# $m_n/m_p = 1 + 1/720$
# A Simple Approximation to the Neutron-Proton Mass Ratio

**Relative difference:** 0.00105%

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May 12, 2026

**Abstract**

The neutron-proton mass ratio is approximated by the simple expression

$$\frac{m_n}{m_p} \approx 1 + \frac{1}{720}.$$

This yields $1 + 1/720 = 1.001388888\ldots$ to be compared with the CODATA value $m_n/m_p \approx 1.00137841946\ldots$. The relative difference is approximately 0.00105%.

The same integer term 1/720 also appears in other geometric relations within the Kochenov framework, including the refined form of the gravitational constant and the golden-ratio identity

$$\frac{\phi^{12}}{\sqrt{5}} = 144 + \frac{1}{720} + \varepsilon, \quad |\varepsilon| < 10^{-8}.$$

Since $720 = 6!$, the term is naturally associated with a compact factorial scale. Its recurrence across multiple independent relations suggests a possible discrete pattern, although the physical origin of this numerical agreement remains an open question.

## 1 Main Result

The neutron-proton mass ratio is given by the simple expression

$$\frac{m_n}{m_p} \approx 1 + \frac{1}{720}.$$

Numerically:

$$1 + \frac{1}{720} = 1.001388888888\ldots$$

The CODATA value is

$$\frac{m_n}{m_p} \approx 1.00137841946\ldots$$

The relative difference is approximately 0.00105%.

## 2 Context

The same term $1/720 = 1/6!$ appears in other geometric relations within the Kochenov framework:

- The refined form of the gravitational constant $G_{\text{Koch}}$
- The golden-ratio identity $\dfrac{\phi^{12}}{\sqrt{5}} = 144 + \dfrac{1}{720} + \varepsilon,\ |\varepsilon| < 10^{-8}$
- The fine-structure constant expression $\alpha^{-1} = 144 - 7 - 1/720$

The recurrence of the factorial scale 720 across different domains (pure mathematics, gravity, nuclear physics) suggests a possible discrete geometric pattern, although its physical origin remains an open question.

## 3 Conclusion

A remarkably compact integer-based approximation comes very close to one of the fundamental mass ratios in physics. While the agreement is numerical rather than derived from a standard physical model, the repeated appearance of the same $1/720$ term makes the pattern noteworthy and worth further examination.

## Related Publications

- Platonic G: Gravitation from Geometry
- G_from_two_integers
- The Integer 31 as a Discrete Geometric Node in Kochenov G
- Geometric Origin of $10^{11}$ in G (Corrected)
- A High-Precision Identity Linking $\phi^{12}/\sqrt{5}$, Fibonacci Numbers, and a Micro-Deviation of $1/720$

**Suggested citation:**
B. V. Kochenov (2026). *"$m_n/m_p = 1 + 1/720$: A Simple Approximation to the Neutron-Proton Mass Ratio."* Zenodo. 10.5281/zenodo.20146556

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