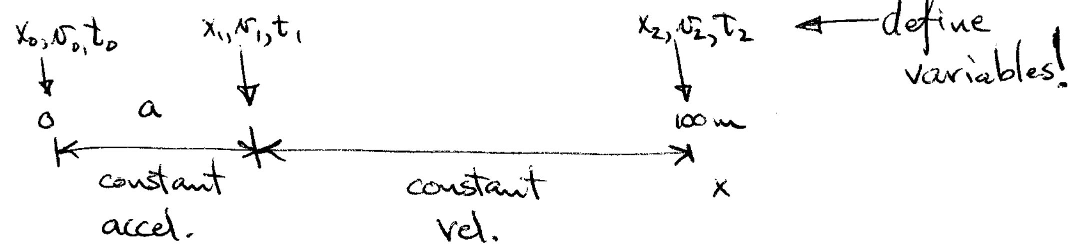
Since we didn't get to do any examples in lecture, let me answer this in more detail.

First, let's try to sketch the situation:



Next, what do we know?

> Total time, t_2
> Total distance, x_2
> $v_2 = v_1$
> Time for acceleration, t_1
> Initial conditions, $x_0 = 0, v_0 = 0, t_0 = 0$.

What ~~don't~~ we know?

> x_1 or v_1
> a, of course!

Since there were two parts to the race, part with acceleration and part without, ~~it makes sense~~ we should break our analysis into two pieces:

$\underline{0 \le t \le t_1}$ $\quad x_1 = \cancelto{0}{x_0} + \cancelto{0}{v_0} t_1 + \frac{1}{2} a t_1^2$

$\quad v_1 = \cancelto{0}{v_0} + a t_1$

$\underline{t_1 \le t \le t_2}$ $\quad x_2 = x_1 + v_1 (t_2 - t_1)$

Now we have

$$x_1 = \frac{1}{2} a t_1^2$$

$$v_1 = a t_1$$

$$x_2 = x_1 + v_1 (t_2 - t_1)$$

$\Longrightarrow$ 3 equations with 3 unknowns!

So, we can solve for the unknown we're interested in, a, in terms of known quantities.

Explicitly, eliminating x_1 & v_1:

$$x_2 = \frac{1}{2} a t_1^2 + a t_1 (t_2 - t_1)$$

$$x_2 = a t_1 \left(t_2 - \frac{1}{2} t_1\right)$$

or

$$a = \frac{x_2}{t_1 \left(t_2 - \frac{1}{2} t_1\right)}.$$

$\leftarrow$ at this point only do we substitute numerical values!

Note that I've deliberately been very wordy here so that the logic is (hopefully!) transparent. The strategy I have employed is pretty general — and it follows the strategy outlined in the syllabus and text (Picture, Solve, Check).

To complete this as an example, I show below the x vs t and v vs t plots for this problem!