Finding Normality in Irrational Numbers

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Abstract

Normal numbers were introduced in the early twentieth century, and mathematicians have since found irrational numbers with properties of normality. This study focuses on the normality of pi, Euler's number (e), and Champernowne's number. Sets of digits up to the first 5000 decimal places were used to make a histogram of digits from one to nine. This study uses normal distribution to compare the occurrence of each digit to a normal distribution curve. The results show that the distribution of the digits in pi and e are closely related to a normal distribution, but the correlation is not exact. Champernowne's number appears to have a normal distribution, but the raw data suggests some digits do not appear to have an equal representation when compared to other ones. Since Champernowne's number is viewed by most mathematicians as being normal, the inconsistency from this study's data is most likely due to the number of digits represented in the data sets. There is reason to believe that as more digits of pi and e are being represented, the irrational numbers seem to be approaching normality.