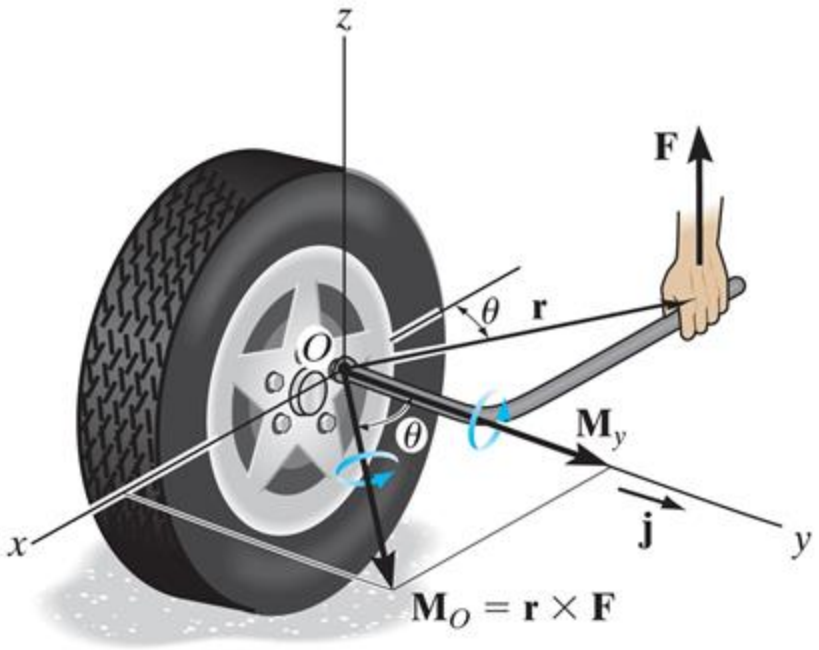
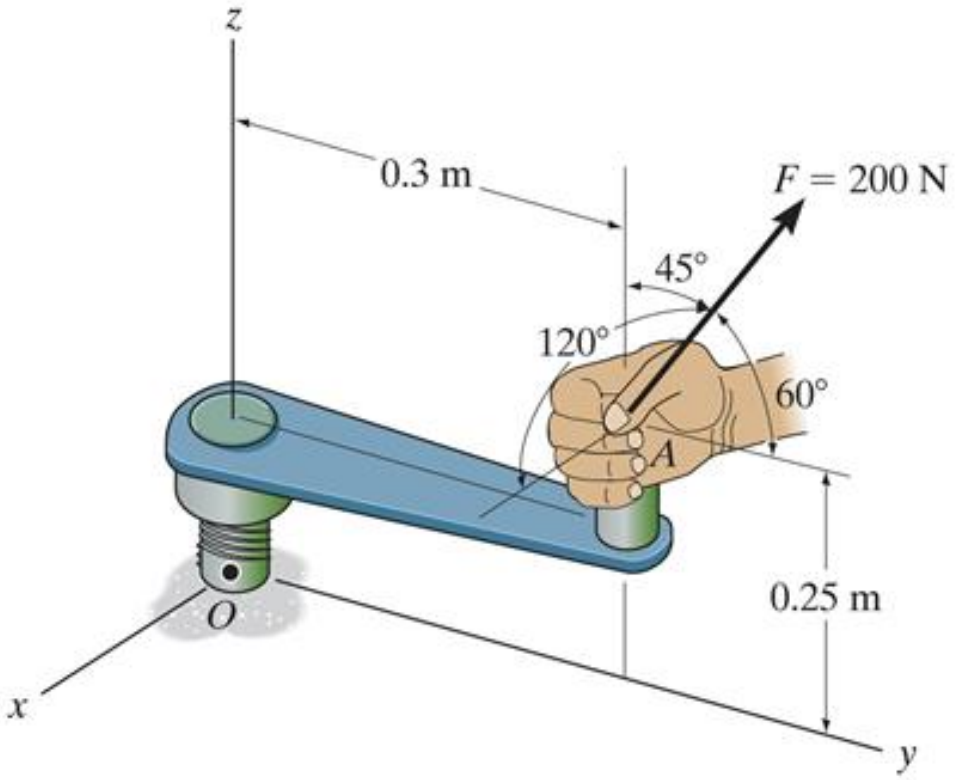
To do ...

