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**1 Give a brief description, not exceeding one page, of your number, including the charac- teristics that make it unique.**

# Function : Natural logarithm of 2 i.e. *lne*2

Definitions :

Irrational Numbers - are the numbers that cannot be represented as ratio or a fraction.

Natural Logarithm - The natural logarithm of a number x is nothing but log to the base e of x. Here e has a approximate value of 2.718.

Natural logarithm is computing the time taken to reach the desired growth.

*logex* can be written as ln x ln is called the natural log.

Natural Logarithm of 2 - The project is based on the natural logrithm of 2 ie. *lne*2 .

The value of *lne*2 0*.*69314718056 and it is an irrational number i.e cannot be expressed in fractional form.

*≈*

The proof of *lne*2 being irrational goes something like :

Let suppose, *lne*2 is rational i.e. there exist a x,y integers *>* 0 and they can represent the natural log of 2.

Therefore it can be said :

*lne*2 = *x/y*

Applying exponential to both LHS and RHS , we get:

*elne* 2 = *ex/y*

2 = *ex/y*

2*y* = *ex*

Since we know e is a transcendental number and from the theorm mentioned the famous book - ”Proofs from the book” [1],Page 45, *er* , where r is rational number not equal 0 , is irrational we can say that *lne*2 is also an irrational number i.e. cannot be denoted as ratio of two integers with value *>* 0. The understanding of the proof was gathered from the website [2] - concept explained by Richard Morris, Maths tutor, doctorate in mathematics/computer science.

# Application of natural logarithm of 2

The uniqueness of this number has been noticed in below concepts:

1. Half-life : Natural Logarithm of 2 plays a significant role in computing half life of a substance i.e computing the time taken by a substance to reduce to half of it initial value.This is concept is used in nuclear physics and biology.
2. Finance - The Rule 72 : Natural Logarithm of 2 is used in finance sec- tor as a way to quickly compute annually computed interest and continously compounded interest. i.e. when we have to find the time taken (in years) to double the principle at a given interest rate, we have to divide 72 by interest rate(given). And this number 72 is calculated using natural logarithm of 2.

# Reference

1. Aigner, Martin, and Gu¨nter M. Ziegler. Proofs from THE BOOK. Fourth ed.
2. “How Do I Prove ln2 Is Irrational?” Quora, [www.quora.com/How-do-I-prove-](http://www.quora.com/How-do-I-prove-) ln2-is-irrational.