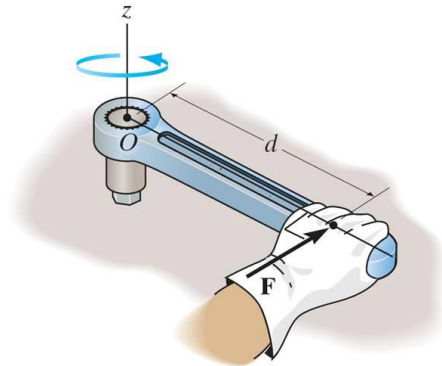


# To do ...

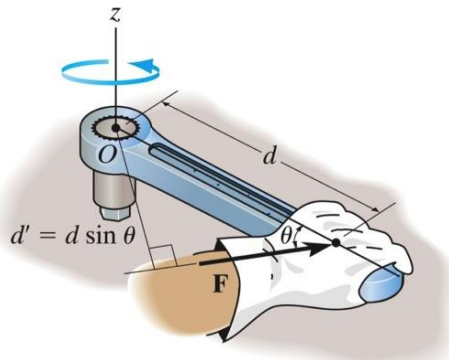
- Quiz 1 — last day!
- Quiz 2 — next week — sign up now!
  - Tues — Fri (9/19-9/22)
- HW 6 due **Tues**
- HW 7 due **Thurs**
- Written Assignment due **Fri (9/22)**
  - Separate white or engineering paper
  - Upload a SINGLE PDF file

# Recap

- Moment of a force
  - Scalar representation

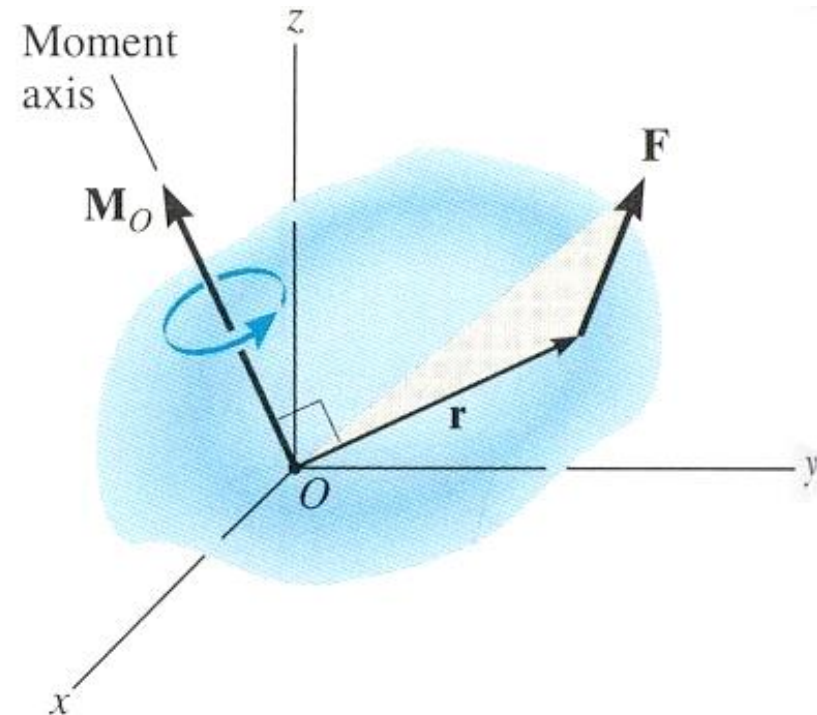
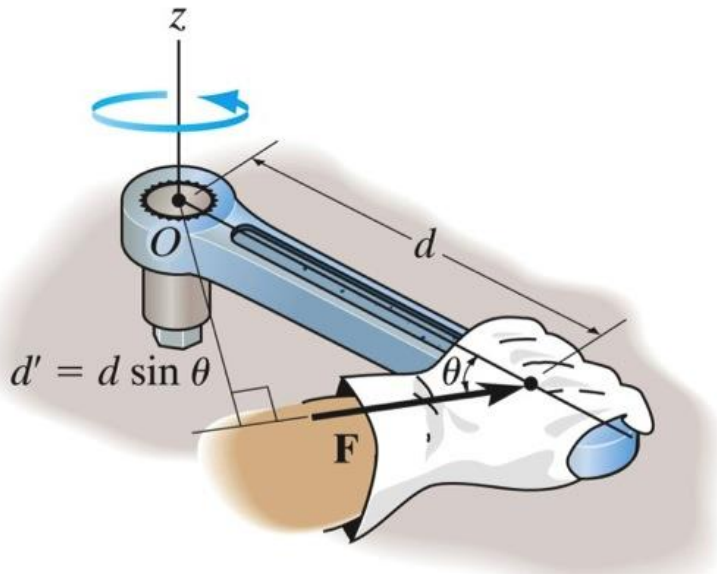


