The following data is from "Note on the spectral lines of hydrogen" by J. J. Balmer dated 1885. Numerical values are hydrogen line wavelengths in units of 10^{-10} meter. (Data for H_I is not included because H_I is not a hydrogen line. The H_I data is for Fraunhofer line H which is ionized calcium.)

	H_α	H_β	H_γ	H_δ	H_ϵ	H_ζ	H_η	H_ϑ	H_ι
Van der Willigen	6565.6	4863.94	4342.80	4103.8	–	–	–	–	–
Angstrom	6562.10	4860.74	4340.10	4101.2	–	–	–	–	–
Mendenhall	6561.62	4860.16	–	–	–	–	–	–	–
Mascart	6560.7	4859.8	–	–	–	–	–	–	–
Ditscheiner	6559.5	4859.74	4338.60	4100.0	–	–	–	–	–
Huggins	–	–	–	–	–	3887.5	3834	3795	3767.5
Vogel	–	–	–	–	3969	3887	3834	3795	3769†

(†The value given in the paper is 6769 which is an obvious typo.)

From this data, Balmer determined that

$$\hat{y} = \frac{m^2}{m^2 - 2^2} \times 3645.6 \times 10^{-10}\,\text{meter}$$

where $\hat{y}$ is the predicted wavelength and m is determined by the hydrogen line according to the following table.

	H_α	H_β	H_γ	H_δ	H_ϵ	H_ζ	H_η	H_ϑ	H_ι
$m =$	3	4	5	6	7	8	9	10	11

Just for the fun of it, use linear regression in R to compute the model coefficient.

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m = c(3,3,3,3,3,4,4,4,4,4,5,5,5,6,6,6,7,8,8,9,9,10,10,11,11)

x = m^2 / (m^2 - 4)

y = c(
6565.60, 6562.10, 6561.62, 6560.70, 6559.50,
4863.94, 4860.74, 4860.16, 4859.80, 4859.74,
4342.80, 4340.10, 4338.60, 4103.80, 4101.20,
4100.00, 3969.00, 3887.50, 3887.00, 3834.00,
3834.00, 3795.00, 3795.00, 3767.50, 3769.00)

coef(lm(y ~ 0 + x))
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The result is

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3645.296
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which is a little bit smaller than Balmer's value.

The actual value is now known to be

$$\frac{4}{R_H} = 3647.05 \times 10^{-10}\,\text{meter}$$

where R_H is the Rydberg constant for hydrogen.

$$R_H = 1.09677576 \times 10^{7}\,\text{meter}^{-1}$$