INTRO TO TORQUE

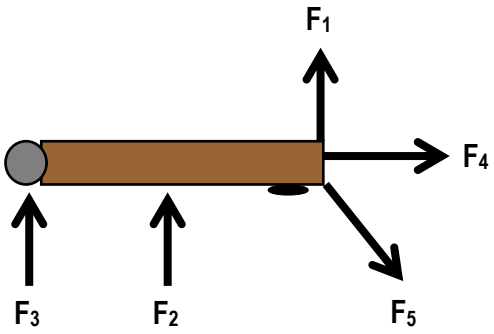
● TORQUE is a "twist" that a Force gives an object around an axis of rotation.

- For example, when you push on a door, it rotates around its hinges.
- When a Force acts on an object, away from its axis, it *produces a Torque* on it.
- Similar to how Forces cause linear acceleration, Torques cause _____ (___). More later!

● The MAGNITUDE of the Torque is given by → τ = _____ [_____]

- Where **r** is a vector from the _____ to the point where _____.
  - **Θ** is the angle between _____ and _____.
  - Torque is max when the Force is the farthest possible and _____ (____°) to the **r** vector.
- To calculate Torque, we'll use 3 steps: **(1)** Draw **r** vector → **(2)** Figure out **Θ** → **(3)** Plug numbers into equation

EXAMPLE: You push/pull on a 3-m wide door with 10 N in different ways, as shown. Calculate the Torque that each force produces. F_1, F_4, F_5 act at the edge of the door, F_2 half way through it, F_3 at the hinge. F_5 is directed 60° below the x-axis.



EXAMPLE: TORQUE ON A FISHING POLE

EXAMPLE**:** When a fish catches your bait, your 2 kg, 3 m long fishing pole is directed at 50º above the +x axis. Calculate the Torque produced on your fishing pole, about an axis of rotation on your hands, if the fish pulls on it with 40 N directed at 20º below the +x axis**.**

EXAMPLE: FIND MAXIMUM TORQUE

EXAMPLE**:** You must produce a torque of 100 Nm to properly tighten a given bolt using a 20-cm wrench**.** What is the *minimum* force you need to apply to the wrench to achieve this?

PRACTICE: TORQUE ON A WRENCH

PRACTICE**:** You pull with a 100 N at the edge of a 25 cm long wrench, to tighten a bolt (gold), as shown. The angle shown is 53º. Calculate the torque your force produces on the wrench, about an axis perpendicular to it and through the bolt**.**