

Explanation for 9.1 Notes

Combinatorics is a fancy way to call counting the number of ways something can happen. In example 1, it is the number of ways we can arrange the letters A, B, and C. It is easy to see what can happen with the tree diagram, but it isn't always easy or realistic to create a tree diagram as you'll see in examples 2 and 3.

In examples 2 and 3 we are asked to determine the number of license plates that are available under certain restrictions. For example 2, it is simply that there are 4 digits (numbers from 0-9) and 3 letters. For example 3, we cannot repeat any of those digits or letters. On CA license plates, there is generally a digit, followed by three letters, followed by 3 digits. So, we're going to format our work keeping that in mind.

On both examples, there are 7 numbers (that I'll call placeholders) that are being multiplied since there are 7 total digits and letters on CA license plates. Each placeholder represents how many digits or letters are available to be placed on that particular position on the license plate. So since the first placeholder is a digit, given what I said above, and there are 10 digits to pick from, that is why we put a 10 in the first placeholder for both examples. Then, there are 26 letters for us to put in the second placeholder, so that is why there is a 26 second placeholder for both examples. It changes from there on and here is why:

In example 2, we use the fact that there are still 26 letters to choose from for the third and fourth placeholder. Then, we go back to 10 for the fifth, sixth, and seventh placeholder since we're going back to digits.

In example 3, we use the fact that there is one less letter to choose from for the third placeholder, so 25, and two less letters to choose from for the fourth placeholder, so 24. With a similar argument, there are one, two, and three less digits to choose from for the last three placeholders, so that is why we put in a 9, 8, and 7.