

Free Fall Example 1 Hot air balloon.

A hot air balloon is floating at a constant height above earth when it releases weights to gain altitude.

If the package hits the ground with a velocity of 270.0 km/h how long is it falling and how far does it fall?

$v_i = 0$
 $a = -9.81 \text{ m/s}^2$ Sp. Up down.
 $v_f = -75 \text{ m/s}$
 $d = ?$
 $t = ?$

$v_f = v_i + at$
 $d = v_i t + \frac{1}{2} at^2$
 $v_f^2 = v_i^2 + 2ad$
 $d = \left(\frac{v_i + v_f}{2}\right)t$

$t = \frac{v_f - v_i}{a}$
 $t = \frac{(-75 \text{ m/s}) - (0)}{-9.81 \text{ m/s}^2}$
 $t = 7.65 \text{ s}$

$d = \frac{v_f^2 - v_i^2}{2a}$
 $d = \frac{(-75 \text{ m/s})^2 - (0)^2}{2(-9.81 \text{ m/s}^2)}$
 $d = -286.7 \text{ m}$

checking $v_{avg} = \frac{0 + 75}{2}$
 $= 37.5 \text{ m/s}$

$\frac{d}{t} = \frac{286.7 \text{ m}}{7.65 \text{ s}}$
 $= 37.477$

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