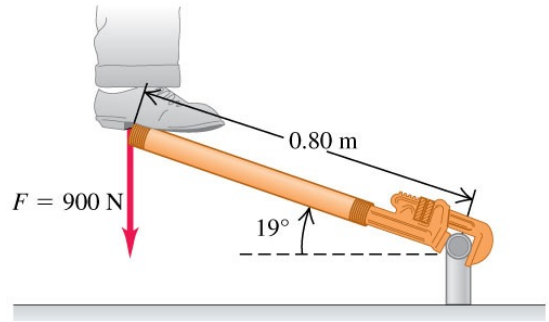


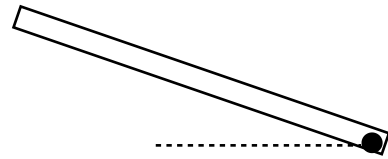
## Torque and Rotational Equilibrium

1. **Plumber's Cheater:** A plumber applies his full 900-N weight at a point 0.80 m from the center of a pipe fitting by using a scrap pipe ("cheater"). The wrench-cheater makes an angle of  $\theta = 19^\circ$  with the horizontal. Find the magnitude and direction of the torque exerted by plumber's weight.



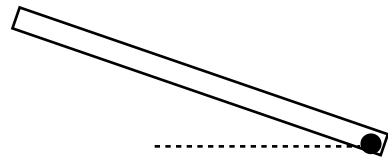
method (1):

- \* Sketch vector  $r$
- \* Sketch angle  $\phi$

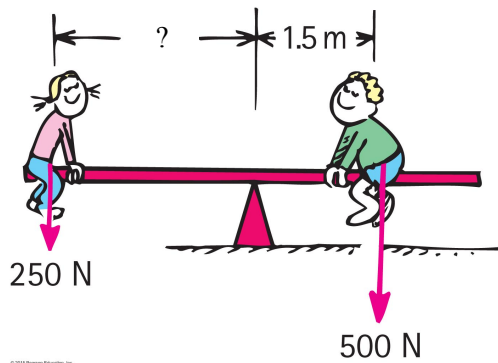


method (2):

- \* Sketch vector  $r_\perp$



2. **See-saw:** Leah and Thomas are playing on a see-saw. Thomas weighs more than Leah and is seated a distance  $L = 1.5\text{ m}$  from the pivot point. Where should Leah seat such that the net torque is zero?



3. The weight  $F_G$  of the load in a wheelbarrow exerts a torque about the axle of the wheel. A person pulls on the handle with a force  $F_p$ . The wheelbarrow is in rotational equilibrium. The magnitude of the pulling force is:
- smaller than the weight ( $F_p < F_G$ )
  - the same as the weight ( $F_p = F_G$ )
  - larger than the weight ( $F_p > F_G$ )
  - not possible to determine

