

SOLUCIÓN EJERCICIOS DE CAÍDA LIBRE

① DATOS INCOGNITAS

$$g = 9,8 \text{ m/s}^2$$

$$v_i = 0 \text{ m/s}$$

$$t = 5 \text{ s}$$

$$y = ?$$

$$y = \frac{g \cdot t^2}{2} = \frac{(9,8 \text{ m/s}^2)(5 \text{ s})^2}{2}$$

$$y = 122,5 \text{ m}$$

② DATOS INCOGNITA

$$g = 9,8 \text{ m/s}^2$$

$$v_i = 0 \text{ m/s}$$

$$y = 78,4 \text{ m}$$

$$t = ?$$

$$y = \frac{g \cdot t^2}{2} \Rightarrow 2y = g \cdot t^2$$

$$\frac{2y}{g} = t^2 \Rightarrow \sqrt{\frac{2y}{g}} = t$$

$$t = \sqrt{\frac{2 \cdot (78,4 \text{ m})}{9,8 \text{ m/s}^2}}$$

$$t = 4 \text{ s}$$

③ DATOS INCOGNITAS

$$h = 90 \text{ m}$$

$$t = 1,5 \text{ seg}$$

$$v_i = 0 \text{ m/s}$$

$$g = 9,8 \text{ m/s}^2$$

$$v_f = ?$$

$$h_1 = ?$$

$$v_f = v_i + g \cdot t$$

$$v_f = 0 \text{ m/s} + 9,8 \text{ m/s}^2 \cdot 1,5 \text{ s}$$

$$v_f = 14,7 \text{ m/s}$$

Altura recorrida en 1,5 seg.

$$y = \frac{g t^2}{2} = \frac{9,8 \text{ m/s}^2 \cdot (1,5 \text{ s})^2}{2}$$

$$y = 11,025 \text{ m}$$

Altura total menos lo recorrido en los 1.5 seg

$$90 \text{ m} - 11,025 \text{ m} = 78,975 \text{ m}$$

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④ DATOS INCÓGNITA

$$g = 9.8 \text{ m/s}^2 \quad v_f = ?$$

$$v_i = 0 \text{ m/s}$$

$$y = 120 \text{ m}$$

$$t = 2.5$$

$$v_f = v_i + g \cdot t$$

$$v_f = 0 \text{ m/s} + 9.8 \text{ m/s}^2 \cdot 2.5$$

$$v_f = 24.5 \text{ m/s}$$

$$h = \frac{g \cdot t^2}{2} = \frac{(9.8 \text{ m/s}^2)(2.5 \text{ s})^2}{2}$$

$$h = 30.625 \text{ m lo que ha descendido}$$

$$120 \text{ m} - 30.625 \text{ m} = 89.375 \text{ m}$$

Lo que le falta por descender

⑤ DATOS INCÓGNITAS

$$g = 9.8 \text{ m/s}^2 \quad t = ?$$

$$v_i = 0 \text{ m/s} \quad y = ?$$

$$v_f = 39.2 \text{ m/s}$$

$$\rightarrow v_f = v_i + g \cdot t$$

$$t = \frac{v_f - v_i}{g}$$

$$t = \frac{39.2 \text{ m/s} - 0 \text{ m/s}}{9.8 \text{ m/s}^2}$$

$$t = 4 \text{ seg.}$$

$$\rightarrow y = \frac{g \cdot t^2}{2}$$

$$y = \frac{9.8 \text{ m/s}^2 (4 \text{ s})^2}{2}$$

$$y = 78.4 \text{ m}$$

$$\rightarrow y = \frac{(v_f + v_i) \cdot t}{2}$$

$$y = \frac{(9.8 \text{ m/s} + 0 \text{ m/s}) \cdot 4 \text{ s}}{2}$$

$$y = 19.6 \text{ m}$$

$$78.4 \text{ m} - 19.6 \text{ m} = 58.8 \text{ m}$$

⑥ DATOS INCÓGNITAS

$$v_i = 735 \text{ m/s} \quad t = ?$$

$$g = -9.8 \text{ m/s}^2 \quad y = ?$$

$$v_f = 0 \text{ m/s}$$

$$\rightarrow v_f = v_i - g \cdot t$$

$$t = \frac{v_f - v_i}{-g} = \frac{0 \text{ m/s} - 735 \text{ m/s}}{-9.8 \text{ m/s}^2}$$

$$t = 75 \text{ s de subida más } 75 \text{ s de bajada, igual a } 150 \text{ seg.}$$

$$\rightarrow y = \frac{(v_f + v_i) \cdot t}{2}$$

$$y = \frac{(735 \text{ m/s} + 0 \text{ m/s}) \cdot 150 \text{ seg}}{2}$$

$$y = 2.7.562 \text{ m}$$

$$\rightarrow v_f = v_i - g \cdot t$$

$$v_f = 735 \text{ m/s} - (9.8 \text{ m/s}^2 \cdot 150 \text{ s})$$

$$v_f = 588 \text{ m/s}$$

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$$\rightarrow y = \frac{(V_f + V_i) \cdot t}{2}$$

$$y = V_i \cdot t - \frac{g \cdot t^2}{2}$$

$$y = 735 \text{ m/s} \cdot 10 \text{ s} - \frac{(9.8 \text{ m/s}^2 \cdot 10 \text{ s}^2)}{2}$$

$$y = 6860 \text{ m}$$

⑦ DATOS INCOGNITAS

$g = -9.8 \text{ m/s}^2$ $t = ?$
 $y = 10 \text{ m}$ $v_i = ?$
 $V_f = 0 \text{ m/s}$

