

A car travels at a constant speed on a flat circular track. Which factor, when doubled, either mass of car, weight of car, radius of track, or velocity of car, will decrease the centripetal force on the car?

The magnitude of the centripetal force on an object of mass m moving at tangential speed v along a path with radius of curvature r is:

$$F = \frac{mv^2}{r}$$

So, suppose we doubled mass of car, then:

$$F(2m) = \frac{(2m)v^2}{r} = 2F$$

Centripetal force will increase 2 times.

If we doubled weight of car (for example, changing gravitational acceleration), then F don't change.

If we doubled radius of track, then:

$$F(2r) = \frac{mv^2}{2r} = \frac{F}{2}$$

Centripetal force will decrease 2 times.

If we double mass of car, then:

$$F(2v) = \frac{m(2v)^2}{r} = 4F$$

Centripetal force will increase 4 times.