



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, $F = m a = -k x$

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

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

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

Answer **B**.