



Consider a mass-spring system. Use dimensional analysis on the force law:

$$F = m a = m \frac{d^2 x}{dt^2} = -k x .$$

Identify one of the following expressions which has the same dimension as that of the angular velocity ω .

- A) $\omega = \frac{k}{m}$.
- B) $\omega = \sqrt{\frac{k}{m}}$.
- C) $\omega = \frac{m}{k}$.
- D) $\omega = \sqrt{\frac{m}{k}}$.

Use the bracket notion for “dimension of..”

Since

$$\omega = \frac{2\pi}{T},$$

$$[\omega] = \frac{1}{T},$$

Since, $F = ma = -kx$

$$\frac{k}{m} = -\frac{a}{x},$$

$$\left[\frac{a}{x} \right] = \frac{L}{T^2}$$

$$\left[\sqrt{\frac{k}{m}} \right] = \frac{1}{T}.$$

Answer **B**.

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