

# Carousel Columbia



## *Qualitative*

### DATA:

Time for one revolution (T): \_\_\_\_\_ sec

Radius for outside rider: \_\_\_\_\_ m

Radius for inside rider: \_\_\_\_\_ m

Lateral accelerations - inside: \_\_\_\_\_ g's .... outside: \_\_\_\_\_ g's

### QUESTIONS:

- (a) The linear velocity of an outside rider is [less than, equal to, greater than] an inside rider. Circle your answer.

(b) The centripetal acceleration of an outside rider is [less than, equal to, greater than] an inside rider. Justify your answer to part (b), keeping in mind your answer to part (a).
- Sketch the forces acting on you when you're riding on an outside horse. Identify the forces.
- While the ride is in motion, do you feel as if you are being pulled toward or away from the center of the ride? Explain.
- Why don't people sit straight up on a horse while the carousel is moving?
- Imagine that all riders are riding outside horses. Once the carousel is turning, the motor is turned off and the carousel continues to turn freely with no frictional loss. If all riders then move from the outside horses to inside horses while the carousel is turning, what affect would this have on the motion of the carousel? Explain.

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## *Quantitative*

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Time for one revolution (T): \_\_\_\_\_ sec

Radius for outside rider: \_\_\_\_\_ m

Radius for inside rider: \_\_\_\_\_ m

Lateral accelerations - inside: \_\_\_\_\_ g's .... outside: \_\_\_\_\_ g's

### CALCULATIONS: show your work and clearly identify your final answers

1. Find the linear speed of an outside rider.
2. Find the linear speed of an inside rider.
3. Calculate the centripetal acceleration of the outside rider in  $\text{m/s}^2$  and g's.
4. Calculate the centripetal acceleration of the inside rider in  $\text{m/s}^2$  and g's.
5. Compare your calculated accelerations to the measured lateral accelerations
6. What is the average linear speed in miles per hour (mph) that you traveled on the carousel at Great America? First make a mental estimate, then do the calculations. You may use the approximate conversion of  $30 \text{ m/s} \approx 90 \text{ ft/s} \approx 60 \text{ mph}$ , or work it out any other way you choose. Show your work.

Mental estimate = \_\_\_\_\_ mph

Calculation = \_\_\_\_\_ mph