- Quiz 2 this week (**Tues-Fri**)
- HW 6 due **Tues**
- HW 7 due **Thurs**
- WA 1 (FBD only) due **Fri**

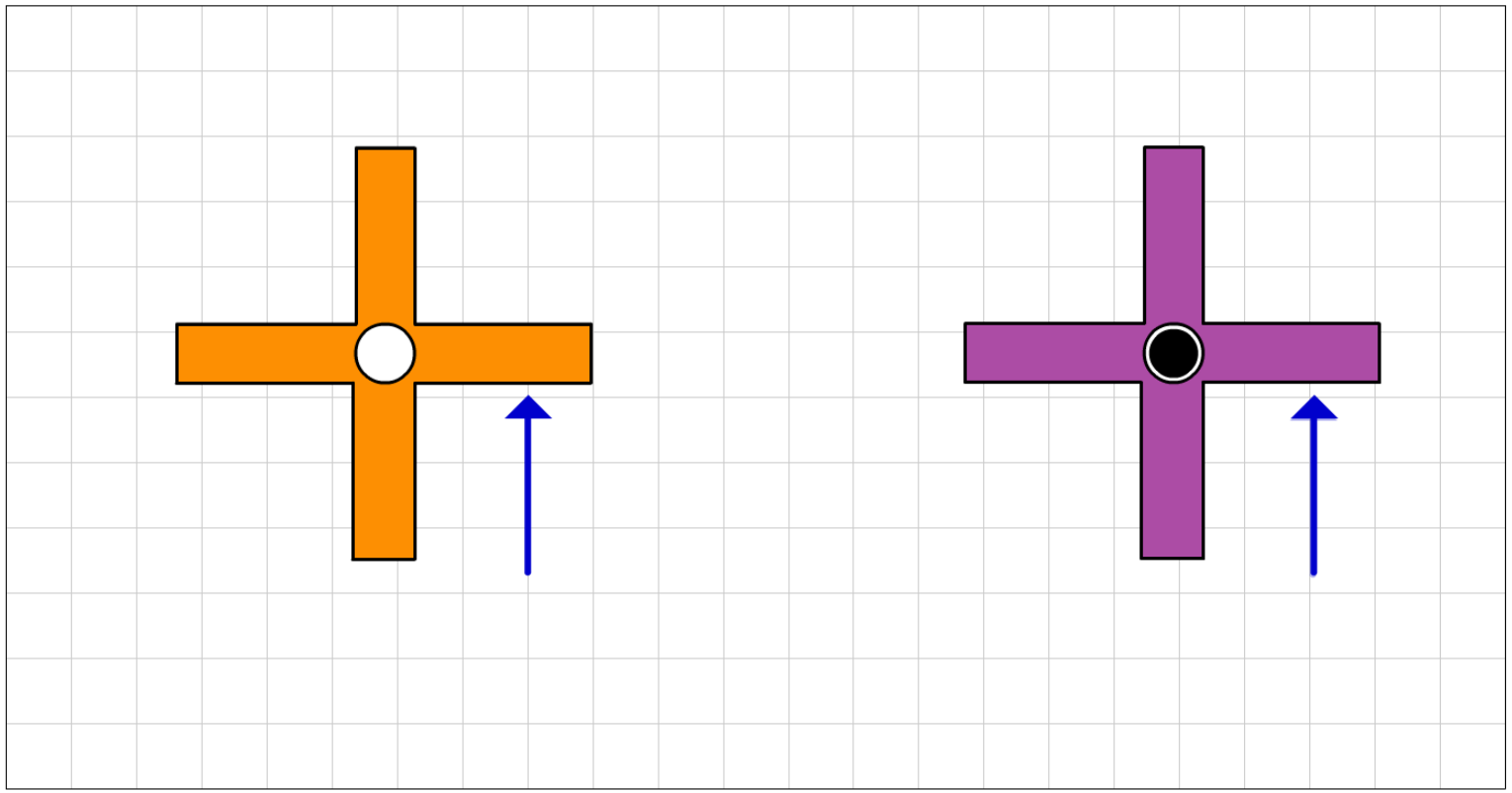
Moment of a force about a specified axis



