In the roller coaster loop-the-loop shown, the frictionless car starts with zero velocity at a height $h$. The normal force at the top of the loop (point A) is found to be three times the weight of the cart. Take the radius of the loop as $R$.

15 pts. (a) Calculate $h$ in terms of $R$ and $g$.

15 pts. (b) Calculate the normal force on the car at point B where $\theta = 30^\circ$ from the horizontal. Express this as a number or fraction times the weight of the car.

Most common errors:

1) $N$ pointing in opposite direction of what it should be
2) Incorrect calculation of $h_B$
3) Mixing up $\sin$, $\cos$, and $\tan$
4) Putting in $KE_{rot}$ or leaving out $PE_a$ or $PE_b$