

## Problem Solutions Chapter #8 Giancoli 6th Edition

### ■ Problem #8:

QUESTION: A rotating merry - go - round makes one complete revolution in 4.0 seconds (a) What is the linear speed of a child seated 1.2 meter from the center? (b) What is her acceleration?

ANSWER: The linear or tangential velocity  $V=\omega R$  where  $R=1.2$  m is the distance to the axis of rotation. The period of revolution is  $T=4.0$  sec/cycle so the frequency  $f=1/4$  cycles/sec= 0.25 Hertz so the angular frequency in radians per second is  $\omega=2\pi f=1.57$  Rad/s. The linear speed  $V=\omega R=1.57$  Rad/s  $\times$  1.2 m =1.9 m/s. The tangential acceleration is zero because it seems  $\omega$  is constant (and so the angular acceleration is zero). The radial acceleration is  $V_p=V^2/R=\omega^2 R=2.96$  m/s<sup>2</sup> in the radial direction toward the center of the merry-go-round.

$$T = 4.0;$$

$$f = 1 / T;$$

$$\omega = 2 \times \pi \times f$$

$$1.5708$$

$$R = 1.2;$$

$$V = \omega \times R$$

$$1.88496$$

$$a = v^2 / R$$

$$2.96088$$

### ■ Problem #9

Calculate the angular velocity of the Earth (a) as it orbits the Sun and (b) about its axis.

ANSWER:  $T=365$  days/cycle for the Earth going about the Sun.  $f=1/T$  is the frequency in cycles/sec and  $\omega=2\pi f$  is the angular frequency in Rad/sec and  $\omega=1.2 \times 10^{-7}$  Rad/s.

$$T = 365. \times 24 \times 60 \times 60.;$$

$$f = 1 / T;$$

$$\omega = 2 \times \pi \times f$$

$$1.99238 \times 10^{-7}$$

PART B:  $T=24$  hours per day and this corresponds to  $\omega=7.27 \times 10^{-5}$  Rad/s.

$$T = 24. \times 60 \times 60;$$

$$f = 1 / T;$$

$$\omega = 2 \times \pi \times f$$

$$0.0000727221$$

### ■ Problem #16

An automobile engine slows down from 4500 rpm to 1200 rpm in 2.5 seconds. Calculate (a) its angular acceleration  $\alpha$  assuming it is constant.  $2\pi$  Rad = 1 Rev

$$\omega f = 1200. \times (2 \times \pi) ;$$

$$\omega 0 = 4500. \times (2 \times \pi) ;$$

$$t = 2.5;$$

$$\alpha = \frac{\omega f - \omega 0}{t}$$

$$-8293.8$$

The minus sign means there is a deceleration or slowing down.

Part (b) Calculate the total number of revolutions it makes in the time  $t=2.5$  sec.

ANSWER:

# Giancoli Chapter Answers

**Marcel A. Müller**



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