1. **Describe your experiences during the swing.**

____

____

____

How Does the Twin Dragon Operate?

2. Go around to the left hand side and look at the underneath. You should see a rubber strip along the length and a set of wheels at end end.

Drive mechanism

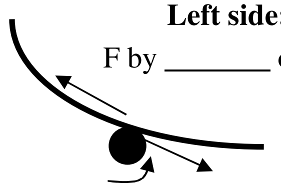
There are two set of tyres underneath the dragon, one on the left and one on the right. They turned by motors and provide the driving force. When the motor turns the tyres, the tyres push to the left on the bottom of the dragon, making it go higher. The tyres disengage as the dragon swings back down and engages again as it is about to go back up to the left. This makes the dragon go higher with each swing.

When a tyre pushes the dragon, by Newton's 3rd law, the dragon also pushes on the tyre.

3. The diagram below shows two arrows representing these forces. Label each arrow using the format "Force by ___ on _____"
4.

Left side: Going up

F by _______ on _______



F by _______ on ______

4. Compare and contrast this situation with that of a car on the road.

____

____

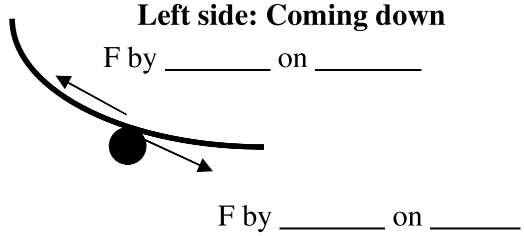
____

How does the Twin Dragon slow down.
Braking mechanism
The tyres can be restricted by brake pads and provides the braking force on the dragon. When the brakes are applied, the dragon slows down

When a tyre pushes back on the dragon, by Newton's 3rd law, the dragon also pushes on the tyre.

5. The diagram below shows two arrows representing these forces. Label each arrow using the format "Force by ___ on _____"

Left side: Coming down



6. Draw the direction of rotation of the wheel on the diagram above.

The Twin Dragon swings in a circular arc. So while the motion is circular motion, it is not uniform circular motion. The Twin Dragon is stationary at it's maximum height and fastest at its lowest point. However with some assumptions, we can use some ideas from circular motion.

7. Measure the time of the maximum swing from the maximum height on the left to the maximum height on the right.

____

At this stage the Twin Dragon is swinging through 120^0, or 1/3 of a circle.

8. Using radius of the arc as 12m, determine the average speed of the Twin Dragon in this swing.

____

____

____

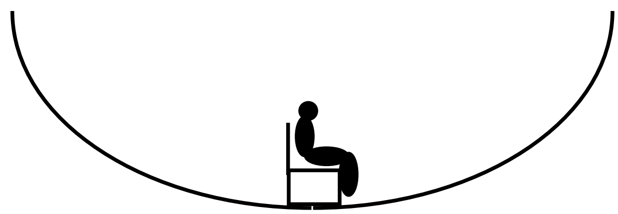
9. Assuming that the speed at the bottom of the swing is twice the average speed, calculate the centripetal acceleration of the Twin Dragon at this point.

____

____

____

10. One the diagram below, draw,
    i) The acceleration vector of you, a passenger sitting it the middle as the Twin Dragon passed through it's lowest point.
    ii) Your Weight force, labelled F by Earth on You
    iii) The Reaction force, labelled F by Seat on You
    For the force vectors consider the point of action, comparative size and direction.



Explaining your experiences

11. Why do you think it is a more exciting ride at either end of the dragon compared to the middle?

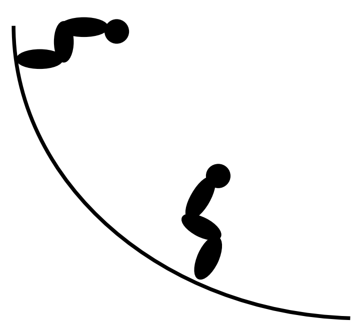
____

____

____

When the Dragon gets to its maximum height, the ends of the dragon are almost vertical. In this position, the Dragon is temporarily stationary and about to pick up speed., so for a short interval the acceleration will be along the tangent of the swing, as the centripetal acceleration ($a = v^2/r$) towards the centre is yet to become significant.

12. Draw the acceleration vector and the forces acting on a person at the top end of the Dragon and also on a person near the middle. Label the diagram.



Pendulum Motion: An Investigation

The Twin Dragon swings backwards and forwards like a pendulum. A pendulum swings with a constant period, the time for one complete oscillation. Does the Twin Dragon swing at a constant rate?

13. Measure the period of every second cycle. (Note: It is more accurate to start and stop the stop watch when the Dragon is moving fast, at the bottom)

1st: ________________ 3rd: ______________________ 5th: ____________________

7th: ________________ 9th ______________________ 11th ____________________

13th ________________ 15th ______________________ 17th ____________________

14. Is the period fairly constant?

____

15. The period of a pendulum is given by $T = 2\pi\sqrt{l/g}$, where l is the length of the pendulum and g = 9.8 m/s^2. Use your measurement for the period to calculate the effective length of this “pendulum”.

____

____

____

16. The distance from the axle to the seat is 12 m. How does your answer compare with this? Suggest a reason for any difference.

____