- Vector representation

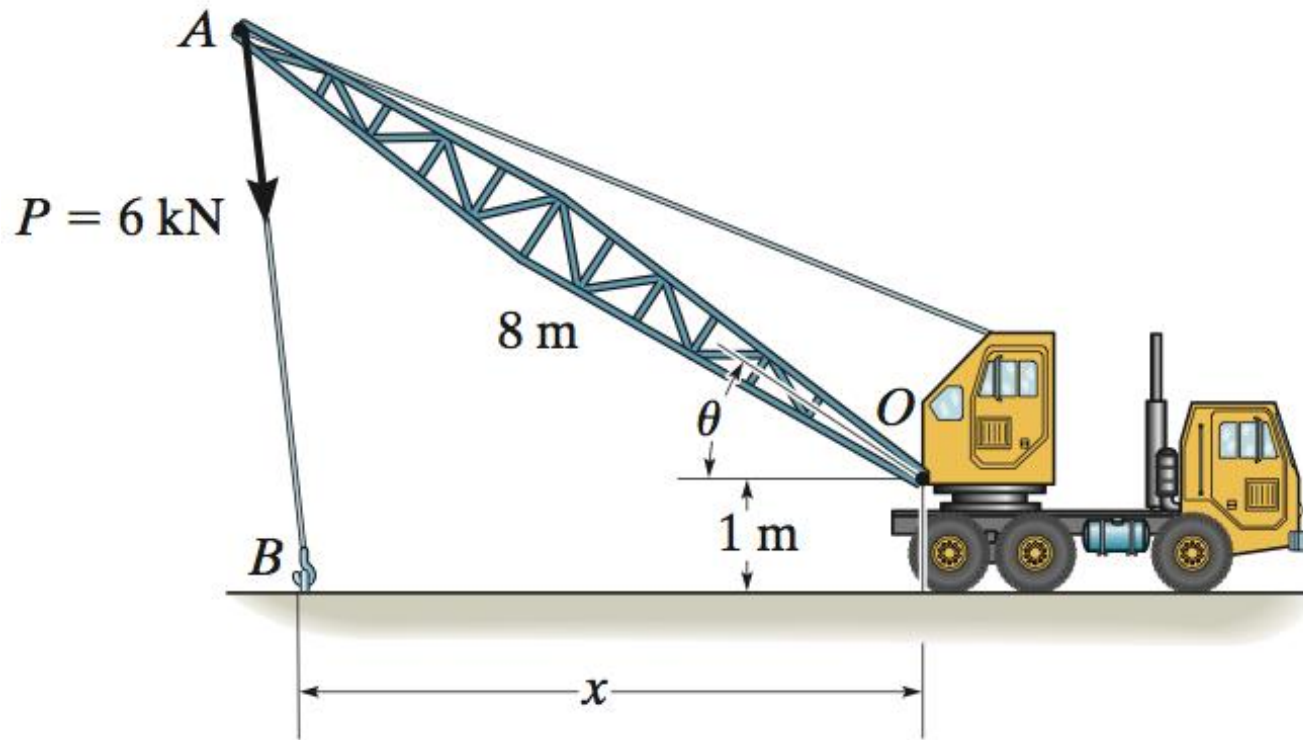


# Moment of a force – vector formulation

The moment of a force  $\mathbf{F}$  about point  $\mathbf{O}$ , or actually about the moment axis passing through  $\mathbf{O}$  and perpendicular to the plane containing  $\mathbf{O}$  and  $\mathbf{F}$ , can be expressed using the cross (vector) product, namely:



