1. A racing car is turning a corner on a banked track which makes an angle of 26^0 with the horizontal. It moves with a speed v in a horizontal circle of radius $r = 300$ m.

   (a) Draw a free body diagram of the car showing all the forces (including friction) which act on it.

   (b) Write two expressions giving the net force in the horizontal and vertical directions and apply Newton's second law to each of these expressions.

   (c) How fast should the car travel so that the frictional force is zero?

   (d) The car actually drives around the corner at a speed of 30 ms^{-1} in which direction will the frictional force act?

   (e) The mass of the car is 1000 kg calculate the magnitude of the frictional force and the normal reaction of the road on the car.

2. A 50 kg pilot performs a vertical loop of radius 250 m in her plane.

   (a) At the top of the loop she travels at just the right speed so that she feels weightless. Find this speed

   (b) If the maximum normal force she can withstand without fainting is 2000 N find her maximum safe speed at the bottom of the loop.

   (c) In passing from the top of the loop to the bottom of the loop her plane speeds up due to the action of gravity. Will she need to brake in order to avoid fainting at the bottom of the loop?