Practice Circular Motion Problems

1. **Ariel and Myles travel to Six Flags Great Adventure to test their "physics skills". They start on a ride called the SkyScreamer, which consists of long swings, which spin in a circle at relatively high speeds. As part of their research, Ariel and Myles estimate that the riders travel through a circle with a radius of 6.5 m and make one turn every 5.8 seconds.**

   a. **Determine the speed of the riders on the SkyScreamer.**
   b. **Determine the centripetal acceleration of the swings.**
   c. **Calculate the force needed to keep the swings in the circular path at that speed.**

2. **Thomas the Tank Engine is moving at constant speed around a track with a radius of 1.5 m once every 15 seconds.**
   a. **What is the average speed of the train?**
   b. **What is the centripetal acceleration?**

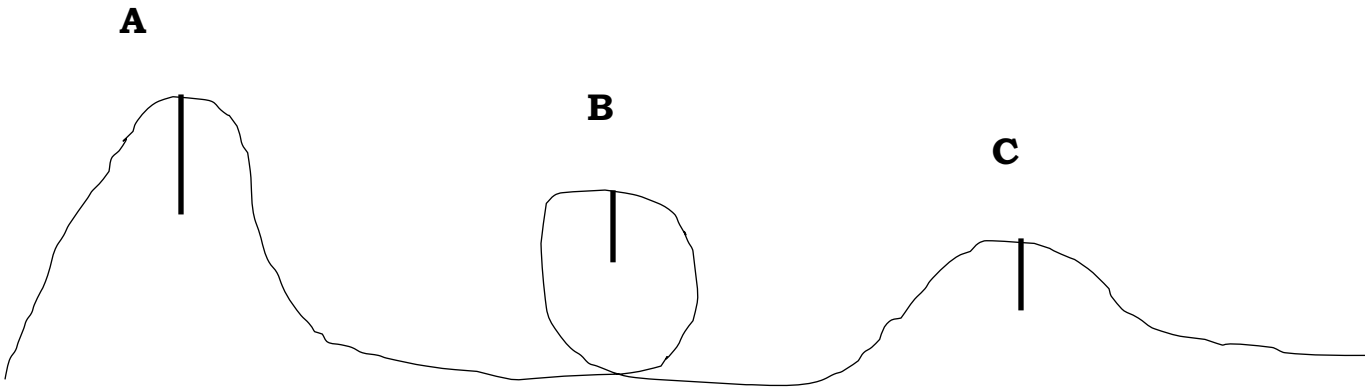
3. **In the display window of the toy store at the local mall, a drone is flying in a horizontal circle. The 550 gram quadcopter makes a complete circle every 2.15 seconds. The radius of the circle is 0.950 m.**
   Determine the ….
   a. **acceleration**
   b. **net force acting upon the plane.**

4. **A 245 g mass is on the end of a 35 cm long string. Determine the tension in the string at the top if the mass is spinning at 5.67 m/s.**

5. **A 76-kg pilot at an air show performs a loop de loop with his plane. At the bottom of the 52-m radius loop, the plane is moving at 48 m/s. Determine the normal force acting upon the pilot.**

6. **Isobel is in her VW Beetle and trying to make a turn off an expressway at 19.0 m/s. The turning radius of the level curve is 35.0 m. Her car has a mass of 1350 kg. Determine the**
   a.acceleration
   b. net force
   c. minimum value of the coefficient of friction which is required to keep the car on the road.

7. **Observe the diagram of the track of a frictionless roller coaster below.**



Radius at A = 18 meters
Radius at B = 10 meters
Radius at C = 5 meters

If a coaster cart contains two passengers and the entire mass of the cart is 750 kg, determine the following:

a. **The normal force acting on the cart at point A when the cart is traveling at 15 m/s.**
b. **The normal force acting on the cart at point B when the cart is traveling at 10 m/s.**
c. **The maximum velocity that may be reached at C without the cart speeding of the track.**