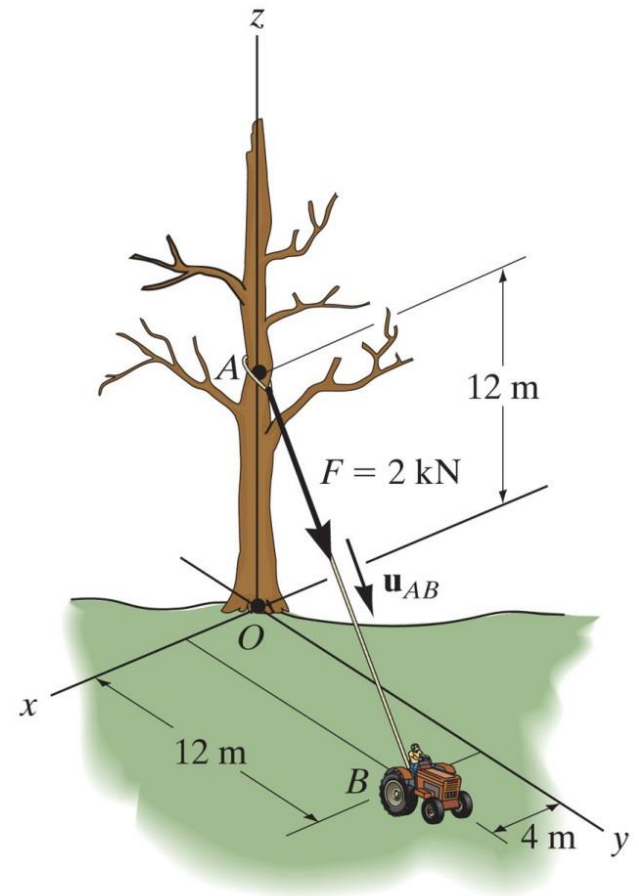
# Example – Vector Formulation



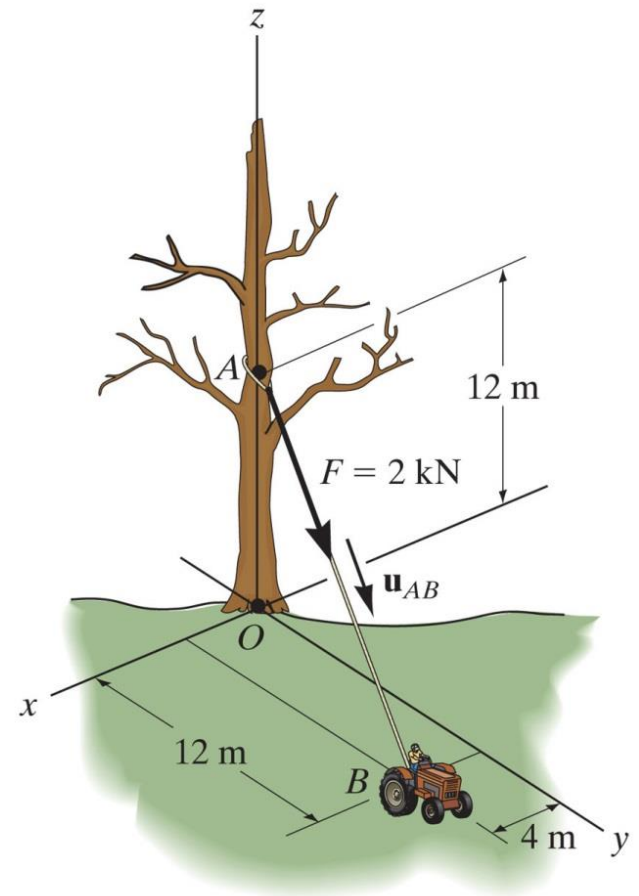
**Given:** The angle  $\theta = 30^\circ$  and  $x = 10 \text{ m}$ .

