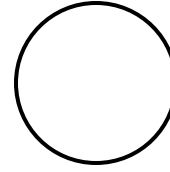


TYPES OF MOTION AND ENERGY

- A Point Mass ($R=0$) in a circular path has **rotational** speed (ω).



- It also has a **tangential** speed (v_{TAN}), which is **linear** →

- Does it mean that it has both LINEAR Kinetic Energy and ROTATIONAL Kinetic Energy? _____

- We have ONE type of motion, so only ONE type of Energy → v_{TAN} is just the **linear equivalent** of ω .

EXAMPLE: For each of the following, indicate it whether has (i) linear kinetic energy, (ii) rotational kinetic energy.

(a) Box in a straight line (b) Disc spinning around itself (c) Earth around itself (d) Earth around Sun

(e) Moon spinning around the Earth

(f) A roll of toilet paper rolling on the floor

KINETIC ENERGY OF A POINT MASS

- A Point Mass in a circular path has **rotational** speed (ω) and a **linear equivalent** (v_{TAN}), BUT only ONE type of motion.
 - So it only has ONE type of kinetic energy, BUT you can calculate it using EITHER equations (K_L or K_R).
 - This is because the 2 equations are equivalent. What you can't do is have BOTH – it would be “double counting”.

EXAMPLE: A small 2-kg object spins horizontally around a vertical axis at a rate of 3 rad/s, maintaining a constant distance of 4 m to the axis. Calculate the object's kinetic energy using: **(a) K_L** ; **(b) K_R** .

PRACTICE: ROTATIONAL ENERGY / ENERGY OF EARTH

PRACTICE: The Earth has mass 5.97×10^{24} kg, radius 6.37×10^6 m. The Earth-Sun distance is 1.5×10^{11} m. Calculate the Earth's kinetic energy as it spins around itself. → BONUS: Find the Earth's kinetic energy as it goes around the Sun.