Name: Partner: Teacher:

Highland Fling

QUALITATIVE QUESTIONS

1. As riders sit in the stationary Highland Fling how are the rider's bodies oriented relative to the spokes of the ride?

2. 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?

3. Why do the cars change their positions as the ride speeds up?

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

5. Compare the tangential speed of a car to the tangential speed of the middle of a spoke. Explain!

6. Compare the angular speed of a car to the angular speed of the middle of a spoke. Explain!

QUALITATIVE QUESTIONS (continued)

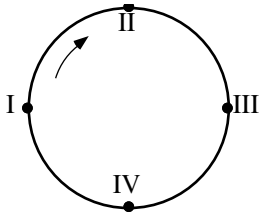
7. Consider the diagram to the right. When the ride is spinning vertically, at what point:

   a. are you going fastest? _____

   b. are you going slowest? _____

   c. do you feel heaviest? _____

   d. do you feel lightest? _____



8. When the ride is spinning horizontally, predict whether or not the readings from your Force Factor meter will differ significantly between positions I, II, III, and IV.

9. When the ride is spinning vertically, predict which of the positions I, II, III, or IV will have a Force Factor meter reading that is a:

   a. maximum: _____

   b. minimum: _____

   c. halfway between the maximum and the minimum: _____

10. 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				

11. Are your answers for #8 and #9 consistent with your Force Factor readings? Explain.

Name: Partner: Teacher:

Highland Fling

QUANTITATIVE QUESTIONS:

1. 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.)

2. From your measurements, calculate the radius of the ride.

3. 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?

4. Calculate the centripetal acceleration and normal force experienced by a 60.0 kg rider when the ride is at rest.

5. Draw and label a quantitative free-body diagram for the 60.0 kg rider when the ride is at rest.

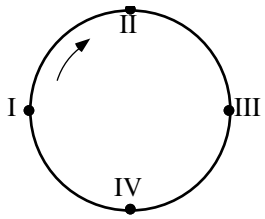
QUANTITATIVE QUESTIONS:
WHEN THE RIDE IS AT FULL SPEED HORIZONTALLY

Note: For this set of questions the cars are <u>not</u> entirely horizontal when the ride is at full speed in its horizontal orientation. Nonetheless, to simplify calculations for this ride, assume that the cars <u>are</u> oriented horizontally.

6. Calculate the tangential speed of the ride.

7. Draw the free-body diagram for a rider.

8. Calculate the centripetal acceleration and normal force toward the center of the circle experienced by a 60.0 kg rider at points I – IV.



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

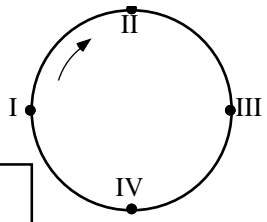
	Point I	Point II	Point III	Point IV
Normal Force (calc. from circular motion principles)				
Force Factor (measured with F. F. meter)				
Normal Force (calc. from Force Factor measurement)				

10. What happens to the Force Factor meter readings from points I to II to III to IV in this situation? Explain!

Name: Partner: Teacher:

Highland Fling

QUANTITATIVE QUESTIONS:
WHEN THE RIDE IS AT FULL SPEED VERTICALLY



11. 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.

12. Calculate the centripetal acceleration and normal force experienced by a 60.0 kg rider at points I – IV.

13. 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)				

QUANTITATIVE QUESTIONS:
WHEN THE RIDE IS AT FULL SPEED VERTICALLY (con't.)

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

15. Compare the magnitude and direction of the Force Factor at positions I and III when the ride was moving vertically to the magnitude and direction of the Force Factor at any point when the ride was moving horizontally. Explain the relationship!