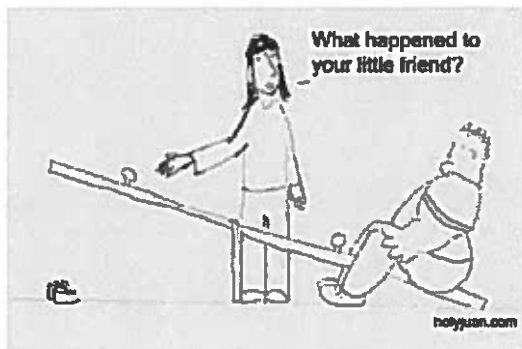


TORQUE

- Torque is a quantity which measures the ability of a force to rotate an object about an axis, fulcrum or pivot
- Torque is the measure of force's tendency to rotate an object about an axis, fulcrum or pivot



Symbol:

Units:

Direction:

$$\vec{\tau} = \vec{F} \times \vec{d} = \vec{F} \cdot \vec{d}$$

" × " denotes a cross product = special 3D vector multiplication.

" · " denotes dot product = simpler vector multiplication. We can substitute the cross product in our formula because we set the force and lever arm perpendicular to one another.

Pivot = a center point of any rotational system (2D)

Axis of rotation = an imaginary line about which a 3D object rotates

Fulcrum = a support about which a lever rotates

Lever arm = _____

Right-hand Rule:

- Place fingers of your right hand in the direction of the lever arm and curl them down towards the direction of the applied force. The thumb shows direction of the torque.
 CW = thumb into the page, CCW = thumb out of the page

CW = _____ and CCW = _____

Line of action = _____

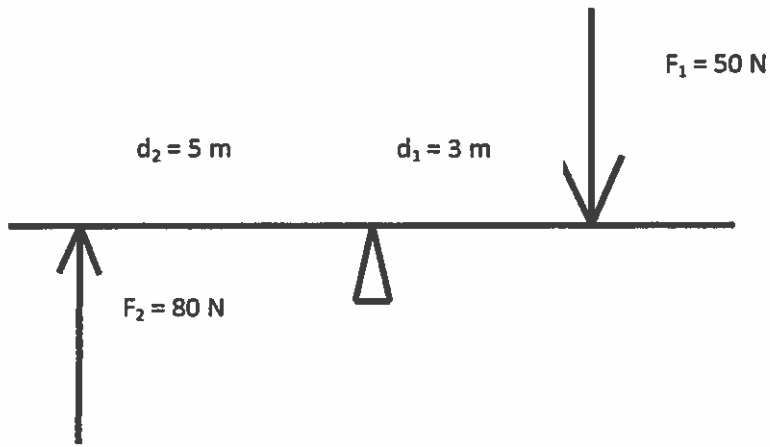
Scenario 1: Maximum effect = largest torque possible:

Scenario 2: Limited effect = non-zero torque but smaller than in scenario 1:

Scenario 3: Zero effect = zero torque:

List the three quantities that affect the magnitude of the torque:

1. Find the sum of all torques on the lever below:



2. Find the net torque on the 15.0-m long lever.

