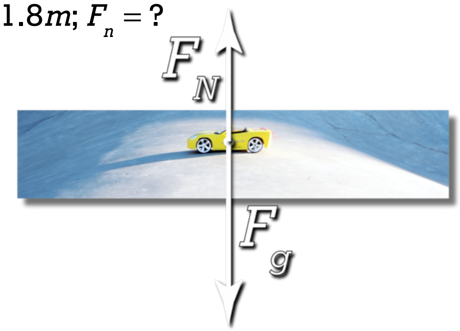
Flipping Physics Lecture Notes:

Introductory Centripetal Force Problem
Car over a Hill

Example: A 453 g toy car moving at 1.05 m/s is going over a semi-circular hill with a radius of 1.8 m. When the car is at the top of the hill, what is the magnitude of the force from the ground on the car?

Knowns: $m = 453g\left(\frac{1kg}{1000g}\right) = 0.453kg;\ v_t = 1.05\frac{m}{s};\ r = 1.8m;\ F_n = ?$



$$\sum F_{in} = F_g - F_N = ma_c \Rightarrow mg - F_N = m\frac{v_t^{\,2}}{r}$$

$$\Rightarrow -F_N = -mg + m\frac{v_t^{\,2}}{r} \Rightarrow F_N = mg - m\frac{v_t^{\,2}}{r}$$

$$F_n = (0.453)(9.81) - (0.453)\left(\frac{1.05^2}{1.8}\right) = 4.1665 \approx \boxed{4.2N}$$

Note: The force causing the circular motion, the Centripetal Force, or the net force in the in-direction, in this case is the Force of Gravity minus the Force Normal. $\sum F_{in} = F_g - F_N$

Also note: $F_g = mg = (0.453)(9.81) = 4.444 \approx 4.4N \Rightarrow F_N < F_g$

In other words, as you go over a hill in a car, you feel as if you weigh less. And the faster you move, the smaller the force normal, and the lighter you feel.