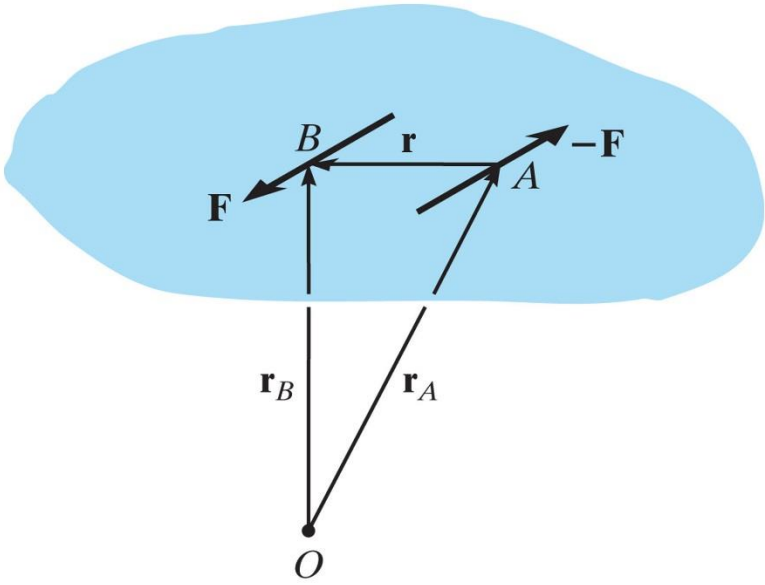


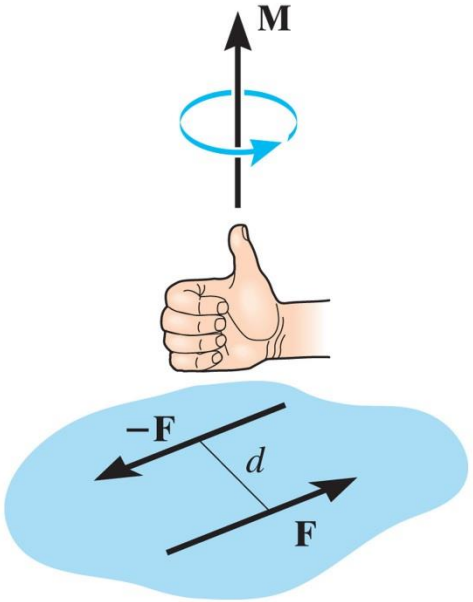
A force is applied to the tool as shown. Find the magnitude of the moment of this force about the x axis of the value.

Moment of a couple



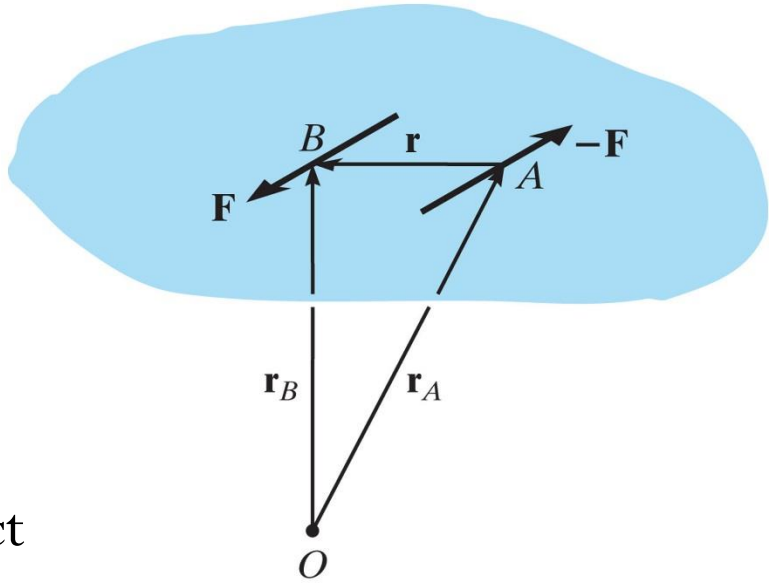
Moment of a couple





Moment of a couple

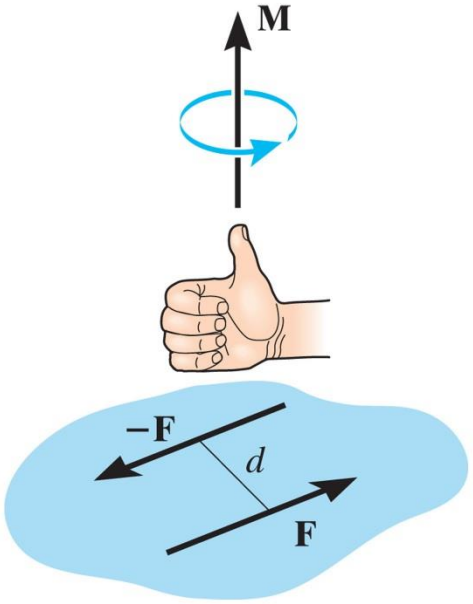
A **couple** is defined as two parallel forces that have the same magnitude, but opposite directions, and are separated by a perpendicular distance d.

