Answer on Question #51379, Physics, Mechanics | Kinematics | Dynamics

The law of motion of the car is $x(t)=v_0 t+\frac{a t^2}{2}$, $v=v_0+a t$, where v_0 is velocity at first point. Let $T=5.32\,s$, $s=56.2\,m$, $v_2=14.8\frac{m}{s}$. Hence, $s=v_0 T+\frac{a T^2}{2}$ and $v_2=v_0+a T$.

a) One has a linear system of equations for v_0, a . Substituting $a=\frac{v_2-v_0}{T}$ from the second equation into the first equation, obtain $s=v_0 T+\frac{v_2-v_0}{2T}\cdot T^2=v_0 T+\frac{v_2-v_0}{2}T=\frac{1}{2}(v_2+v_0)T$, from where $\frac{2s}{T}=v_2+v_0$, thus $v_0=\frac{2s}{T}-v_2=6.38\frac{m}{s}$ - that is the speed of the car at first point.

b) Using $a=\frac{v_2-v_0}{T}$, obtain $a=\frac{14.8\frac{m}{s}-6.38\frac{m}{s}}{5.32\,s}\approx 1.58\frac{m}{s^2}$.

c) $v(t')=v_0+a t'$, hence if $v(t')=0=v_0+a t'$, from where $t'=\frac{-v_0}{a}$ (the time seems to be negative because we chose $t=0$ at first point). Hence, the car had zero speed when it had coordinate $x(t')=\frac{-v_0^2}{a}+\frac{v_0^2}{2a}=\frac{-v_0^2}{2a}=-12.88\,m$. The distance from the first point is thus $12.88\,m$.