Abstract: Consider the product $(4\pi)(4\pi - 1/\pi)(4\pi - 2/\pi)(4\pi - 2/\pi)(4\pi - 4/\pi)$. The product of the first three terms is 1836.15. The product of the last two terms is 134.72. The mass ratio of the proton to the electron is 1836.15. We may sharpen the result by letting the last two terms be $(4\pi - 3/\pi)(4\pi - 4/\pi) = 131.13$.

Higgs Boson: A formula is developed for the *Higgs Boson* (H^o).[1] It uses terms consistent with an earlier formula for the mass ratio of the Proton to the Electron. The Higgs Boson is about 133 times the mass of a Proton.

$$(4\pi)\left(4\pi - \frac{1}{\pi}\right)\left(4\pi - \frac{2}{\pi}\right) = 1836.1517\ldots \approx \frac{m_p}{m_e} \tag{1}$$

Where m_e = Electron mass and m_p = Proton mass.

$$\left(4\pi - \frac{2}{\pi}\right)\left(4\pi - \frac{4}{\pi}\right)\left[(4\pi)\left(4\pi - \frac{1}{\pi}\right)\left(4\pi - \frac{2}{\pi}\right)\right] \tag{2}$$

$$= 247374.1421\ldots \approx 134.72 \times \frac{m_p}{m_e} \tag{3}$$

I personally like the extension to the formula:

$$\left(4\pi - \frac{3}{\pi}\right)\left(4\pi - \frac{4}{\pi}\right)\left[(4\pi)\left(4\pi - \frac{1}{\pi}\right)\left(4\pi - \frac{2}{\pi}\right)\right] \tag{4}$$

$$= 240773.7047\ldots \approx 131.13 \times \frac{m_p}{m_e} \tag{5}$$

$$m_p/m_e \approx \prod_{n=0}^{2}\left(4\pi - \frac{n}{\pi}\right) \qquad m_{H^o}/m_e \approx \prod_{n=0}^{4}\left(4\pi - \frac{n}{\pi}\right) \tag{6}$$

Here m_{H^o} stands for the mass of the Higgs Boson. We use the CODATA value for the mass ratio of the Proton to Electron to obtain

$$m_{H^o}/m_e \approx 134.72 \times 1836.15267389 = 247366.497 \tag{7}$$

$$m_{H^o}/m_e \approx 131.13 \times 1836.15267389 = 240774.7087 \tag{8}$$

[1] https://en.wikipedia.org/wiki/Higgs_boson

Derive "133": Recall that one gigaelectron volt divided by the square of the speed of light (GeV/c^2) is $1.78266191 \times 10^{-27}$ kilograms. The Proton mass is $1.6726219 \times 10^{-27}$ kilograms. The most recent value for the mass of the *Higgs Boson*[2] is 125.09 ± 0.24 GeV/c^2. We do the arithmetic to show that the mass of the Higgs Boson is approximately 133 times the mass of the Proton. We start by converting gegaelectron volts per light speed squared into kilograms (kg).

$$(125.09) \times \Big(1.78266191 \times 10^{-27}\ kg\Big) = 2.229931783 \times 10^{-25}\ kg \qquad (9)$$

We then divide by the Proton rest mass in kilograms.

$$\Big(2.229931783 \times 10^{-25}\Big) \Big/ \Big(1.6726219 \times 10^{-27}\Big) = 133.3195376 \qquad (10)$$

To compute the mass ratio of the Higgs Boson (H^o) to the electron, we use the mass of the Electron in kilograms. The Electron rest mass is $9.10938356 \times 10^{-31}$ kilograms.

$$\Big(2.229931783 \times 10^{-25}\Big) \Big/ \Big(9.10938356 \times 10^{-31}\Big) = 2.447950257 \times 10^{5} \qquad (11)$$

Five Dimensions: Let $(a_1, a_2, a_3, a_4, a_5)$ be a point $\mathbf{a}$ in five-dimensions. The volume of the 5D *ellipsoid* is

$$\frac{8\pi^2}{15} a_1 \cdot a_2 \cdot a_3 \cdot a_4 \cdot a_5 = \frac{8\pi^2}{15} \prod_{n=1}^{5} |a_n| \qquad (12)$$

Compare with one dimension and three dimensions

$$a_1 = 4\pi \qquad a_1 a_2 a_3 = (4\pi)(4\pi - 1/\pi)(4\pi - 2/\pi) = 1836.15 \qquad (13)$$

The electron seems to behave as a unit ball in each dimension. Recall in 3D the multiplier is $4\pi/3$; in 5D the "Volume" of the electron is $(8\pi^2/15) \cdot 1$.

Accuracy: From the above calculations. Ninety-eight percent here is great!

$$\frac{134.72 - 133.32}{133.32} = 0.01050 \qquad \frac{133.32 - 131.13}{133.32} = 0.01643 \qquad (14)$$

[2] https://physics.aps.org/articles/v8/45