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Assignments, Part 2.

Ex 2.1   Imagine a rotating wheel (like roulette) with 10 cells, numbered 0 to 9, each of equal size. The probability of each cell is $1/10$. Let $W = \{0, 1, \ldots, 9\}$. What is the probability space? (Give a description only.) Now let us group the first seven cells into group A and the other three into group B. You can now only bet on either A or B. What are the odds? What is the probability space?

Ex 2.2   Suppose you bet five times in a row on the wheel, where you can bet only A or B. Outcomes are: 0 times A, 1 time A, 2 times A, 3 times A, 4 times A and 5 times A. In general, when you are betting n times, we look at the outcome e_k^n: "the wheel turned A exactly k out of n times". This number is

$$(1) \quad p(e_k^n) := \binom{n}{k} 0.7^k 0.3^{n-k}$$

Compute the distribution of e^5. Plot the distribution of e^{10}, e^{20} and e^{50}. What do you see?

Ex 2.3   Suppose you know that the wheel showed an even number. What is the probability that the outcome was A? What is the probability that it was B? What is probability that the number is even when you know that it is in A?

Ex 2.4   Now we change the setup somewhat. Suppose that all you know is that the cells have been divided into two groups, one called A and the other called B. You also know that the results have recently been

$$(2) \quad \text{A B B A B A B A B B}$$

Of course it is impossible to know exactly which cells are called A and B; the only thing we can reliably find out is how many of them are called A.

For the numbers i between 0 and 10 compute the probability (a) that the outcome is as given when there are exactly i A cells, (b) the probability that there are exacty i A cells given that the outcome is as given above. For (b) assume additionally that the a priori probabilities are evenly distributed.