**Find:** The moment by  $\mathbf{P}$  about point O.

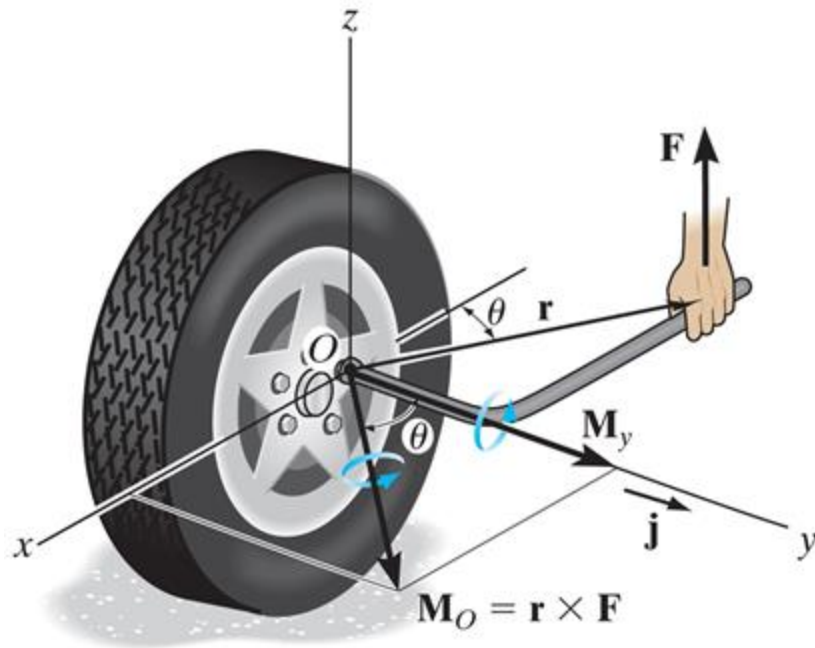
Determine the moment produced by the force  $\mathbf{F}$  about point  $\mathbf{O}$ .

