

Povzetek

V nalogi bomo predstavili igro množenj med dvema igralcema. Igralca izbirata poljubni števili, kateri med seboj zmnožimo. V primeru, da je prva številka zmnožka ena, dva ali tri, zmagata prvi igralec. V nasprotnem primeru igro dobi drugi igralec. Opirali se bomo na Benfordov zakon, pri katerem so prve številke porazdeljene po logaritemskem zakonu. Predstavili bomo, kako naj bi igra potekala v praksi. Igro množenj bomo analizirali za končne in neskončne izbire, ter pri tem poiskali optimalno strategijo izbire števil za oba igralca. Izbirali bomo različne vrste števil, naravna, racionalna in realna, na različnih intervalih. Določili bomo mejo verjetnosti za zmago prvega igralca ob optimalni strategiji, za veliko število ponovitev igre. Le ta je $L = \log_{10} 4 \approx 0,6020599913$. To pomeni, da bo igralec v najboljšem primeru izgubil z verjetnostjo L oz. kazino zmagal z verjetnostjo L in več.

Ključne besede: verjetnostna porazdelitev, funkcija gostote, Benfordov zakon, Benfordova mera, slučajna spremenljivka,

Math. Subj. Class. (2010): 91A05, 91A20

Abstract

In this work, we will present the multiplication game between two players. Both players choose a number, we multiply them together and examine the result. In case the first digit is one, two or three, the first player wins. In all other cases, the winner is the second player. We will rely on the Benford law, which states that the first digits are distributed by a logarithmic law. We will show how the game looks in reality. We will analyze the multiplication

game for finite and infinite choices and find the optimal strategy for both players for these choices. We will choose different sort of numbers, natural, rational and real numbers within different intervals. We will define the bound of probability for the win if a player uses the optimal strategy. The bound is equal to $L = \log_{10} 4 \approx 0,6020599913$. This means that in the optimal case the player will lose with the probability L , or equivalently, the casino will win with the probability at least L .

Keywords: probability distribution, density function, Benford's law, Benford's measure, random variable.

Math. Subj. Class. (2010): 91A05, 91A20

6 Literatura

- [1] Kent E. Morrison, *The multiplication game*, Mathematics Magazine, Vol. 83, No. 2, pp. 100-110, 2010.
- [2] Milan Hladnik, *Benfordov zakon ali problem prve številke*, Obzornik za matematiko in fiziko, Letnik 49, Številka 5, Stran(140-147), 2002.
- [3] B. Ravikumar, *A simple multiplication game and its analysis*, International journal of combinatorial number theory, 2009.