LET IT GO!

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ROLLING DOWN THE RAMP DEMO:



USED TO DEMONSTRATE ENERGY CONSERVATION:



$$\begin{split} mgh &= \frac{1}{2}mv^2 + \frac{1}{2}\underbrace{J}_{\beta mr^2}\omega^2 \\ &= \frac{1}{2}mv^2 + \frac{\beta}{2}m(\underbrace{r\omega}_v)^2 = \frac{1+\beta}{2}mv^2 \\ &\downarrow \\ gh &= \left(\frac{1+\beta}{2}\right)v^2 \end{split}$$

• The velocity at the bottom does not depend on the mass or radius.

MOMENT OF INERTIA:

TABLE 8.2 Moment of Inertia for Some Common Objects



COST:

- The ramp can be constructed out of relatively inexpensive material. (1 in x 12 in x 4 ft unfinished pine board is about \$20 at Lowes/Home Depot)
- Rolling objects can be expensive.
 Example: Ring and Disk set from Arbor Scientific (equal mass and equal radii) - \$44



Can we use canned foods we have lying around in the pantry instead? (No need for equal mass or equal radii after all.)

ANDY WARHOL RACE:



• Which can will win the race?

INORGANIC (CONDENSED) VS. ORGANIC (NON-CONDENSED):



• Which can will win the race?

FROZEN (LEFT) AND THAWED (RIGHT) CANS OF ORANGE JUICE



• Which can will win the race?

OTHER POSSIBLE RACES BETWEEN HOUSEHOLD ITEMS:

- Ping-Pong ball vs. Golf Ball (hollow vs. solid sphere)
- Baseball vs. Golf ball (different mass and size but same shape)
- Baseball vs. Soup Can (sphere vs. cylinder)
- Baseball vs. Toy Car (rolling vs. non-rolling)
- etc.