The $1 Investment Puzzle

Imagine you have **$1** to invest in a very generous (but theoretical) bank account offering **100% interest per year**.

The rules are simple: You can choose *how often* the interest is calculated and added back to your account.

Does calculating it more often make you infinitely rich?

Most people think:

- ”If I compound it every month, I earn more.”
- ”If I compound it every second, surely it explodes!”

Let’s crunch the numbers to see if you can break the bank.

The Race to Infinity?

Let's see what happens to your $1 based on the frequency (n) of compounding:

Frequency	Calculation	Total ($)
Yearly ($n = 1$)	$(1 + 1/1)^1$	**2.00000**
Semi-Yearly ($n = 2$)	$(1 + 1/2)^2$	**2.25000**
Quarterly ($n = 4$)	$(1 + 1/4)^4$	**2.44140**
Monthly ($n = 12$)	$(1 + 1/12)^{12}$	**2.61303**
Daily ($n = 365$)	$(1 + 1/365)^{365}$	**2.71456**
By Second ($n = 31m$)	...	**2.71828**

Wait a minute... Even if we calculate interest every single second, the money stops growing past a certain point. It hits an invisible ceiling.

The Universal Constant

Mathematicians discovered that this ”ceiling” isn’t random. It represents the natural limit of continuous growth.

The general formula for compound interest is:

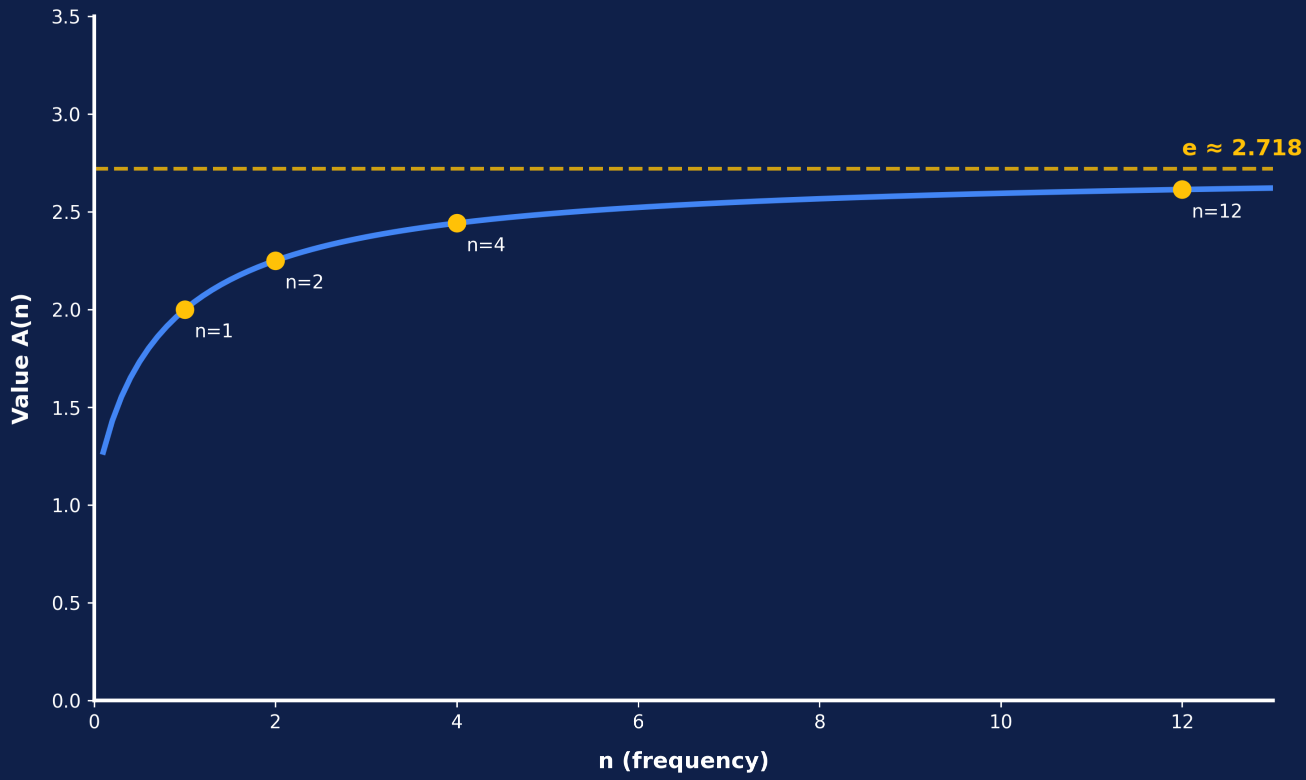
$$\text{Growth} = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$$

This limit converges to a specific irrational number, as fundamental to the universe as π. We call it **Euler’s Number**:

e

$$\approx 2.7182818\ldots$$

Visualizing the Limit



"e" is the speed limit of the universe's growth.

From finance to biology, nothing grows faster than e^x.

About MathSpark today’s contributor

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”As a Mathematical Modeling and Numerical Simulation Engineer, I passionately apply Deep Learning to solve complex challenges. I specialize in bridging theory and practice, developing rigorous models for critical real-world applications in epidemiology and the detailed study of fluid dynamics.”

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