

Centripetal Force WS 3

- ① Autumn has a mass of 60 kg, she is riding a skateboard traveling a 25 m/s. She rides into a dip of radius 25 meters. What is the upward force (normal force) on Autumn from her feet at the bottom of the dip?

- ② Autumn now goes over a hill that has a radius of 50 m at a speed of 20 m/s. What is the upward normal force?

- ③ Autumn approaches a hill that has a radius of 25 m. What is the fastest that Autumn can drive over the hill and not go airborne? (hint $F_N = 0$ when air borne).

- ④ Autumn approaches a flat plain. What is the normal force acting on Autumn?

5) A block slides down a frictionless ramp as shown:



What is the minimum height ' h ' of the ramp such that the block will maintain contact with the circle at the top?

6) A ball of mass M is released from rest at a vertical height ' h ' above the ground. The ball then rolls (without friction) down the incline and through a loop-the-loop of radius ' R '. Derive an expression for each of the following: $v_i = 0\text{m/s}$



- a) The velocity of the ball at the bottom of the loop.
- b) The normal force on the ball at the bottom of the loop.
- c) The minimum velocity the ball must have at the top of the loop in order to not fall out of the circular path.
- d) The minimum vertical height (h) the ball must start with in order to barely make it through the loop and not leave the track.