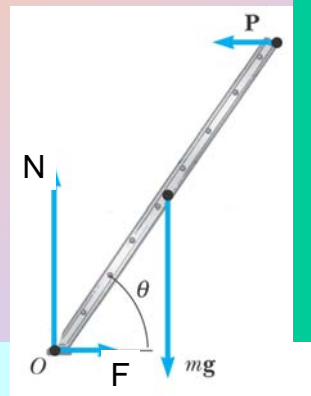


Phys171 - Fri 4/20

- Mon: Midterm 3 chapter 12,13
- Tue: Rotation finished
- Thu/Fri: Fluids
- Following week: Relativity
- Last week: gases / review

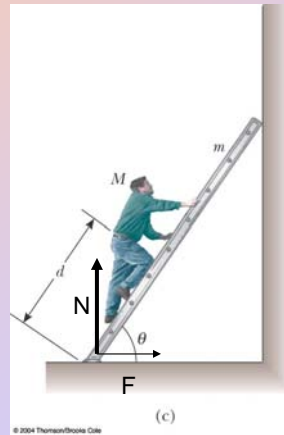
Ladder Example

- Draw a free-body diagram for the ladder (see on right)
 - Choose O as axis of rotation (fewer forces generate torque than for other points -> easier calculation)
- > Two conditions of equilibrium



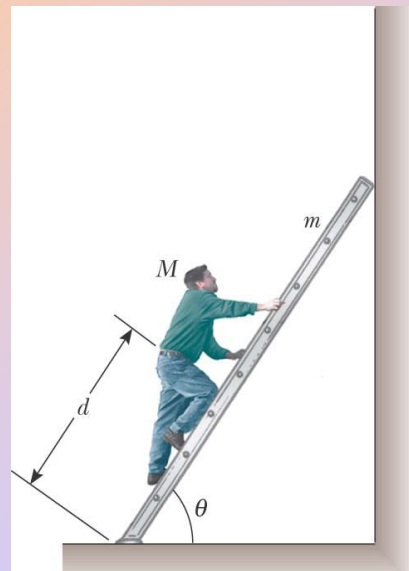
Ladder Example, Extended

- Add a person of mass M at a distance d from the base of the ladder
- The higher the person climbs, the larger F is relative to N
- Eventually, the ladder may slip



Which forces change if a person climbs up the ladder

1. N
2. F
3. P
4. N, F
5. N, P
6. F, P
7. N, F, P



Kinetic Energy of rotation

Each particle is in motion and has a kinetic energy of

$$K_i = \frac{1}{2} m_i v_i^2$$

- Since the tangential velocity depends on the distance, r_i , from the axis of rotation, we can substitute $v_i = \omega_i r_i$
- The total rotational kinetic energy of the rigid object is the sum of the energies of all its particles

$$K_R = \sum_i K_i = \sum_i \frac{1}{2} m_i r_i^2 \omega^2$$
$$K_R = \frac{1}{2} \left(\sum_i m_i r_i^2 \right) \omega^2 = \frac{1}{2} I \omega^2$$

- Where I is called the moment of inertia