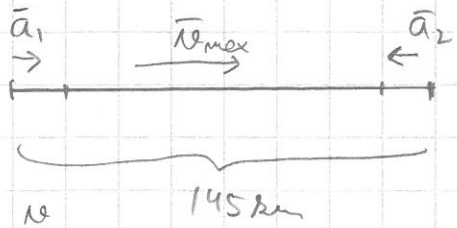
$$\boxed{\begin{aligned} v &= v_0 + at \\ s &= v_0 t + \tfrac{1}{2} a t^2 \\ v_k &= \frac{v_0 + v}{2} \\ s &= v_k t \end{aligned}}$$

a vakio

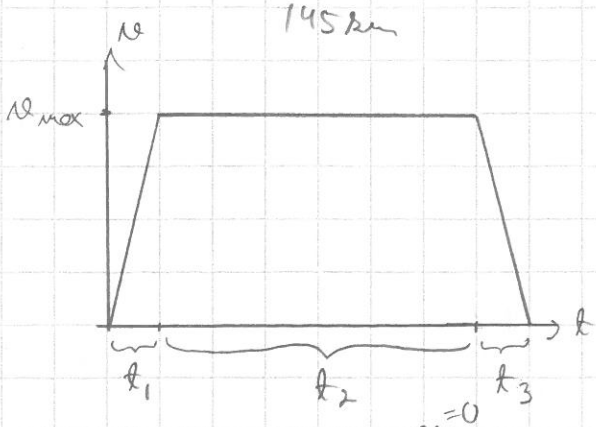
pätee aina

4.12



$a_1 = 1{,}1 \frac{m}{s^2}$, $v_{max} = 155 \frac{km}{h}$

$a_2 = -1{,}1 \frac{m}{s^2}$



$v = v_0 + at$

$\Leftrightarrow v_{max} = 0 + a_1 t_1$

$\Leftrightarrow t_1 = \frac{v_{max}}{a_1} = \frac{\frac{155}{3{,}6} \frac{m}{s}}{1{,}1 \frac{m}{s^2}}$

$\approx 39{,}1414\, s$

$t_3 = t_1$ (symmetria)

$s_1 = v_k \cdot t_1 \underset{a_1 \text{ vakio}}{=} \frac{\overset{=0}{v_0} + v_{max}}{2} \cdot t_1 = \frac{v_{max}}{2} \cdot t_1 = \frac{\frac{155}{3{,}6} \frac{m}{s}}{2} \cdot 39{,}1414\, s$

$\approx 842{,}627\, m$

$s_3 = s_1$ (symmetria)

$s_2 = s - s_1 - s_3 = 145\, km - 2 \cdot 0{,}842627\, km \approx 143{,}315\, km$

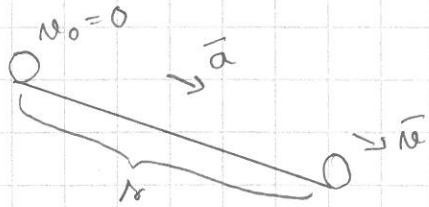
$v_{max} = \frac{s_2}{t_2} \quad \Big| \cdot \frac{t_2}{v_{max}}$

$\Leftrightarrow t_2 = \frac{s_2}{v_{max}} = \frac{143{,}315\, km}{155 \frac{km}{h}} \approx 0{,}924613\, h$

$\Rightarrow t = t_1 + t_2 + t_3 = 2 \cdot \frac{39{,}1414}{60}\, min + 0{,}924613 \cdot 60\, min$

$\approx 56{,}7815\, min \approx \underline{57\, min}$

4.13



$s = 1{,}70\, m$

$v_k = 1{,}9 \frac{m}{s}$

a) $v_k \underset{a \text{ vakio (kaltevuus vakio)}}{=} \frac{v_0 + v}{2} = \frac{v}{2} \quad | \cdot 2 \Leftrightarrow v = 2 v_k = 2 \cdot 1{,}9 \frac{m}{s}$

$= \underline{3{,}8 \frac{m}{s}}$

b) $v_k = \frac{s}{t} \quad \Big| \cdot \frac{t}{v_k} \Leftrightarrow t = \frac{s}{v_k} = \frac{1{,}70\, m}{1{,}9 \frac{m}{s}} \approx 0{,}894737\, s$

$a = \frac{\Delta v}{\Delta t} = \frac{v - v_0}{t} = \frac{3{,}8 \frac{m}{s} - 0 \frac{m}{s}}{0{,}894737\, s} \approx 4{,}24706 \frac{m}{s^2} \approx \underline{4{,}2 \frac{m}{s^2}}$