3 Andrea and Chuck are riding on a merry-go-round. Andrea rides on a horse at the outer rim of the circular platform, twice as far from the center of the circular platform as Chuck, who rides on an inner horse. When the merry-go-round is rotating at a constant angular speed, Andrea's angular speed is

- A twice Chuck's
- B the same as Chuck's
- C half of Chuck's
- D impossible to determine

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$\uparrow v = \omega r \uparrow$

Linear and Angular Connections

Displacement Relation

$$r \cdot \boxed{\Delta\theta = \frac{s}{r}} \cdot r$$

Displacement

$$\boxed{s = r\Delta\theta}$$

V_{AVG}

$$\omega_{AVG} \quad \boxed{\frac{\Delta\theta}{t}} = \frac{1}{r}\,\boxed{\frac{s}{t}}$$

time

$$\lim_{t \to 0} \; r \cdot \omega = \frac{1}{r} v \cdot r$$

$$\boxed{v = r\omega}$$

$$\lim_{t \to 0}$$

$$\boxed{a = r\alpha}$$

A bicycle is turned upside down while its owner repairs a flat tire. A friend spins the other wheel and observes that drops of water fly off tangentially. She measures the heights reached by drops moving vertically. A drop that breaks loose from the tire on one turn rises vertically 54.0 cm above the tangential point. A drop that breaks loose on the next turn rises 51.0 cm above the tangent point. The radius of the wheel is 0.381 m.

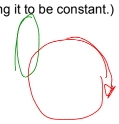
a. Why does the first drop rise higher than the second drop?
b. Neglecting air friction and using only the observed heights and the radius of the wheel, find the wheel's angular acceleration (assuming it to be constant.)

$\alpha = ?$ $\quad a = \alpha r$ $\quad v = \omega r$

$\Delta\theta = \omega_i t + \frac{1}{2}\alpha t^2$

$\omega_f = \omega_i + \alpha t$

$\omega_f^2 = \omega_i^2 + 2\alpha\Delta\theta$



ω_f, ω_i } needed

use kinematics

Since we know linear info we can fin (v_i + v_f linearly + then calc. $\omega_i + \omega_f$ for kinematics.

Linear

Drop 1

$\Delta y = 0.540\,m$
$a = -9.80\,m/s^2$
$v_i =$
$v_f = 0\,m/s$

$t =$

$v_f^2 = v_i^2 + 2a\Delta y$

$v_i = \pm\sqrt{\cancel{v_f^2} - 2a\Delta y}$

$v_i = \pm\sqrt{-2a\Delta y}$

$v_i = \pm\sqrt{-2(-9.80)(.540)}$

$v_i = 3.25\,m/s$

Drop 2

$\Delta y = 0.510\,m$
$a = -9.80\,m/s^2$
$v_i =$
$v_f = 0\,m/s$

$t =$

$v_i = \pm\sqrt{-2(-9.80)(.510)}$

$v_i = 3.16\,m/s$

$\frac{v}{r} = \frac{\omega r}{r}$

$\omega = \frac{v}{r}$

Angular

$\omega_i = \frac{3.25\,m/s}{.381\,m} = 8.53\,rad/s$

$\omega_f = \frac{3.16\,m/s}{.381\,m} = 8.29\,rad/s$

$\Delta\theta = 2\pi$

$\alpha = ?$

$\omega_f^2 = \omega_i^2 + 2\alpha\Delta\theta$

$\alpha = \frac{\omega_f^2 - \omega_i^2}{2\Delta\theta}$

$= \frac{8.29^2 - 8.53^2}{2(-2\pi)}$

$$\boxed{= 0.321\,rad/s^2}$$