Question #14028

Let $v_0 = 32\,m/s$ be the initial velocity of Speedy Sue, and $v_1 = 5.4\,m/s$ be the velocity of the van. After applying the brakes, the velocity of Speedy Sue as a function of time will be $v = v_0 - a\,t = 32 - 2\,t$, so the time, needed to stop will be $t_1 = \frac{v_0}{a} = 16\,s$. For that time, the van will pass $\delta l = 16\,s \cdot 5.4\,m/s = 86.4\,m$ from its initial position (so the distance from the initial position of the Speedy Sue will be $L = 160 + \delta l = 246.4\,m$). Speedy Sue will pass $S = v_0 t_1 - a\frac{t_1^2}{2} = 256\,m$ until full stop. So, obviously, there will be a collision.

Lets find a moment of time, when the collision is going to happen. At that time the positions of the Speedy Sue and van will be the same. Taking the initial position of Speedy Sue as zero, we equal two positions in order to find the time: $x = v_0 t - \frac{a\,t^2}{2} = 160 + 5.4 \cdot t \Rightarrow t \approx 9.19\,s$