Wednesday Reading Assessment: Unit 6, Circular Motion

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1 Memory Bank

- $\Delta s = r\Delta\theta$ ... Arc length, radius, and angle (radians)

- $\omega = \frac{\Delta\theta}{\Delta t}$ ... Definition of angular velocity

- $v = r\omega$ ... Relationship between tangential velocity, v, and angular velocity, ω

- $C = 2\pi r$ ... Circumference of a circle

- $a_{\mathrm{C}} = r\omega^2$ ... Centripetal acceleration

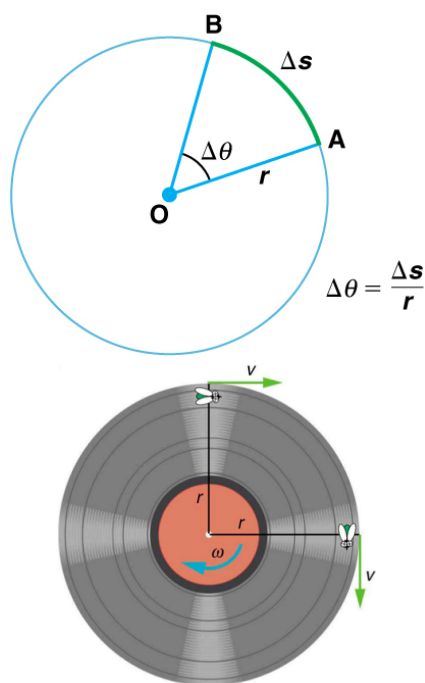- $F_{\mathrm{C}} = mr\omega^2$ ... Centripetal force

Figure 1: (Left) A circle with a radius r. Arc length Δs around the edge is related to the angle $\Delta\theta$. (Right) A record that is spinning counter-clockwise.

2 Angular Displacement, Velocity

1. Suppose disc has a radius of 0.1 m. (a) What is the circumference? Suppose the object begins to rotate. A spot on the edge returns to its original location after 1.5 seconds. (b) Compute the ratio of the circumference to the time to get a speed.

2. In the previous exercise, how many times per minute will this object rotate?

3. Consider Fig. 1 (right). A record spins at 45 revolutions per minute (rpm). (a) How many revolutions per second is this? (b) Using a formula from the memory bank, calculate the *angular velocity*. Take 2π as $\Delta\theta$, and the time of one rotation as Δt. (c) If the record is left playing for one hour, and continues to spin at 45 rpm, how many times will it rotate?

3 Centripetal Force

1. What is the *centripetal acceleration* of the fly on the edge of the disc in Fig. 1, if the radius is 10 cm?

2. What is the *centripetal force* of the fly, if $m = 1$ gm?