

### Circular Motion

**Directions** –Solve the following problems using the GUESS method and correct significant figures. Be sure to show ALL work!

1. What is the period of a ball being swung around in a circle of radius 0.65 meters at 3.1 m/s?

$$T = \frac{2\pi r}{v} = \frac{2\pi(0.65m)}{(3.1 \frac{m}{s})} = 1.3s$$

2. What is the speed of a rubber stopper traveling in a circle of radius 0.62 m if it takes 1.0 second to travel 10 times around the circle?

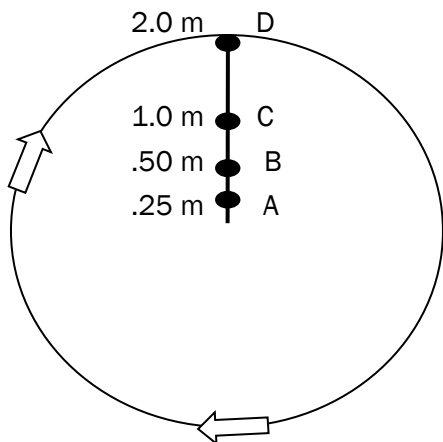
$$v = \frac{2\pi r}{T} = \frac{2\pi(0.62m)}{0.10s} = 39 \frac{m}{s}$$

3. Assuming that the Earth moves around the sun in a circular path with radius  $1.5 \times 10^8$  km at a constant speed, and the period is one year, what is the orbital speed in km/hr?

$$\left(\frac{1yr}{1}\right)\left(\frac{365day}{1yr}\right)\left(\frac{24hr}{1day}\right) = 8760hr$$

$$v = \frac{2\pi r}{T} = \frac{2\pi(1.5 \times 10^8 km)}{8760hr} = 1.1 \times 10^5 km/hr$$

4. Four friends are on a merry-go-round as shown below. The friend on the outside keeps getting sick, no matter which friend it is. It takes 3.0 seconds for the merry-go-round to complete a full circle. Determine the speed for each friend. (You'll see why the outside kid always gets sick)



$$v_A = \frac{2\pi r}{T} = \frac{2\pi(0.25m)}{3.0s} = 0.52 \frac{m}{s}$$

$$v_B = \frac{2\pi r}{T} = \frac{2\pi(0.50m)}{3.0s} = 1.0 \frac{m}{s}$$

$$v_C = \frac{2\pi r}{T} = \frac{2\pi(1.0m)}{3.0s} = 2.1 \frac{m}{s}$$

$$v_D = \frac{2\pi r}{T} = \frac{2\pi(2.0m)}{3.0s} = 4.2 \frac{m}{s}$$

Answers in size order: 0.52, 1.0, 1.3, 2.1, 4.2, 39,  $1.1 \times 10^5$