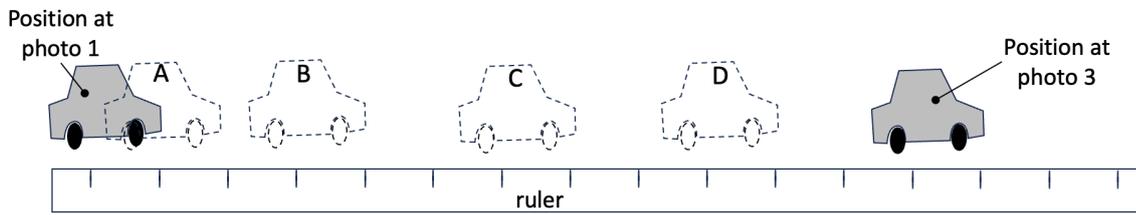


12. A fixed camera was set up to take a photo at regular time intervals as a car accelerated to the right at a constant rate. The camera should have taken 3 photos of the car, but the middle photo is missing.

Q4116

Which options shows where the car could have been in the missing photograph, photo 2?





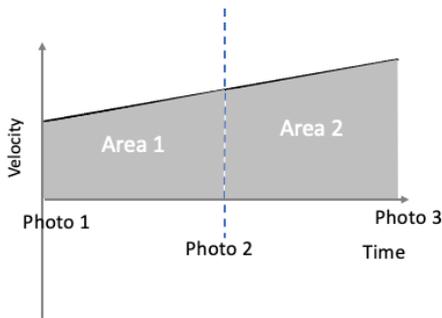
This is a tough question. Since it is accelerating to the right at a constant rate, it must travel faster in the second half of the time between photo 1 and 2. Therefore it must cover more distance in the second half of the journey.

That logic rules out D. It also rules out C, which is equal distance in each half of the time.

This is a good strategy to use in multiple choice question - eliminating the wrong ones first. Now, you have a choice between 2 and 50% chance of being right is better than 25%, 😊

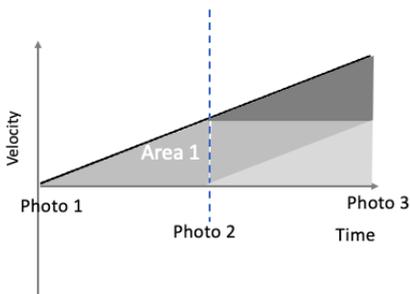
It is very useful to consider extremes (physicists do this a lot - imagine the extreme example and that gives us a clue as to the pattern).

Taking the extreme that fits the question, the car could be already travelling fast and only have a tiny amount of acceleration. That velocity-time graph would look like this:



The area under a velocity-time graph is the change in displacement. You can see that the change in displacement in the second half would only be a little more than the first half. That would put the car nearly a C, but just a bit less than C.

So, consider the other most extreme case, where the care was initially at rest and large a. This looks like



You can see that the area after photo 2 (the change is displacement) is 3 times that of the first half of the time up to photo 2.

So, the furthest it could have travelled after photo 2 is 3 times the distance it travelled before photo 2.

That rules out A. It is impossible that it could have travelled more than 3 times the distance in the second half.

Using the ruler for option B, it travels 3 diamonds in between photo 1 and 2 and 9 diamonds between 9 between photo 2 and 3.