

Using Probability to Check for Coincidences

A few years ago my wife and I pulled up to a line up at a red light. My wife likes to look at license plates and she said, "Hey look, each license plate on those three cars has a '6' in it." There were 3 license plates that we could see, each with 3 numbers and 3 letters. Was this a fluke? Or should we expect to see this fairly often?

We will approach this by trying to find the probability that it WON'T happen. Then subtracting that probability from 1, we get the probability that it WILL happen.

Once we have seen one license plate, let's say for sake of argument that we have 3 different numbers on the first license plate and that we see "8 4 7", then the probability that these numbers are not repeated are

$\frac{7 \times 7 \times 7}{10 \times 10 \times 10} = 0.343$ on the second license plate since the first digit can choose any 7 out of 10 digits, while the second digit can choose any 7 out of 10 digits and the last digit can choose any 7 out of 10 digits.

Since the second license plate does not have a number from the first license plate, then obviously all three license plates do not share a single digit. Thus the probability that it WILL happen is $1 - 0.343 = 0.657$.

So there is a 65.7% chance that it should occur. Now, start observing and see how accurate this is.