

LEARNING PROBABILITIES BY PROBLEMS AND PARADOXES: THE ORGANIZATION OF JOSEPH BERTRAND'S TEXTBOOK (1889)

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Joseph Bertrand's textbook *Calcul des probabilités* had been published in 1889. This textbook is the result of Bertrand's teaching at the École polytechnique and the Collège de France, and it strongly influenced French mathematicians such as Gaston Darboux, Henri Poincaré and Émile Borel. Thereafter, until the 1940s, it was often referred to.

This textbook is actually a kind of textbook for learning how to learn probability, and today teachers can find in it a rich material to build their approach, and in particular to get rid of possible errors. Moreover, it proposes to learn probabilities by problem solving. Indeed, the author proceeded from numerous "concrete" problems, old and new, in which he illustrated the basic notions of probability calculation, and especially the difficulties and paradoxes to which their misuse can lead.

After a slightly historical reflection on the "laws of chance", in a well-chosen order he addressed the question of equipartition of chances and the composition of probabilities, then the calculation of expectations, the law of large numbers and the ruin of gamblers, the question of the probability of causes, and the law of errors of observation and statistics.

We only illustrate our point with some problems concerning the two most basic questions of equipartition of chances and the ways of combining probabilities between them. In particular, we will examine the famous "Bertrand's paradox".

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