The notes claimed that all the usual types of forces we know (e.g., gravity, tension, friction, normal force of contact) can produce a centripetal acceleration. Well, gravity explains the circular orbit of the Webb Space Telescope, while a tetherball is kept circling by the tension in the rope, but what about the other two I mentioned? Pick one, and describe a situation in which either friction or a normal force of contact produces a centripetal acceleration.

A turning car experiences centripetal acceleration but what's the force?

A situation which produces centripetal acceleration would be a car which is turning around a corner and you're holding on to the steering wheel steady during the turn at a constant speed, thus a uniform circular motion occurs.

And a sideways acceleration occurs because you as the driver and the car change directions, so the tighter the curve the higher the speed , the more noticeable the acceleration occurs.

Friction clearly identified

Friction produces a centripetal acceleration on a merry-go-round. Friction is the only radial force acting in this situation, so it produces the entire centripetal force.

Normal force acts here, but not alone

Normal force would produce a centripetal acceleration when you are going around a turn on a roller coaster. The contact force from the seat you are in on the roller coaster is making you feel as though you are being pushed outward, hard.

What actually produces centripetal acceleration at a race track?

An example of friction producing a centripetal force would be a race car driving around the track in continuous circles. The friction from the tires causes centripetal acceleration as they are turning the wheel at high rates of speed. There is no skidding friction happening so only non-skidding friction is causing the centripetal acceleration.

Estimate the magnitude of the force exerted for the particular situation you discussed in the first question. I shouldn't have to say this, but outline your logic, explain your estimates, and don't use a @#$%* calculator.

Good example of estimating the acceleration but not the force

If a car is going on a curve of a radius of 400m at 25 m/s then the centripetal acceleration formula ac=v^2/r is used.

Sub in the given values for V, which equals to 25 m/s and the r which equals to 400m

thus giving us, ac= (20 m/s)^2/400m, giving us an estimate of 1.0 m/s^2.

Good explanation and inclusion of units, but suspicious calculation at end

We estimate that the average weight of the car is 2 tons(2000 kg). When driving the car in a circular arc, the speed limit would be 20 miles per hour which is approximately 8 m/s. Then I would estimate that the radius of the circular arc to be 10 m. To figure out the magnitude of the force, we apply the centripetal force equation, which is F=m*v^2/r. We would plug in our known values; 2000 kg*(8 m/s)^2/10m= 12,800 N.

Good discussion with proper spirit of estimation

We know that radial force is given by the formula, F=m*(v^2/r).

1 metric ton seems reasonable for the mass of a car and it's an easy number, and since its turning the car is going at a relatively slow speed of 10 m/s. The radius of the turn is 10 m for mathematical convenience and because its my road to design how I please. It also seems like a reasonable radius.

We plug in our known values and get

F= 1000Kg*(10m/s)^2/10m

So the force involved is 10,000Kg. (should be newtons)

Key misconception: which way does the centripetal acceleration point?

Since friction is the only radial force, the centripetal force would be equal to the force of friction by Newton's 3rd law. The frictional force would be in the opposite direction of the centripetal force.

Looking back at that picture, at the instant shown what provides the force pushing the ball outward away from the pole?

Select one:

a. The string
b. The ball itself
c. The boy who struck it
d. Nothing is pushing it away from the pole