Solución.

1. $V_i = 0$

$V_f = g \cdot t$

$h = 1/2 \, V_f \cdot t$

Ambos llegan al mismo tiempo porque no hay rozamiento.

2. $V^2 = V_0^2 - 2g(y - h)$

$V_0 = 30 \, m/s$

$V^2 = (-30 \, m/s)^2 + 2gh = (30 \, m/s)^2 + 2gh$

$V_0 = 30 \, m/s$

$V_2 = (30 \, m/s)^2 + 2gh$

$y = h - V_0 t - 1/2 \, g t^2$

$y = h \; 30t - 4{,}9 t^2$

$y = 0 \; 4{,}9t^2 + 30t - h = 0$

$t = 1{,}2 [-30 + \sqrt{(30^2 + 4 \cdot 4{,}9 \cdot h)}$

$y = h + V_0 t - 1/2 \, g t^2 = 0 : 4{,}9 t^2 - 30t - h = 0$

$t = 1/2 [30 + \sqrt{(30^2 + 4 \cdot 4{,}9 \cdot h)}]$

3. $V_1 = 20\ km/h$

$t = 1h$

$V_2 = 10\ km/h$

$t = 2h$

$V = d \cdot t$

$X1 = V1 \cdot t \rightarrow X1 = 20\ km/h \cdot 1h \rightarrow X1 = 20\ km$

$X2 = V2 \cdot t \rightarrow X2 = 10\ km/h \cdot 2h \rightarrow X2 = 20\ km$

4. $T_1 = V_1/g \qquad T_2 = 4V_1/g$

$h = (g \cdot t^2) \cdot 2 \qquad H = (g \cdot T2^2)/2$

$h = (g \cdot (V1/g)^2) \cdot 2 \qquad H = (g \cdot (4V1 \cdot g)^2) \cdot 2$

$h = (V1^2) \cdot 2 \qquad H = 8V1^2$

$(V1^2 \cdot 2) \cdot (8V1^2) = 16$

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$$\frac{F}{M} = a = \frac{90N}{10kg} = \frac{90kg \cdot \frac{m}{s^2}}{10kg} = 90\ m/s^2$$