AKA Shakespeare
A Scientific Approach to the Authorship Question

by Peter A. Sturrock
Palo Alto. Exoscience. 2013. xiii + 320 pages

The calculations of the probability values in "AKA Shakespeare" are here performed only for the first example (the book on **page 46**).
In this case only the example "for Beatrice" (Stratfordian) is treated and only the column "Stratford Theory" (H_1) is executed.
The "Post Probability" is given in the book as **0.15.**

- **The calculation of this figure is shown.**

From **page 46** the following numbers are taken:

	D	H_1	H_2	H_3
S_1	5	1	20	1
S_2	1	10	1	10

These are the "weights" made in the text by "Beatrice", From these "weights" the "probabilities" are to calculate first.
The procedure is as described in the appendix on page 304:
From the weights (**W**) the probabilities (**P**) are calculated.
("The probabilities may then be derived from the weights by dividing each weight by the sum of the weights").
The formula for calculating the probabilities is given as:

$$P(S_n) = \frac{W(S_n)}{\sum_k W(S_k)}.$$

If there are only two "Statements" (S_1 and S_2), as in the present case, the formula simplifies.
For example, in the case of S_1:

$$P(S_1) = \frac{W(S_1)}{W(S_1)+W(S_2)}$$

Since the names of the "weights" W (S_n) in the formula are based on the columns of the table and the notations are not differentiated, they are labeled here differently for a better understanding:
W (S_1) = a_1, etc.:

$a_1 = 5$	$b_1 = 1$	$c_1 = 20$	$d_1 = 1$
$a_2 = 1$	$b_2 = 10$	$c_2 = 1$	$d_2 = 10$

The formula requires in each individual case the following simple calculation:

(In each column each "weight" is divided by the "sum of the weights" in the column.):

$\frac{a_1}{a_1+a_2}$	$\frac{b_1}{b_1+b_2}$	$\frac{c_1}{c_1+c_2}$	$\frac{d_1}{d_1+d_2}$
$\frac{a_2}{a_1+a_2}$	$\frac{b_2}{b_1+b_2}$ 2	$\frac{c_2}{c_1+c_2}$	$\frac{d_2}{d_1+d_2}$

in numbers:

$\frac{5}{5+1}$	$\frac{1}{1+10}$	$\frac{20}{20+1}$	$\frac{1}{1+10}$
$\frac{1}{5+1}$	$\frac{10}{1+10}$ 2	$\frac{1}{20+1}$	$\frac{10}{1+10}$

as fractions:

$\frac{5}{6}$	$\frac{1}{11}$	$\frac{20}{21}$	$\frac{1}{11}$
$\frac{1}{6}$	$\frac{10}{11}$	$\frac{1}{21}$	$\frac{10}{11}$

The results decimal (from here on a calculator is necessary):

0.83333333	0.09090909	0.95238095	0.09090909
0.16666667	0.90909091	0.04761905	0.90909091

It now involves "probabilities", that is, the values can only be between 0 and 1.
The sum in each column **mus**t be 1, which is the case here:

1.0000000	1.0000000	1.0000000	1.0000000

Note: Even if the true facts are not known, the probabilities for "lame" and "not lame" **must** sum up to 1, because ultimately either "lame" or "not lame" applies - tertium non datur!

Here again the numerical values of the probabilities calculated above:

0.83333333	0.09090909	0.95238095	0.09090909
0.16666667	0.90909091	0.04761905	0.90909091

In the formula for the "Post Probability" they are labeled in this way:

$P(S_1/D)$	$P(S_1/H_1)$	$P(S_1/H_2)$	$P(S_1/H_3)$
$P(S_2/D)$	$P(S_2/H_1)$	$P(S_2/H_2)$	$P(S_2/H_3)$

The formula for calculation (p. 303.) is:

$$P(H_k/D)=\sum_{n=1}^{N}\frac{P(S_n/H_k)\cdot P(S_n/D)}{\sum_j P(S_n/H_j)}.$$

Designed for the case of the "first hypothesis" H_1 (Stratford) this formula reads as:

$$P(H_1/D)=\frac{P(S_1/H_1)\ \cdot\ P(S_1/D)}{P(S_1/H_1)\ +P(S_1/H_2)+P(S_1/H_3)}\ +\ \frac{P(S_2/H_1)\ \cdot\ P(S_2/D)}{P(S_2/H_1)\ +P(S_2/H_2)+P(S_2/H_3)}$$

The value can now be calculated with the numerical values from the table of probabilities:

$$P(H_1/D)=\frac{0.09090\ \cdot 0.83333}{0.09090+0.95238+0.09090}\ +\ \frac{0.9090\ \cdot\ 0.16666}{0.9090+0.0476+0.9090}$$

$$=\frac{0{,}07578}{1.13468}\ +\ \frac{0.15149}{1.8656}$$

$$=\ 0.066759\ +\ 0.08120$$

$$=\ 0.1479$$

$$\approx 0.15\,.$$

This is the value given above and in the book
:

a_1 b_1 c_1 d_1
a_2 b_2 c_2 d_2

$P(S_1/D)$

$a_1 + a_2 = a_3 \quad b_1 + b_2 = b_3 \quad c_1 + c_2 = c_3 \quad d_1 + d_2 = d_3$

$\frac{a_1}{a_3} = a_4 \quad \frac{b_1}{b_3} = b_4 \quad \frac{c_1}{c_3} = c_4 \quad \frac{d_1}{d_3} = d_4$

$\frac{a_2}{a_3} = a_5 \quad \frac{b_2}{b_3} = b_5 \quad \frac{c_2}{c_3} = c_5 \quad \frac{d_2}{d_3} = d_5$

$b_4 \cdot a_4 = K$
$b_4 + c_4 + d_4 = L$

$b_5 \cdot a_5 = M$
$b_5 + c_5 + d_5 = N$

$\frac{K}{L} = P$

$\frac{M}{N} = Q$

$P + Q = W$