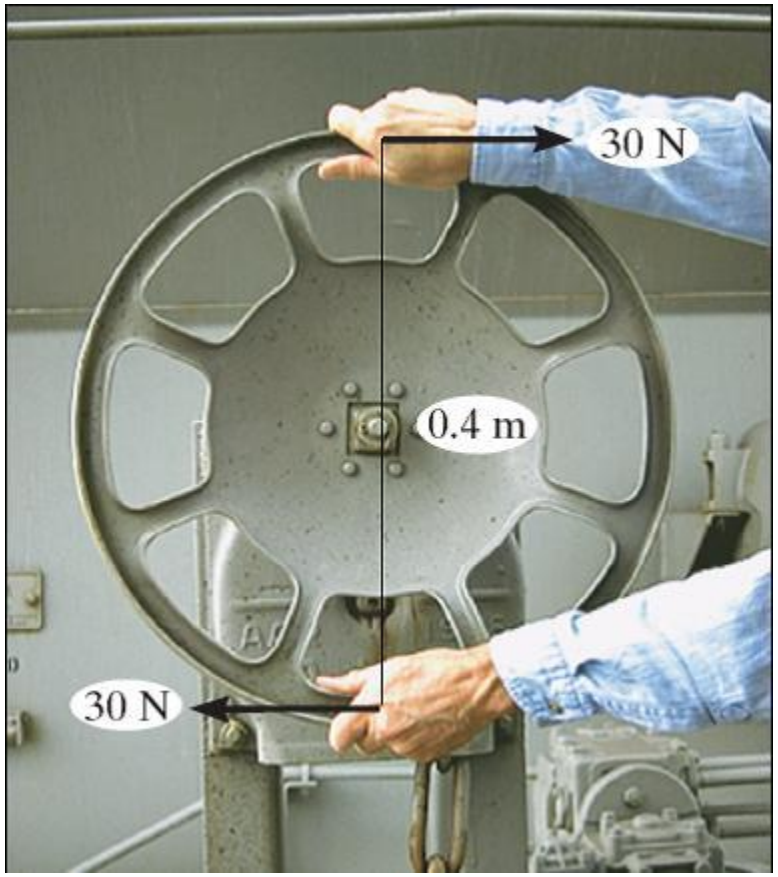


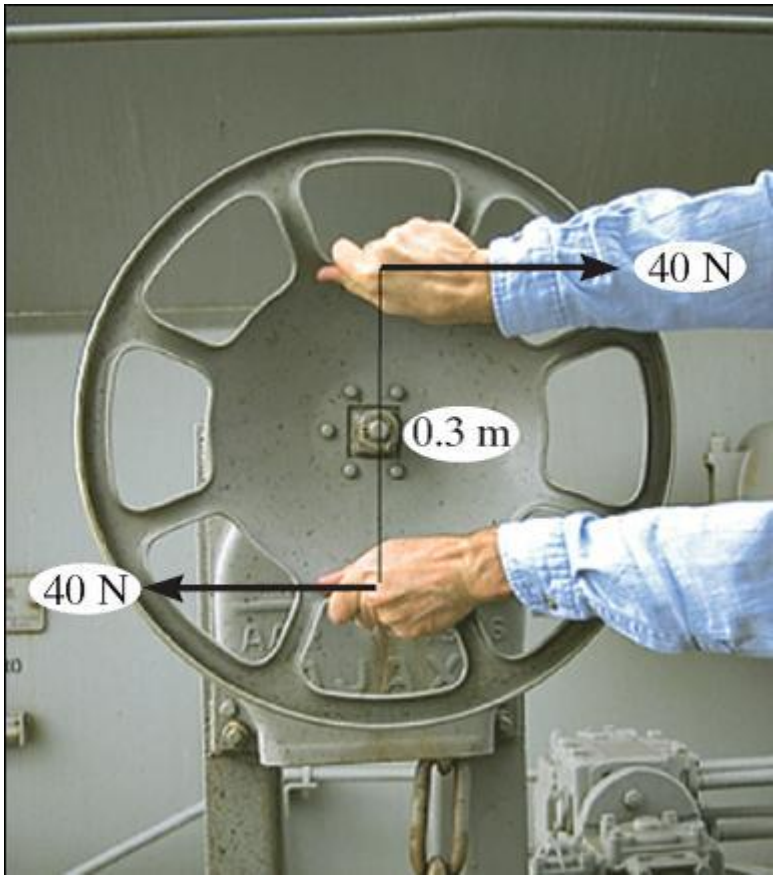
Since the resultant force is zero, the only effect of a couple is to produce an actual rotation, or if no movement is possible, there is a tendency of rotation in a specified direction.