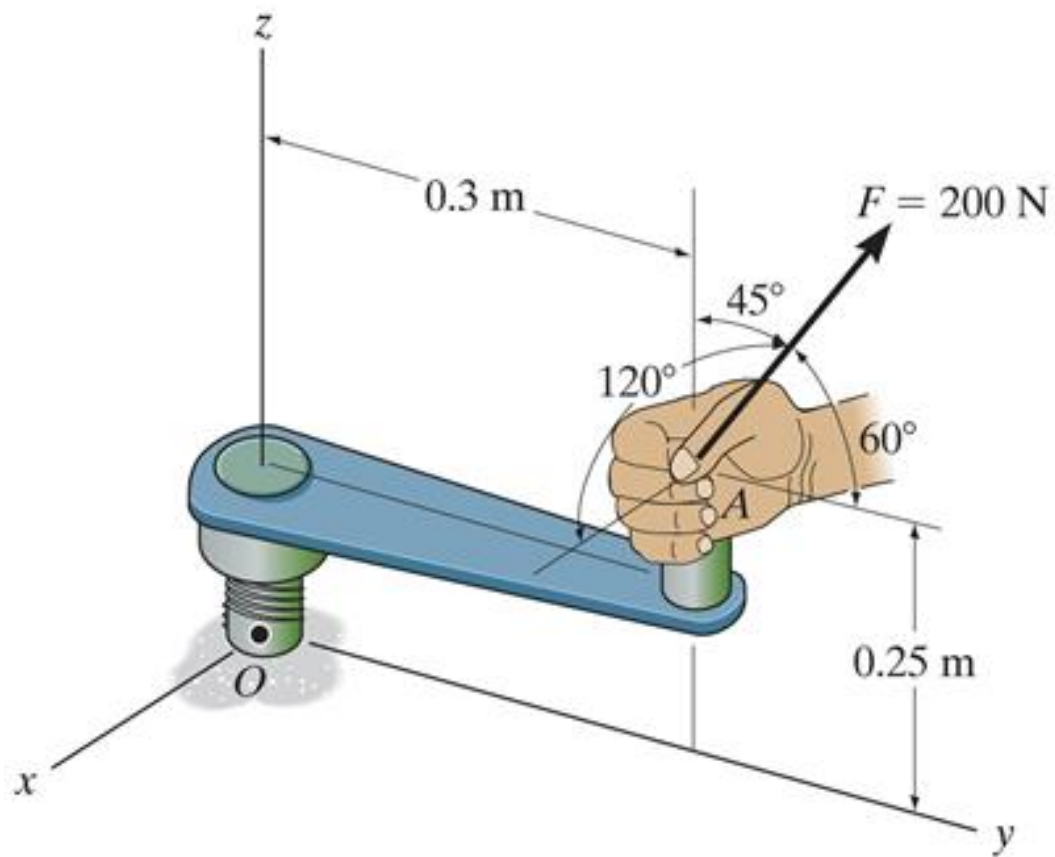


Determine the moment produced by the force  $\mathbf{F}$  about point  $\mathbf{O}$ .



# Moment of a force about a specified axis





A force is applied to the tool as shown. Find the magnitude of the moment of this force about the  $x$  axis of the value.



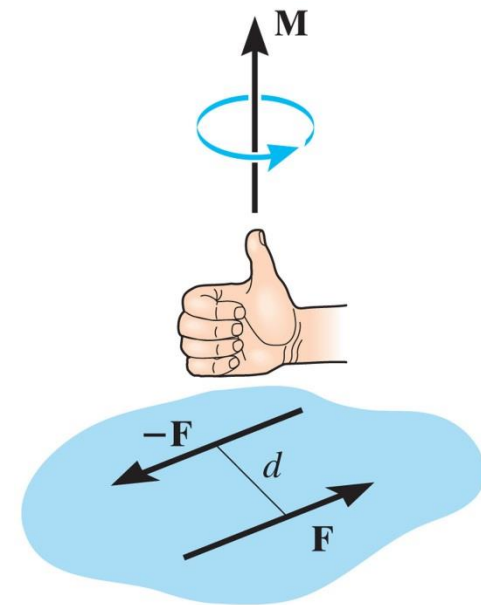
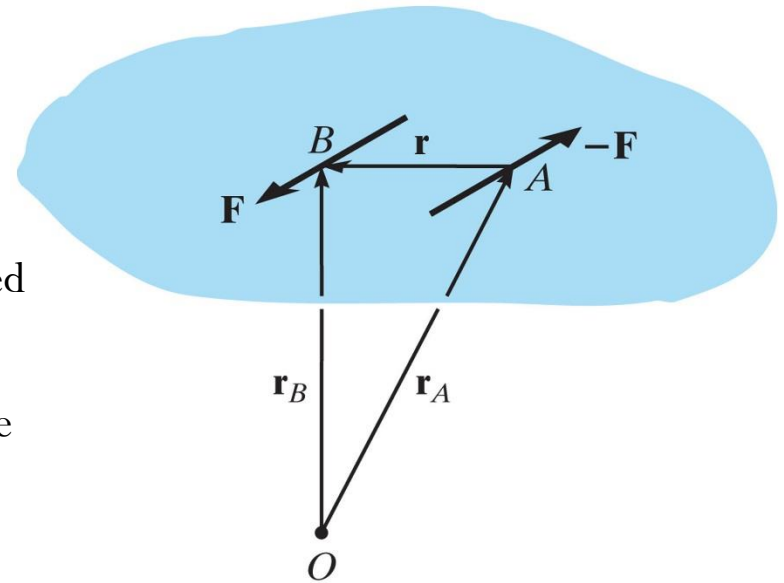
# Moment of a couple

