

Applications of the Dot and Cross Product (7.7)

Day 2



"I can calculate torque. I can apply what I have learned in familiar and unfamiliar settings."

Recall >

For any two vectors \vec{a} and \vec{b}

$$|\vec{a} \times \vec{b}| = |a||b|\sin \theta$$

where θ is the angle between the two vectors and $0^\circ \leq \theta \leq 180^\circ$

Torque

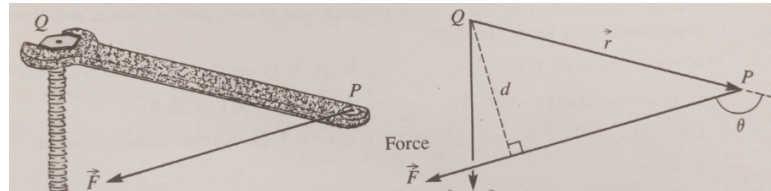
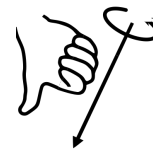
The tendency of a force to rotate an object about an axis to produce a turning or twisting force is **torque**. It is also called a **moment** and **moment of force**. Its magnitude is measured in Newton-metres (Nm).



Right-hand



Left-hand



Example

Suppose a 10 N force is pushed at the end of a 30 cm wrench to tighten a bolt (right hand thread) with which it makes 60° . Calculate the magnitude of the torque.

Complete:

1. Calculate the exact amount of work done by a 5N force in moving an object from A(-2, 1) to B(7, 8), where it is 30 degrees between the force and the displacement vector, and distance is in metres. [Answer: $\frac{5\sqrt{390}}{2}$ J]
2. Suppose that a certain jar-opener has a handle that is 30 cm in length, and that a jar of pickles requires 10 J of torque to open. If we were to apply 40 N of force to the end of the jar opener handle at an angle of 45° to the handle, would the jar open? Explain. [Answer: No. *Can you explain it?*]
3. New questions: Page 414... #1, 5b, 8, 10.
4. Continue the Unit Review (see website). *Sorry to throw a "wrench" into your day!*