

Document : De Méré's problem

Gamblers in the XVIIth century France were used to bet on the event of getting at least one Ace in four rolls of a die. As a variation, two dice were rolled 24 times with a bet on having at least one Double Ace.

According to the reasoning of Chevalier de Méré, a rich Frenchman who liked gambling, two Aces in two rolls are $\frac{1}{6}$ as likely as one Ace in one roll. To compensate, de Méré thought, the two dice should be rolled 6 times. And to achieve the probability of 1 Ace in four rolls, the number of the rolls should be increased four fold - to 24. Thus reasoned Chevalier de Méré who expected a couple of Aces to turn up in 24 double rolls with the frequency of an Ace in 4 single rolls. However, he lost consistently. Chevalier de Mere, desperately seeking to reveal the reason of his failure, turned sight to his friend Blaise Pascal (1623–1662). Pascal combined his efforts with his friend Pierre de Fermat. After a careful analysis he truly spotted the right solution of the problem, which needed to be seen on from another angle.

This problem and others posed by de Méré are thought to have been the original inspiration for a fruitful exchange of letters on probability between Pascal and Pierre de Fermat and the two of them laid out mathematical foundations for the Theory of Probability.

From Various sources

Questions :

- I. Where, when and why did the Theory of Probability appear?
- II. Who are the fathers of this field of Mathematics?
- III. Explain shortly the problem posed by De Méré.
- IV. Solution of the problem :



A. 1st die game : one die is rolled four times

- 1) Find the number of outcomes if the die is rolled once.
- 2) Let A be the event: « getting any number but the Ace ». Evaluate the number of outcomes of A if the die is rolled once. Deduce the probability of A.
- 3) Explain why the probability of the event B: « getting any number but the Ace » if the die is rolled four times is $p(B) = \left(\frac{5}{6}\right)^4$.
- 4) What is the probability of the event C : “getting at least one ace” in four rolls ?

B. 2nd die game : two dice are rolled 24 times

The two dice are rolled once.

- 1) Draw a double -entry table to determine the number of outcomes.
- 2) Let D be the event: « getting any couple of numbers but the double ace ». Evaluate the number of outcomes of the event D. Deduce p(D).

The two dice are rolled 24 times.

- 1) How many outcomes are there?
- 2) Let E be the event : « getting any couple of numbers but the double Ace ».
- 3) Evaluate the number of outcomes of E.
- 4) Deduce the probability of the event F: “getting at least a double Ace rolling the dice 24 times”.
- 5) Compare the two games.