

Sujet n°10

Please do not write on the subject paper and don't forget to give back the examination paper at the end of the test

PROBABILITIES

Introduction :

In the 1650's in France, gambling was popular and fashionable and was not restricted by law. As the games became more complicated and the stakes became larger there was a need for mathematical methods for computing chances.

A well-known gambler, the chevalier De Mere consulted Blaise Pascal in Paris about some games of chance.

Pascal began to correspond with his friend Pierre de Fermat about these problems.

The correspondence between Pascal and Fermat is the origin of the mathematical study of probability.

The method they developed is now called the classical approach to computing probabilities.

The classical method requires a game to be broken down into equally likely outcomes.

Questions :

The likelihood of a fatal vehicular crash is affected by numerous factors. In the table below, the number of fatal crashes during 2004 by speed limit and land use are given.

Speed Limit	Land Use	
	Rural	Urban
30 mph or less	944	2,929
35 or 40 mph	1,951	4,463
45 or 50 mph	3,496	3,559
55 mph	9,646	2,121
60 mph or higher	5,484	2,347

Source: U.S. Department of Transportation (2005)

Let the events be :

- R : « The fatal crash occurred in a rural area. »
- S : « The fatal crash occurred in an area where the speed limit is less than or equal to 50 mph. »

We assume that we pick out one car crash by random. Round all results to three decimal places, when needed.

1. Compute the probability of event R.
2. Compute the probability of event \bar{S} .
3. Compute the probability of event $R \cap \bar{S}$. What event does it correspond to ?
4. Compute the probability of the event « Knowing that the car crash occurred in an rural area, it occurred at more than 50 mph. »

NB : the stakes : les mises

mph = miles per hour