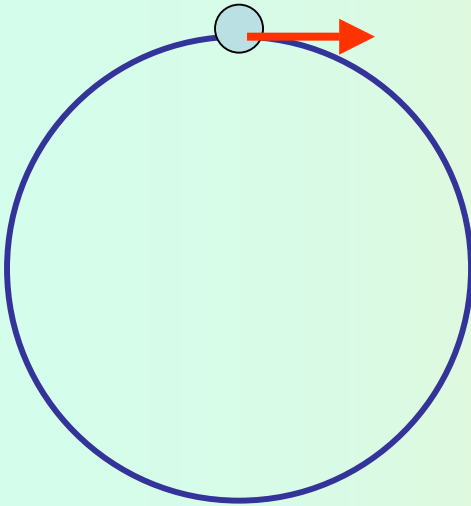


# Circular motion: exercise

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## Problem

A 6 kg-body is moving in a circular motion with constant speed. The radius of the trajectory is 50 cm and the period of the motion is 2 s.

Determine:

- The angular velocity (rad/s and rpm)
- The frequency (number of cycles per second, Hertz -Hz-)
- The linear velocity (m/s)
- The centripetal acceleration ( $\text{m/s}^2$ )
- The centripetal force needed to get the motion

## Circular motion: exercise

### Problem

A 6 kg-body is moving in a circular motion with constant speed. The radius of the trajectory is 50 cm and the period of the motion is 2 s.

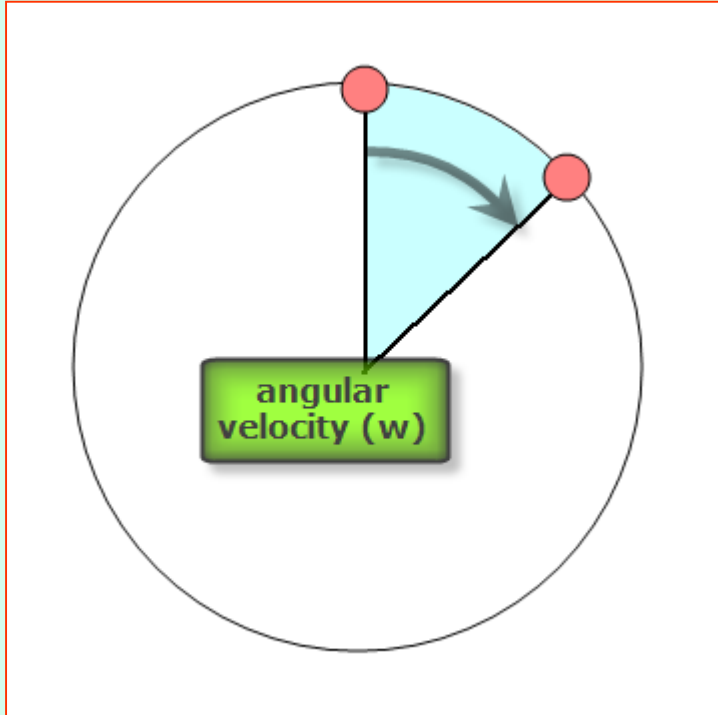
Determine:

a) The angular velocity (rad/s and rpm)

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{2\text{ s}} = \pi \frac{\text{rad}}{\text{s}}$$
$$\omega = \pi \frac{\text{rad}}{\text{s}} \frac{60\text{ s}}{1\text{ min}} \frac{1\text{ rev}}{2\pi\text{ rad}} = 30\text{ rpm}$$

b) The frequency (number of cycles per second, Hertz -Hz-)

$$f = \pi \frac{\text{rad}}{\text{s}} \frac{1\text{ rev}}{2\pi\text{ rad}} = 0.5 \frac{\text{rev}}{\text{s}} = 0.5\text{ Hz}$$



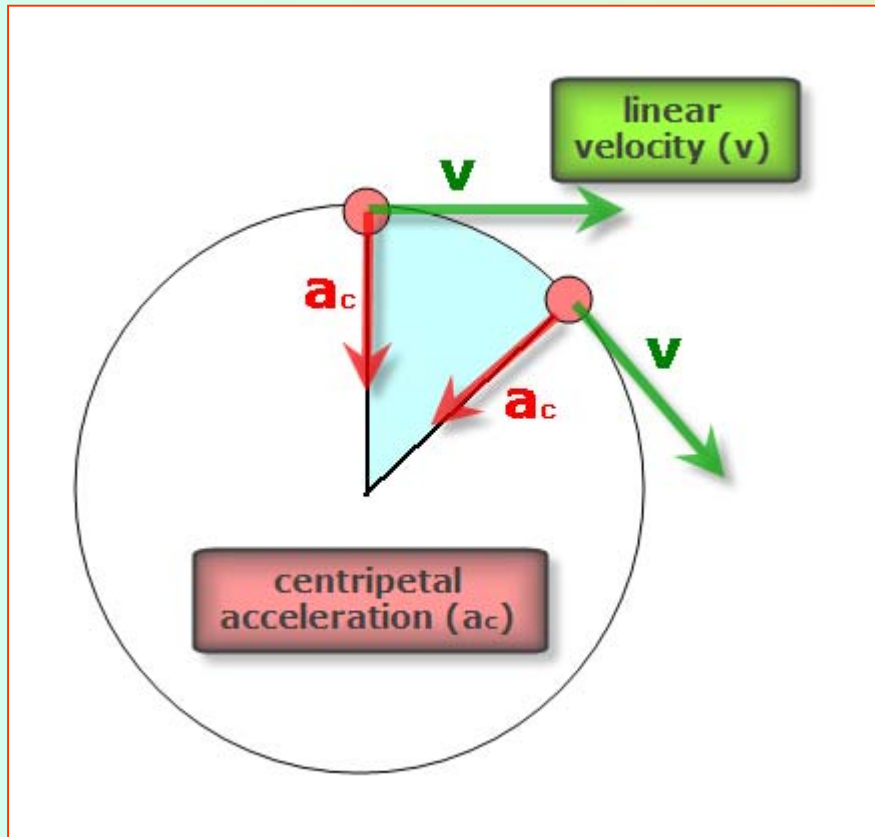
## Circular motion: exercise

### Problem

A 6 kg-body is moving in a circular motion with constant speed. The radius of the trajectory is 50 cm and the period of the motion is 2 s.

Determine:

- c) The linear velocity (m/s)
- d) The centripetal acceleration (m/s<sup>2</sup>)



$$\omega = \pi \frac{\text{rad}}{\text{s}}$$

$$v = \omega R = \pi \frac{\text{rad}}{\text{s}} * 0.5 \text{ m} = 1.57 \frac{\text{m}}{\text{s}}$$

$$a_c = \frac{v^2}{R} = \frac{\left(1.57 \frac{\text{m}}{\text{s}}\right)^2}{0.5 \text{ m}} = 4.93 \frac{\text{m}}{\text{s}^2}$$

## Circular motion: exercise

### Problem

A 6 kg-body is moving in a circular motion with constant speed. The radius of the trajectory is 50 cm and the period of the motion is 2 s.

Determine:

e) The centripetal force needed to get the motion

$$a_c = 4.93 \frac{\text{m}}{\text{s}^2}$$

$$F = m * a = 6 \text{ kg} * 4.93 \frac{\text{m}}{\text{s}^2} = 29.6 \text{ N}$$

