Motion and Force in a Gravitational Field

Revision Problems 3: Circular Motion   Due: _____

Name: _____   **(20 marks)**

1. The mass of a cyclist and bike is 90.0 kg. The cyclist rides around a circular bike track of radius 1.00 x 10^2 m and completes 15.0 revolutions of the track in 10.0 minutes.   Calculate her centripetal force. (3 marks)

2. A beach game involves hitting a ball tied to a pole with a piece of string with the ball moving in a horizontal circle. In one game the 0.400 kg ball swings around and around at an angle to the vertical. The ball takes 1.80 s for one revolution. What is the tension in the string if the radius of swing is 0.950 m?
                                                (3 marks)

Ball swings in a horizontal circle
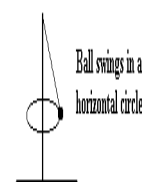
3. A child jumps on the end of a farm gate and swings it closed. If the gate was at 90^0 to its closed position, using reasonable estimates for mass, radius and period, determine the child's centripetal acceleration as she closed the gate.   (3 marks)

4. A roller-coaster has a vertical loop of radius 40.0 m. The owners of the roller-coaster advertise that the passengers will feel weightless while riding the loop.

a. What minimum speed would the roller-coaster need to be doing at the top of the loop for this to be true? (2 marks)	b. Using your understanding of conservation of energy, what then would be the speed of the roller-coaster at the bottom of the loop? (3 marks)

5. A 75.0 kg student has an apparent mass of 63.0 kg at the highest point on a steadily rotating Ferris wheel.   What is the apparent mass of the student at the lowest point? (4 marks)

6. A railway line goes around a curve of radius 5.00×10^3 m. It is designed to carry a train travelling at 1.00×10^2 ms^{-1}. What would be the angle of banking for the tracks which would result in the best cornering. (2 marks)