Vocabulary: Inclined Plane – Rolling Objects

Vocabulary

- Moment of inertia – a measurement of an object's resistance to changes in rotation.
  - Moment of inertia is represented by the symbol *I*.
  - The SI unit of moment of inertia is the kilogram meter squared ($kg \cdot m^2$).
  - The moment of inertia of a collection of masses is equal to the sum (Σ) of each mass (*m*) multiplied by the square of its distance from the axis of rotation (*r*):

$$I = \sum mr^2$$

    - For example, suppose a weightless disk contains a 4-kg mass that is 3 m from the center and a 5-kg mass that is 2 m from the center. The moment of inertia of the disk is:

$$4\ kg \times (3\ m)^2 + 5\ kg \times (2\ m)^2 = 36\ kg \cdot m^2 + 20\ kg \cdot m^2 = 56\ kg \cdot m^2$$

  - Moment of inertia plays the same role in most equations about rotational motion as mass does in equations about linear motion.

- Rotational kinetic energy – kinetic energy due to rotation.
  - Symbols for rotational kinetic energy include *RKE* and KE_{Rot}.
  - For a rotating object, the formula for rotational kinetic energy is:

$$RKE = \frac{1}{2} I\omega^2$$

    In this equation, *I* represents moment of inertia and ω represents angular speed.

- Translational kinetic energy – kinetic energy due to linear motion.
  - Symbols for translational kinetic energy include *TKE* and KE_{Trans}.
  - For a moving object, the formula for translational kinetic energy is:

$$TKE = \frac{1}{2} mv^2$$

    In this equation, *m* represents mass and *v* represents velocity.