On the loop-the-loop shown a block of mass $m$ slides without friction. The block starts with a speed $v_0$ a height $6R$ above the bottom of the loop. ($R$ is the radius of the loop.) $v_0$ is given by $v_0 = \sqrt{gR}$.

(a) Find the velocity of the block at point A.
(b) Find the normal force on the block at point B.

\[ \text{POINT } A \]
\[ \frac{\frac{1}{2}mv_0^2 + mg(6R)}{ \frac{1}{2}mv_a^2 + mg(2R) } \]

\[ v_a^2 = v_0^2 + 8gR \]
\[ v_0^2 = 3gR \]
\[ v_a^2 = 3gR + 8gR = 11gR \]
\[ v_a = (11gR)^{\frac{1}{2}} \]

\[ \text{POINT } B \]
\[ \frac{\frac{1}{2}mv_b^2 + mgR}{\frac{1}{2}mv_0^2 + 6mgR} \]

\[ \frac{1}{2}mv_b^2 = \frac{1}{2}mv_0^2 + 5mgR \]
\[ v_b^2 = v_0^2 + 10gR \]
\[ v_0^2 = 3gR \]
\[ v_b^2 = 3gR + 10gR = 13gR \]

\[ \text{N} = \frac{\mu F_g}{m} = \frac{N}{m} = \frac{v_b^2}{R} \]

\[ N = \frac{mv_b^2}{R} = m \left( \frac{13gR}{R} \right) \]

\[ N = 13mg \]