Torque is a rotational force which is perpendicular to the motion of the object.

That being said the formula is

or ∅)

τ = Torque

F˔ = the perpendicular component of the force applied

F is the force applied

r = distance to the axis of rotation

∅ = the angle the force is applied

If a force was applied at the r meters away from the Axis of rotation

r

Force applied

Axis of rotation

You would split the force applied into its components. Calculate sin(∅).

The Force that is applied parallel to the length of the object has no effect towards rotating the object.

Vertical component of Fa

r

Horizontal component of Fa

Force applied

The Torque generated to move the object

Vertical component of Fa

r

To see how much this affects the object’s rotation it is necessary to utilize Newton’s second law and apply it for rotation.

I = the moment of Inertia

α = angular acceleration

this will find the Inertia of a point object (mass is all at one point), add all point masses to get the sum. m = mass, r = distance to axis of rotation.

For an object that has its mass evenly distributed its moment of inertia can be…

where L is the length and the axis of rotation is at the end of the object. (rod)

where the axis is at the center. (rod)

where this is a cylinder with the axis through the center

for a sphere rotating with the axis through the center

“for many common geometric shapes it is possible to find tables of equations for the rotational inertia in textbooks or other sources.”

- (<https://www.khanacademy.org/science/physics/torque-angular-momentum/torque-tutorial/a/rotational-inertia>)

So, with My understanding it might be possible to calculate the *I* on complex objects by spiting it into multiple ‘common geometric shaped’ objects and calculating each of their *I* ‘s (one who’s axis of rotation is in the center and the rest being point masses around that axis.)