

**BACCALAURÉAT GÉNÉRAL
ÉPREUVE SPÉCIFIQUE DES SECTIONS EUROPÉENNES
MATHÉMATIQUES – ANGLAIS**

SUJET 19

**Chevalier de Méré's problem
Probabilities**

Ce sujet comporte 2 pages. L'usage de tout modèle de calculatrice, avec ou sans mode examen, est autorisé.

A 17th century gambler, the Chevalier de Méré, made it to history by turning to Blaise Pascal for an explanation of his unexpected losses. Pascal combined his efforts with his friend Pierre de Fermat and the two of them laid out mathematical foundations for the theory of probability.

Gamblers in the 17th century in France were used to bet on the event of getting at least one 1 (ace) in four rolls of a dice. As a more trying 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, two aces in two rolls are $\frac{1}{6}$ as likely as 1 ace in one roll (Which is correct.) 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.

From the website Cut the knot by Alexander Bogolmny

I. Explain what the text deals with and comment on it.

II. Exercises:

1. First situation: we roll a dice once.

What is the probability to obtain any number but an ace.

2. Second situation: we roll a dice four times

a) What is the probability to obtain any number but an ace?

b) Deduce the probability to obtain at least one ace.

c) Is it interesting to bet that we can get at least one ace by rolling a die four times?

3. Third situation: we roll two dice once.

What is the probability to obtain any couple of numbers but the double ace?

4. Fourth situation: we roll two dice twenty four times

Assuming that the probability to obtain at least one double ace is $1 - \left(\frac{35}{36}\right)^{24}$,

is it interesting to bet that we can get at least one double ace?

5. Conclude by explaining why Chevalier de Méré lost consistently.