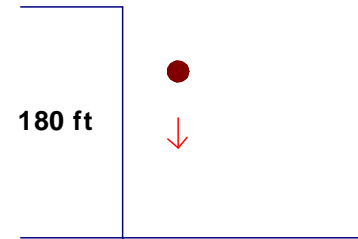A rock is dropped from the top of a cliff that is *180* feet high. How long will the stone take to hit the ground? What is its velocity when it hits the ground?

- We will use the falling body formulas:

  180 ft

  $$s(t) = -16t^2 + v_0 t + s_0$$
  $$v(t) = -32t + v_0$$

- At time $t = 0$, $s(0) = s_0 = 180$, and the initial velocity $v_0 = 0$.

  Hence, $s(t) = -16t^2 + 180$ *and* $v(t) = -32t$

- The stone hits the ground when $s(t) = -16t^2 + 180 = 0$.

- Solving this equation for t , we get $t^2 = \dfrac{180}{16}$ *or* $t = 3.35$ *seconds* .

- Finally, its velocity when it hits the ground is   .

  $$v(3.35) = -32(3.35) = -107.2 \ ft/sec$$