Conservation of Energy

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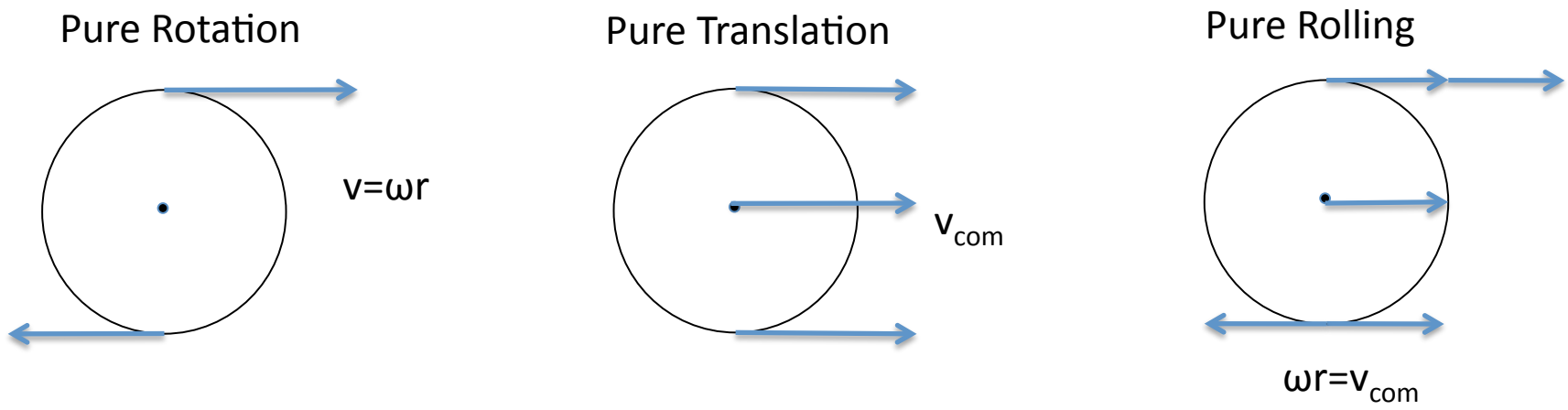
- As usual, we will set initial energy equal to final energy.
- If an object starts higher than its later position, it will have potential energy at the start.
- For falling shapes, we will note how far its **center of mass** descends.
- If an object is spinning, it will have rotational kinetic energy.
- If the axis an object is rotating around is moving linearly, it will have translational kinetic energy.

- If a wheel rolls without slipping, the bottom of the wheel is always at rest instantaneously.



Ex1: A ball of mass M and radius R starts from rest at a height of 2 m and rolls without slipping down a 30^o slope.

A) What is the linear speed of the ball at the bottom of the hill?

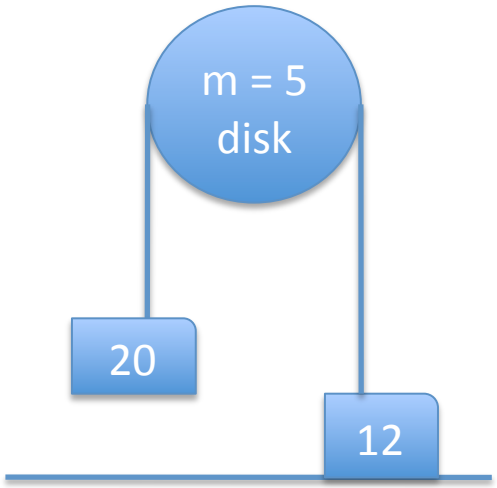
B) Would a hoop of the same mass and radius reach the same speed at the bottom of the hill?

Ex2: A uniform rod of length L and mass M is free to rotate on a frictionless pin passing through one end. The rod is released from rest in the horizontal position.

A) What is the rod's angular speed when it reaches its lowest point?

B) Determine the linear speed of the end of the rod when it is at its lowest position.

Ex3: What is the speed of the 12 kg block when the 20 kg block hits the ground? The system is released from rest when the 20 kg block is 4 m off the ground.



Calculating Work & Power

Linear	Rotational
$W = \int F dx$	$W = \int \tau d\theta$
$W = Fd\cos\theta$	$W = \tau\theta$
$W_{net} = \Delta K$	$W = \Delta \frac{1}{2} I\omega^2$
$\overline{P} = \frac{W}{t}$	*same*
$P = Fv$	$P = \tau\omega$