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

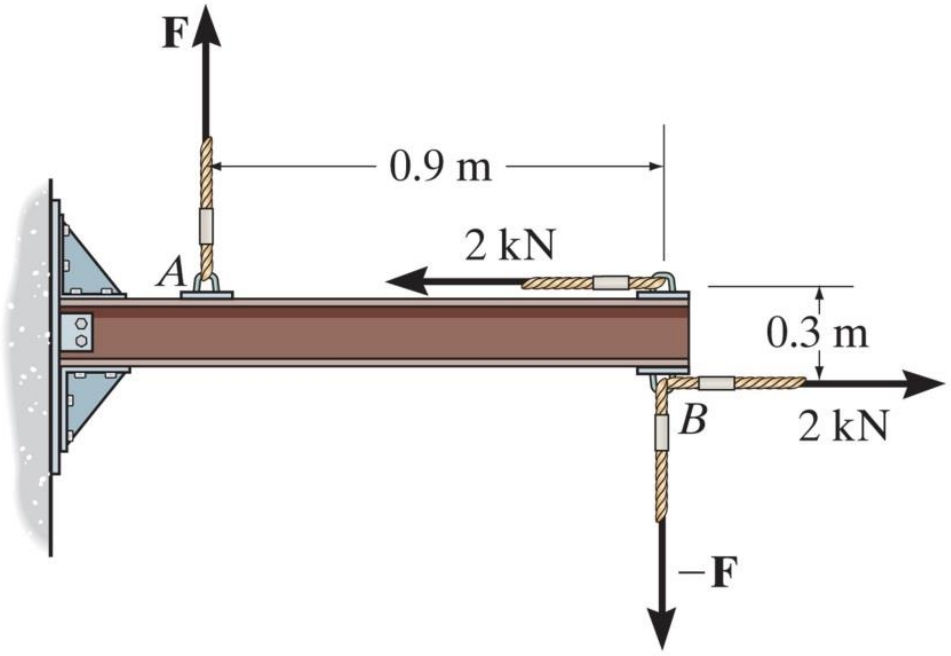
Let's determine the sum of the moments of both couple forces about **any** arbitrary point:



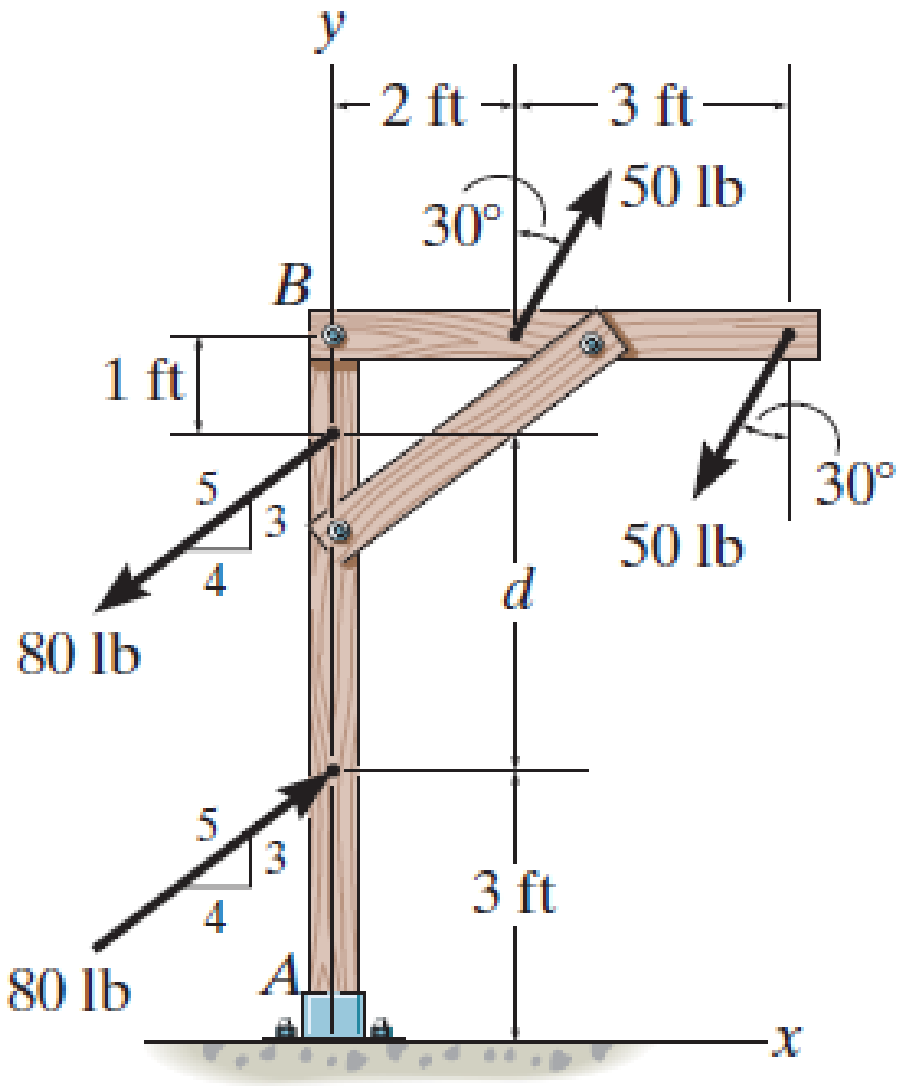




A torque or moment of 12 N·m is required to rotate the wheel. Why does one of the two grips of the wheel above require less force to rotate the wheel?

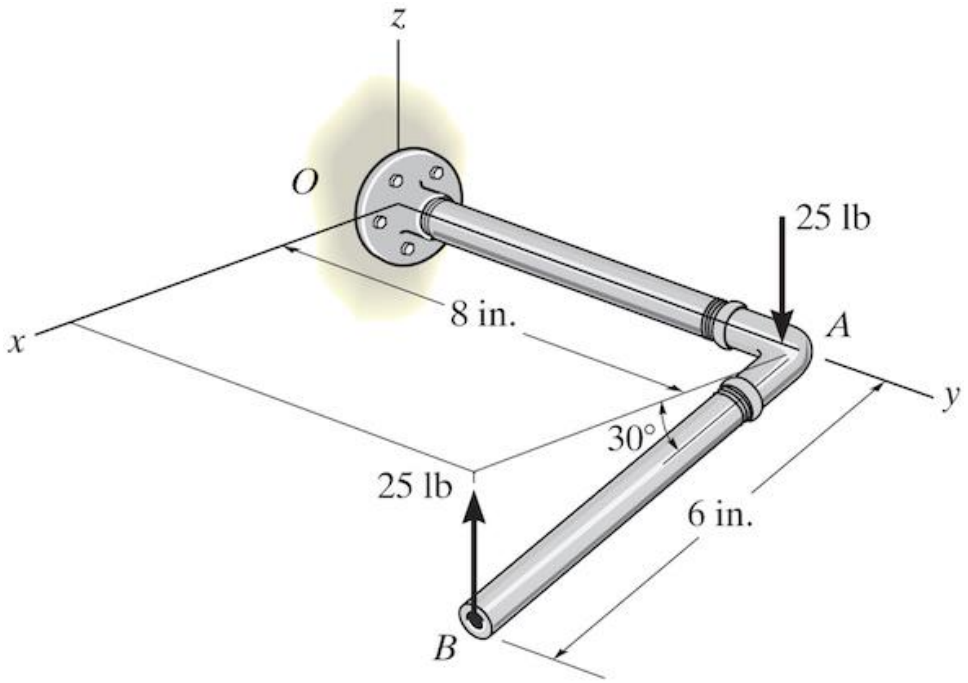


Two couples act on the beam with the geometry shown. Find the magnitude of F so that the resultant couple moment is 1.5 kN·m clockwise.

