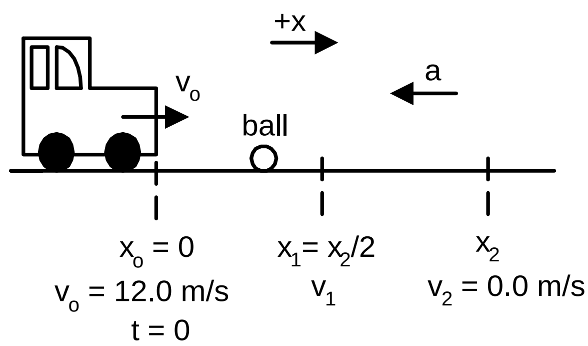
<u>Problem 2-52</u>. Begin by reading the problem statement in the textbook.

The two parts will be solved together, since results of the first part can be used in the second part.

Don't write in this column.	Do your work in this column.
Step 1. After reading the problem, draw a diagram in the cell to the right. On the diagram, indicate the origin and the direction you select for +x. Show with arrows the directions of the initial velocity and the acceleration. Label any other relevant quantities. Note that three positions and velocities are indicated as well as the directions of initial velocity and acceleration.	
Step 2. List all the given information. Identify the givens with the same symbols that are used in the dvat equations, namely, x, x_o, v, v_o, a, and t. If values are known or defined to be 0, say so. Given the direction you selected for +x, make sure all the given information has the correct signs.	$x_o = 0$ $v_o = +12.0$ m/s $v_2 = 0.0$ m/s $a = -3.5$ m/s² $x_1 = x_2/2$
Step 3. State the unknown that you're to find. Identify it with the proper symbol. (See the strategy above.)	a) x_2 = position at which $v_2 = 0$ b) v_1 = velocity at $x_2/2$
Step 4. Look at the list of dvat equations in Table 2-4 and select one for which all quantities are known except for the unknown that you're solving for. Write the equation to the right.	$v^2 = v_o^2 + 2a(x - x_o)$
Step 5. Algebraically solve the dvat equation you selected for the unknown. That means to solve in symbolic form without numbers. However, you may substitute in zeros. (continued below)	**a)** $v_2^2 = v_o^2 + 2a(x_2 - x_o)$ $x_2 = -v_o^2/2a$ (with $x_o, v_2 = 0$) **b)** $v_1^2 = v_o^2 + 2a(x_1 - x_o)$

For the *b* part, we use the same equation as for the *a* part. Note that for x_2 we substitute the *symbolic* result from part *a*. By doing so, we see how v_1 relates to v_o.	$v_1^2 = v_o^2 + 2a(x_2/2 – 0)$ $= v_o^2 + 2a(-v_o^2/4a)$ $= v_o^2/2$ $v_1 = \pm v_o/(2)^{1/2}$ (select positive root since velocity is in the +x direction)
Step 6. Substitute the given values with units. Do the arithmetic to arrive at the final answer.	$x_1 = -(12.0\ m/s)^2/(2\cdot -3.5\ m/s^2) = 21\ m$ $v_1 = (12.0\ m/s)/\ (2)^{1/2} = 8.49\ m/s$
Step 7. Apply sign, units, and sensibility checks.	a) $(m/s)^2/(m/s^2) = m$ sign is positive as final position is on the +x axis 21 m is about three car lengths, which makes sense b) units are m/s, as expected for velocity sign is positive as final velocity is in the +x direction The final velocity is more than half of the initial velocity in half the distance. This makes sense, because the velocity depends on the square root of position. So the velocity decreases slower than the position does.