Skiing Example (no friction)

A skier goes down a 78 meter high hill with a variety of slopes. What is the maximum speed she can obtain if she starts from rest at the top?

Conservation of energy:

$\Sigma W_{nc} = \Delta K + \Delta U$ $\quad 0 = K_f - K_i + U_f - U_i$

$K_i + U_i = K_f + U_f$

$\frac{1}{2} m v_i^2 + m g y_i = \frac{1}{2} m v_f^2 + m g y_f$

$0 + g y_i = \frac{1}{2} v_f^2 + g y_f$

$v_f^2 = 2 g (y_i - y_f)$

$v_f = \text{sqrt}(2 g (y_i - y_f))$

$v_f = \text{sqrt}(2 \times 9.8 \times 78) = 39$ m/s