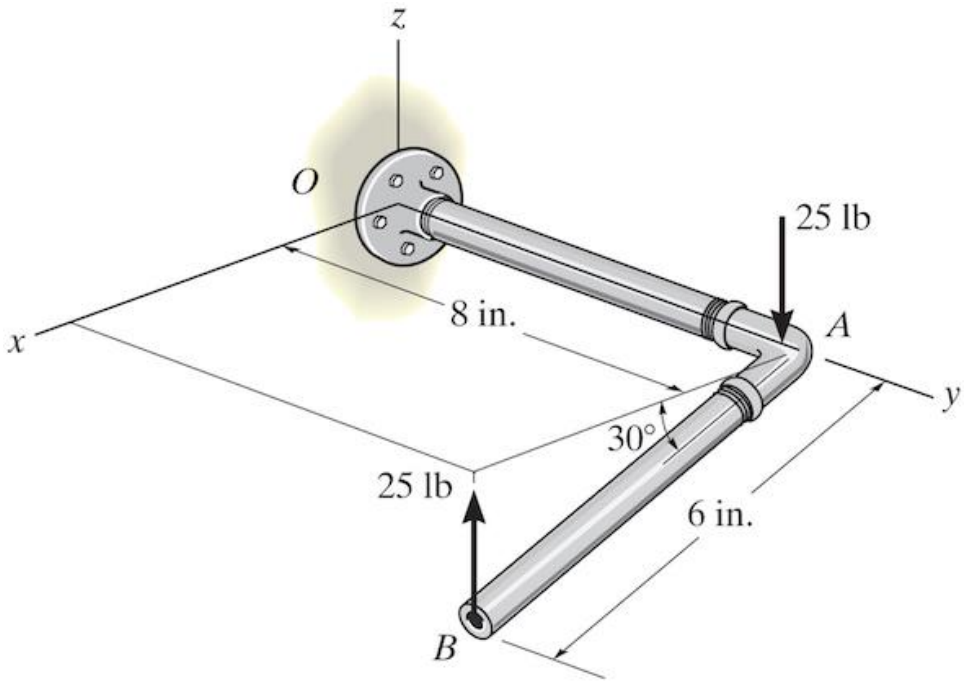


Two couples act on the beam with the geometry shown and d = 4 ft. Find the resultant couple

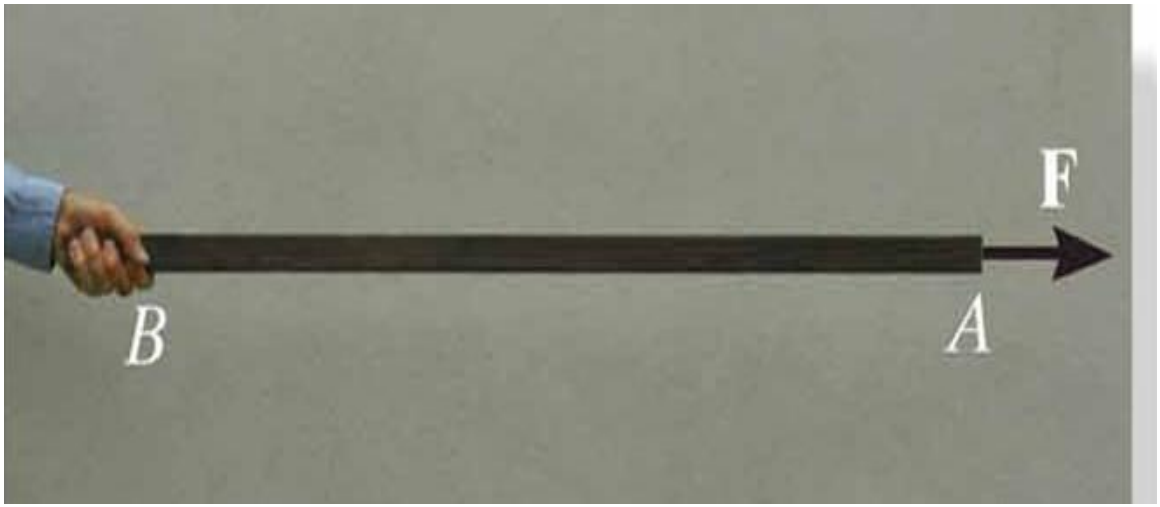
Determine the moment acting on the pipe about O.



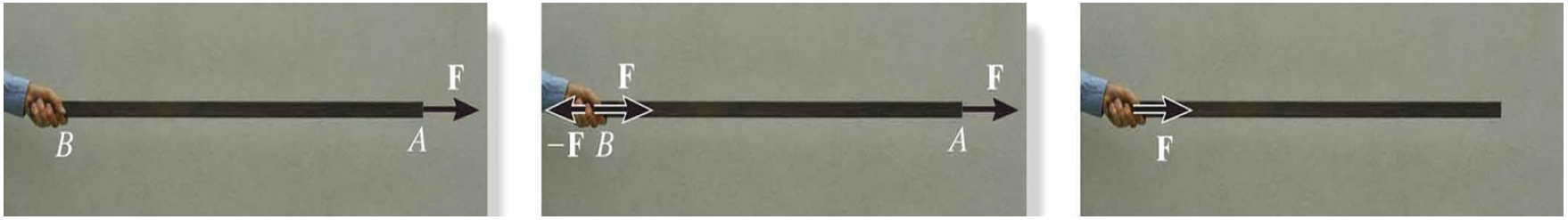
Determine the moment acting on the pipe about O.



