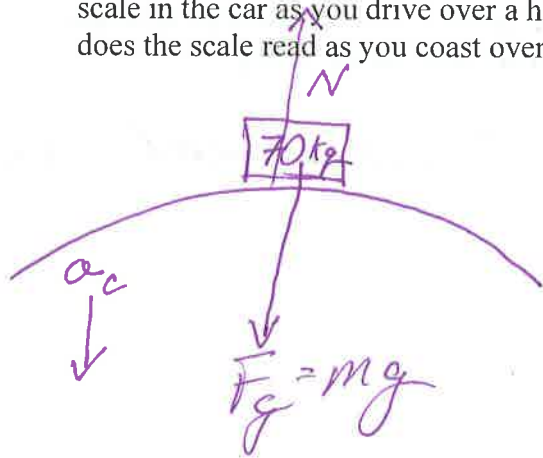Big Exam #4. Remember you are being evaluated on your *communication* of the physics. *Pete*
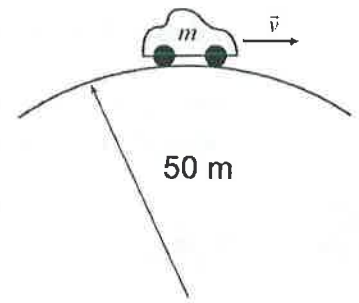
1. Please derive the relationship for centripetal acceleration: $a_c = v^2/r$. You may have noticed that I neglected to define my lens in the video. Please do a better job than I did.

See the 1st centripetal acceleration video.

2. You have a mass of 100 kg (because you're pregnant with twins and the doctor said you need to gain weight) and are sitting on a scale in the car as you drive over a hill as shown at right. What does the scale read as you coast over the peak of the hill?
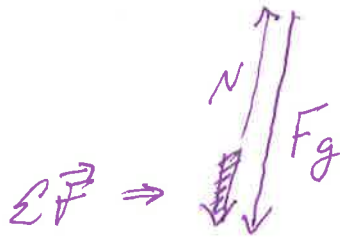
$$v = 20 \tfrac{m}{s}$$

50 m

N

$\boxed{100 \text{ kg}}$

a_c

$\vec{F_g} = mg$

Dynamics! I better follow the protocol!

It's accelerating into the center of the circle (downward)

$$\sum \vec{F} = m\vec{a} \neq 0$$

$$\sum \vec{F} \Rightarrow \quad N \uparrow \downarrow F_g$$

$$a = \frac{v^2}{r} = \frac{400 \tfrac{m^2}{s^2}}{50 \, m} = 8 \tfrac{m}{s^2}$$

say down is the + direction

$$-N + F_g = ma = 100 \text{ kg} \cdot 8 \tfrac{m}{s^2} = 800 \text{ kg} \tfrac{m}{s^2} = 800 N$$

mg

$$-N + 1000N = 800N$$

$$N = 200 N \text{ (upward)}.$$ So, the scale reads in kg, and will give a reading of 20 kg, corresponding to the 200N normal force.