$\rightarrow V_f^2 = v_i^2 - 2g \cdot h$
 $v_i^2 = V_f^2 + 2g \cdot h$
 $v_i = \sqrt{V_f^2 + 2g \cdot h}$
 $v_i = \sqrt{0 \text{ m/s}^2 + 2 \cdot 9.8 \text{ m/s}^2 \cdot 10 \text{ m}}$
 $v_i = 14 \text{ m/s}$

$\rightarrow t = \frac{V_f - v_i}{g} = \frac{0 \text{ m/s} - 14 \text{ m/s}}{-9.8 \text{ m/s}^2}$

$t = 1,42 \text{ seg}$; se multiplica por dos porque el tiempo es de subida y bajada, por lo tanto $t = 2,86 \text{ seg}$

$\rightarrow v_i = 14 \text{ m/s}$ si se duplica entonces trabajamos con $v_i = 28 \text{ m/s}$

$$t = \frac{V_f - v_i}{g} = \frac{0 \text{ m/s} - 28 \text{ m/s}}{-9.8 \text{ m/s}^2}$$

$$t = 2,86 \text{ seg.}$$

$$h = \frac{(V_f + v_i) \cdot t}{2}$$

$$h = \frac{(0 \text{ m/s} + 28 \text{ m/s}) \cdot 2,86 \text{ s}}{2}$$

$$h = 40,04 \text{ m}$$

⑧ DATOS INCOGNITA

$g = -9.8 \text{ m/s}^2$ $V_f = ?$
 $V_f = 0 \text{ m/s}$ $y = ?$
 $v_i = 196 \text{ m/s}$ $t = ?$
 $t = 10 \text{ s}$
 $t = 30 \text{ s}$
 $t = 15 \text{ s}$

• $V_f = v_i - g \cdot t$

$V_{f1} = 196 \text{ m/s} - 9.8 \text{ m/s}^2 \cdot 10 \text{ s}$

$V_{f1} = 98 \text{ m/s}$

$V_{f2} = 196 \text{ m/s} - 9.8 \text{ m/s}^2 \cdot 30 \text{ s}$

$V_{f2} = -98 \text{ m/s}$

• $y = v_i \cdot t - \frac{g \cdot t^2}{2}$

$y = 196 \text{ m/s} \cdot 15 \text{ s} - \frac{9.8 \text{ m/s}^2 \cdot 15^2}{2}$

$y = 1837,5 \text{ m}$

• $V_f^2 = v_i^2 - 2g \cdot y$

$y = \frac{V_f^2 - v_i^2}{-2g}$

$y = \frac{(0 \text{ m/s})^2 - (196 \text{ m/s})^2}{-2(9.8 \text{ m/s}^2)}$

$y = 1960 \text{ m}$

• $t = \frac{V_f - v_i}{-g}$

$T = \frac{0 \text{ m/s} - 196 \text{ m/s}}{-9.8 \text{ m/s}^2} = 20 \text{ seg}$

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9) DATOS INCOGNITA

$$g = -9.8 \text{ m/s}^2 \quad t = ?$$

$$v_f = 0 \text{ m/s} \quad v_i = ?$$

$$y = 490 \text{ m}$$

$$v_f^2 = v_i^2 - 2 \cdot g \cdot h$$

$$v_i = \sqrt{v_f^2 + 2gh}$$

$$v_i = \sqrt{(0 \text{ m/s})^2 + 2(9.8 \text{ m/s}^2)(490 \text{ m})}$$

$$v_i = 98 \text{ m/s}$$

10) DATOS INCOGNITA

$$v_f = 0 \text{ m/s} \quad v_i = ?$$

$$g = -9.8 \text{ m/s}^2 \quad y = ?$$

$$t = 10 \text{ s}$$

$$\bullet v_f = v_i - g \cdot t$$

$$v_i = v_f + g \cdot t$$

$$v_i = 0 \text{ m/s} + 9.8 \text{ m/s}^2 \cdot 10 \text{ s}$$

$$v_i = 98 \text{ m/s}$$

$$\bullet t = \frac{v_f - v_i}{g}$$

$$t = \frac{0 \text{ m/s} - 98 \text{ m/s}}{9.8 \text{ m/s}^2}$$

$$t = 10 \text{ seg.}$$

$$\bullet h = \frac{(v_f + v_i) \cdot t}{2}$$

$$h = \frac{(0 \text{ m/s} + 98 \text{ m/s}) \cdot 10}{2}$$

$$h = 490 \text{ m}$$