Moving a force on its line of action



Moving a force on its line of action

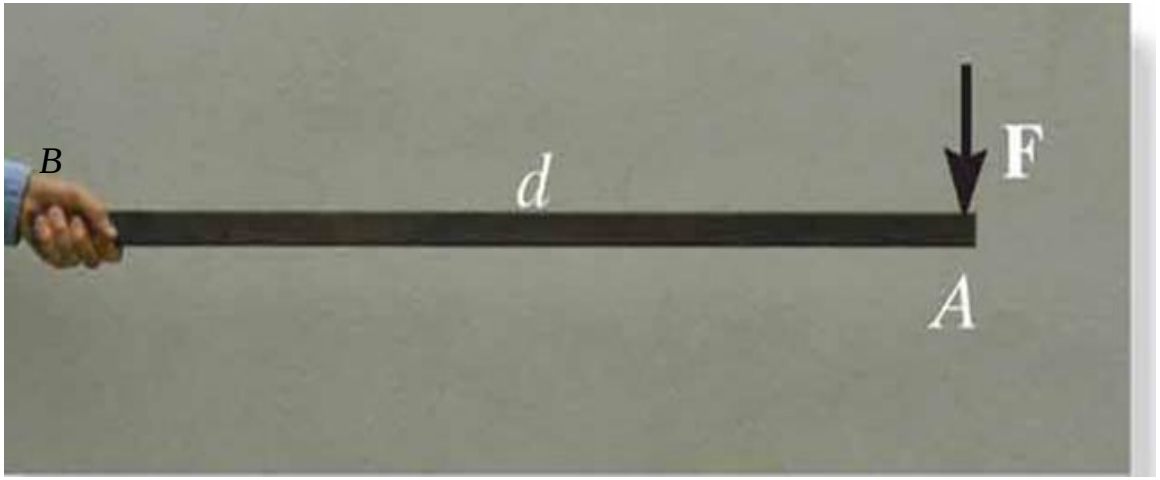


Moving a force from A to B, when both points are on the vector's line of action, does not change the **external effect**.

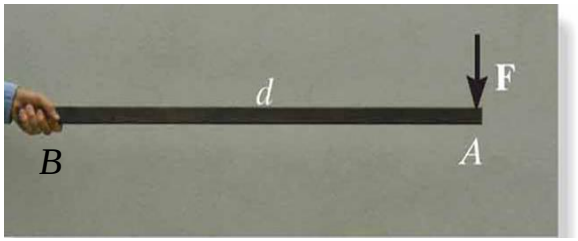
Hence, a force vector is called a **sliding vector**.

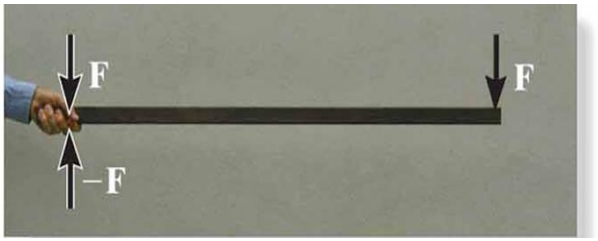
However, the **internal effect** of the force on the body does depend on where the force is applied.

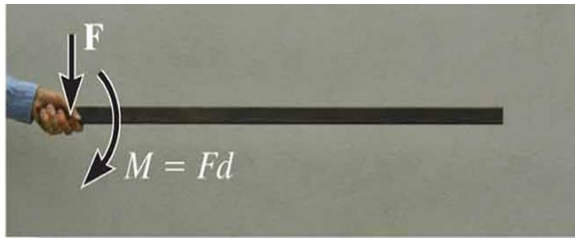
Moving a force off of its line of action



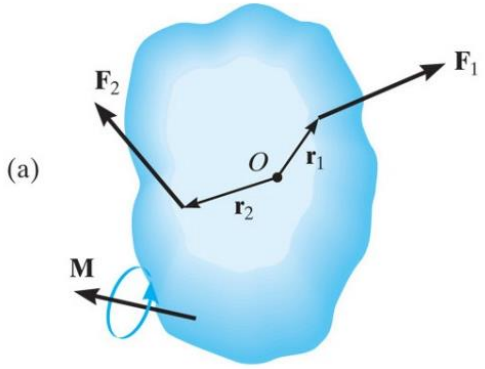
Moving a force off of its line of action







Equipollent (or equivalent) force systems



A force **system** is a collection of **forces** and **couples** applied to a body.

Two force systems are said to be **equipollent** (or equivalent) if they have the **same resultant force** AND the **same resultant moment** with respect to any point P.

Reducing a force system to a single resultant force $\boldsymbol{F}_R$ and a single resultant couple moment $(\boldsymbol{M}_R)_O$:

What is the equivalent system?