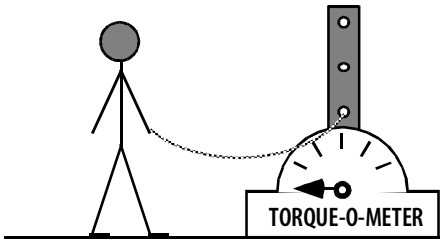
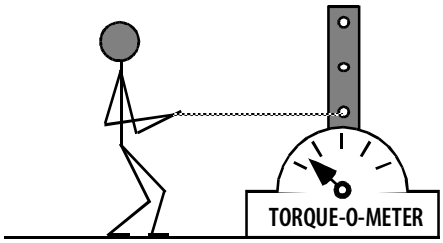
PhyzSpringboard: Torque

Consider the following findings about **torque**. The "torque-o-meter" consists of a vertical bar with three holes in it. Through one hole, a rope is attached. The base of the bar is its axis of rotation. But instead of rotating when a torque is applied, the torque-o-meter measures the torque.

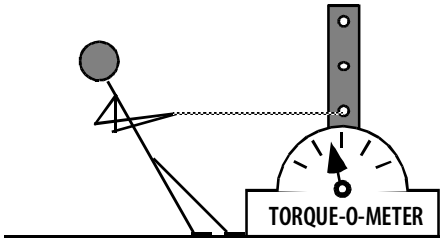


1. Force

a. When no force is applied to the bar, **no** torque is found. (*By the way, what is the name of the curve formed by the drooping rope?**)



b. When some force is applied, **some** torque appears.



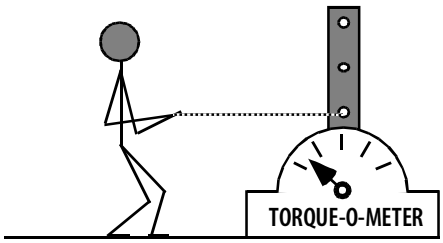
c. When more force is applied, **more** torque appears.

d. What does this indicate about torque?

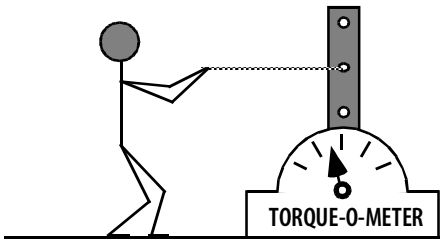
> *Torque is directly proportional to the force applied.*

2. Distance between axis and force

a. When a force is applied close to the axis of rotation, **some** torque is found.



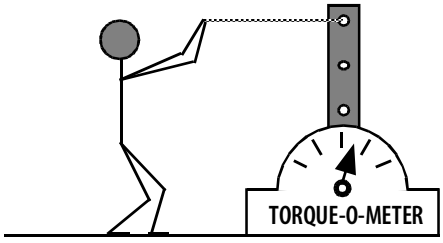
b. When the same force is applied farther from the axis of rotation, **more** torque appears.



c. When the same force is applied even farther from the axis of rotation, **even more** torque appears.

d. What does this indicate about torque?

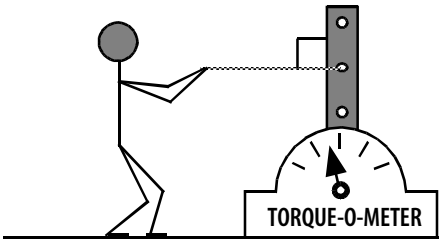
> *Torque is directly proportional to the distance between the axis and where the force is applied.*



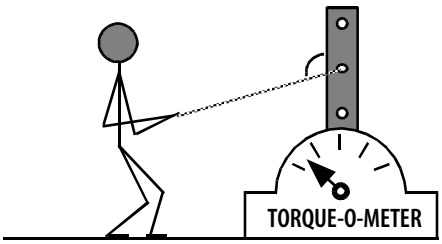
*No, not a parabola.

3. Direction of force

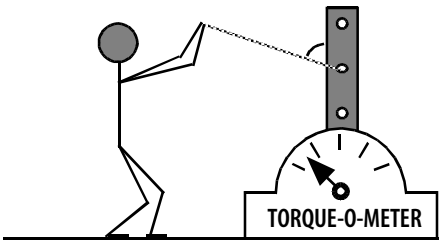
a. When a force is applied perpendicular to the bar, **some** torque is found.



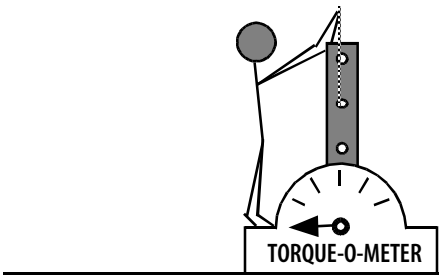
b. When the same force is applied at an obtuse angle, **less** torque appears.



c. When the same force is applied at an acute angle, **less** torque appears again.



d. When the same force is applied at a zero angle , **no** torque appears.

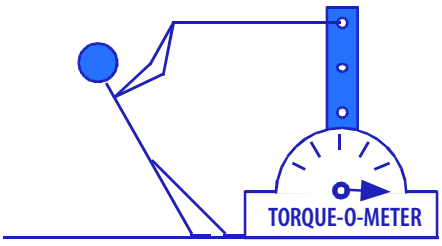


e. What does this indicate about torque?

Torque is directly proportional to the sine of the angle between the lever arm and the direction at which the force is acting.

4. Considering all the factors, how could the greatest torque be applied and measured on the torque-o-meter? Describe the conditions and draw the picture.

Maximum FORCE applied at
Maximum DISTANCE from axis
at 90° to the lever arm.



5. What factors determine torque and how is each related to torque?

Torque is directly proportional to the sine of the angle between the lever arm and the direction at which the force is acting.