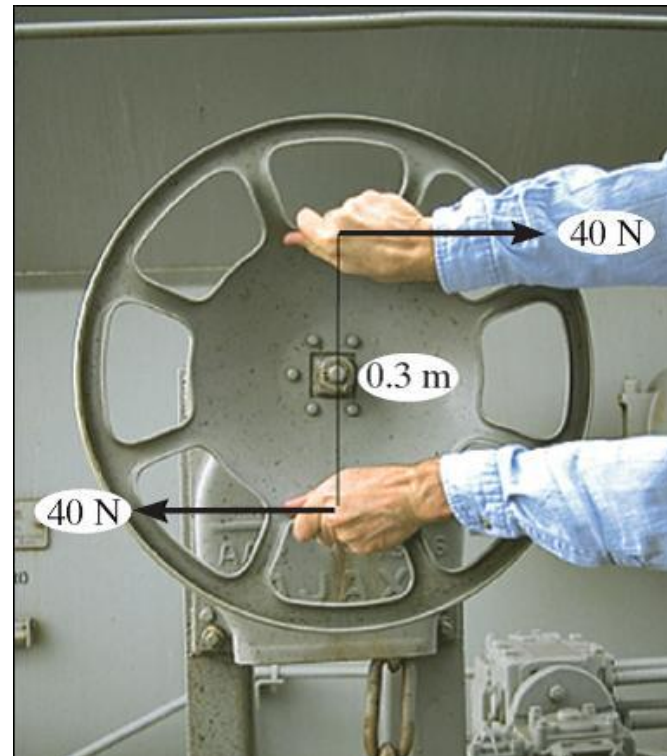
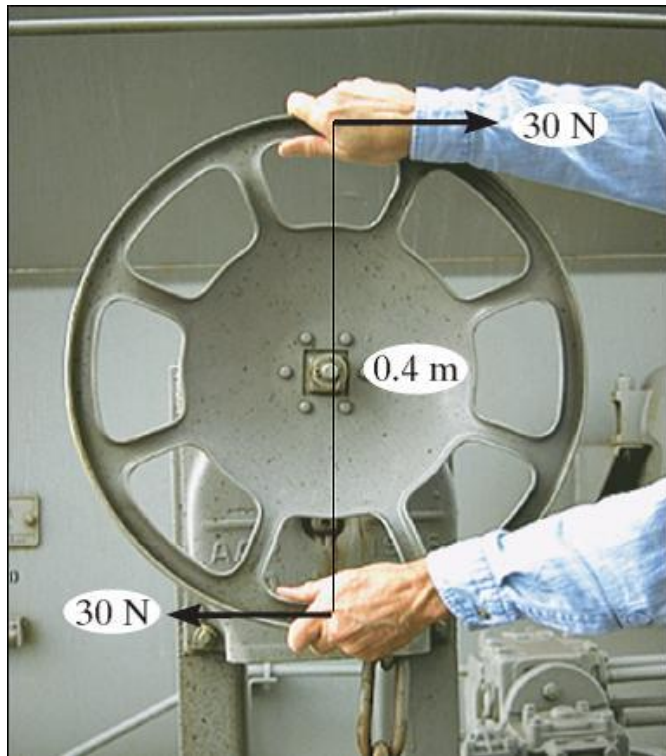
A **couple** is defined as two parallel forces that have the same magnitude, but opposite directions, and are separated by a perpendicular distance  $d$ .

Since the resultant force is zero, the only effect of a couple is to produce an actual rotation, or if no movement is possible, there is a tendency of rotation in a specified direction.

The moment produced by a couple is called **couple moment**.

Let's determine the sum of the moments of both couple forces about **any** arbitrary point:





A torque or moment of  $12\text{ N}\cdot\text{m}$  is required to rotate the wheel. Why does one of the two grips of the wheel above require less force to rotate the wheel?