Name: Partner: Teacher:

Highland Fling

1. Observe the Highland Fling as it reaches full speed while still oriented horizontally. How are the rider's bodies oriented relative to the spokes of the ride?

2. Continue to watch the ride as it changes from horizontal to vertical. How are the rider's bodies oriented relative to the spokes of the ride?

3. Why do the cars change their positions?

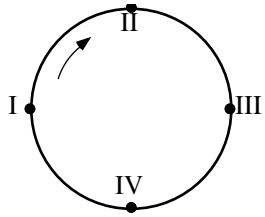
4. Consider the diagram to the right. When the ride is spinning vertically, at what point:

   a. are you going fastest? _____

   b. are you going slowest? _____

   c. do you feel heaviest? _____

   d. do you feel lightest? _____



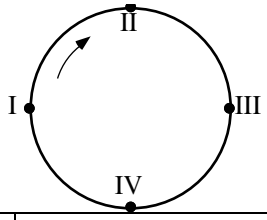
5. Determine the circumference of the ride. (Find the circumference of the ride by walking around the ride and counting your paces before you get on.)

6. Calculate the radius of the ride.

7. Determine the time for one revolution when the ride is at full speed. Does the time for one revolution change when the ride goes from horizontal to vertical?

8. Calculate the tangential speed of the ride.

9. Take head to toe Force Factor meter readings at positions I, II, III, and IV when the ride is vertical and when it is horizontal.

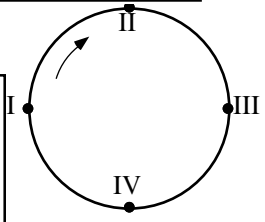


Ride orientation	Force Factor At position I	Force Factor At position II	Force Factor At position III	Force Factor At position IV
Horizontal				
Vertical				

10. Draw the free-body diagram for a rider when the ride is <u>at rest</u>:

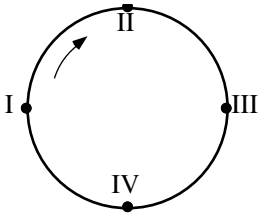
11. Draw the free-body diagram for a rider when the ride is <u>at full speed</u> in its horizontal orientation. To simplify analysis, assume that the cars <u>are</u> oriented horizontally:

12. Draw a free-body diagram for a rider at <u>each</u> of points I, II, III, and IV, when the ride is at full speed, but at its maximum vertical orientation.



I. II. III. IV.

13. Calculate the centripetal acceleration and normal force experienced by a 60.0 kg rider at points I, II, III and IV.



14. Calculate the Normal Force experienced by a 60.0 kg person from the Force Factor meter readings at points I – IV.

	Point I	Point II	Point III	Point IV
Normal Force (calc. from circular motion principles)				
Force Factor (measured with F. F. meter)				
Normal Force (calc. from Force Factor measurement)				

15. Explain why the head to toe Normal Force reading changes from points I to II to III to IV in this situation.

16. Compare the magnitude and direction of the Force Factor at position I and III when the ride was moving vertically to the magnitude and direction of the Force Factor when the ride was moving horizontally. Explain the relationship!