

ROTATIONAL VELOCITY & ACCELERATION

- The rotational equivalents of linear velocity and acceleration are Rotational Velocity and Rotational Acceleration:

$$v_{\text{AVG}} = \underline{\hspace{2cm}} [\underline{\hspace{1cm}}] \quad \rightarrow \quad \underline{\hspace{2cm}} = \underline{\hspace{2cm}} [\underline{\hspace{1cm}}]$$

$$a = \underline{\hspace{2cm}} [\underline{\hspace{1cm}}] \quad \rightarrow \quad \underline{\hspace{2cm}} = \underline{\hspace{2cm}} [\underline{\hspace{1cm}}]$$

- There are 3 additional variables that describe how quickly something rotates (similar to ω). They are all related:

$$\omega = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \quad \left. \begin{array}{l} 1 \text{ RPM} = \underline{\hspace{2cm}} \\ 1 \text{ Hz} = \underline{\hspace{2cm}} \end{array} \right\}$$

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- Often we will convert from any of these three back to $\rightarrow$

- Note that rotational equations work for both:

(1) Points Masses () moving in a circular path; or

(2) Rigid Body/Shape () rotating around themselves.

EXAMPLE 1: A 30-kg disc of radius 2 m rotates at a constant 120 RPM. Calculate its **(a)** period, **(b)** angular speed.

EXAMPLE 2: Calculate the rotational velocity for the Earth as it **(a)** rotates around itself, **(b)** rotates around the Sun.

PRACTICE: ROTATIONAL VELOCITY & ACCELERATION

PRACTICE: Calculate the rotational velocity (in rad/s) of a clock's minute hand.

→ EXTRA: Calculate the rotational velocity (in rad/s) of a clock's hour hand.

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PRACTICE: A wheel of radius 5 m accelerates from 60 RPM to 180 RPM in 2 s. Calculate its angular acceleration.