ADAM RIES (1492-–March 30, 1559)

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"According to ADAM RIES" is a proverbial expression used to indicate that a calculation has been done correctly. RIES or RIESE – at the time in which the master arithmetician lived, German names were still declined, and so the letter "e" came to be attached. Other spellings of the name are Ris, RISE, RYSE, and REYESS.

Little is known about the man's origins and early years. RIES himself gave Staffelstein (near Bamberg) as his place of birth. There, his father owned a water-powered mill. There is no information about the boy's education, including whether he ever attended a university.

In 1518, he is known to have been living at Erfurt, where he ran a school of arithmetic, in which he taught basic calculation to craftsmen and tradesmen. It was at this time that he wrote his first arithmetic book, *Rechnung auff der linihen* (calculating on the lines), which explained how to do arithmetic on the lines of a calculating board (a sort of abacus) using Roman numerals; the book was intended especially for children.

His second book appeared four years later, *Rechenung auff der linihen und Federn* (calculating on the lines and with the quill), in which he also described hand calculation (whence *with the quill*) using Indo-Arabic numerals. This book was written primarily for apprentices to craftsmen and tradesmen. The book was so successful, that during ADAM RIES's lifetime, it was reprinted 42 times and then was reprinted continually after his death until well into the seventeenth century.

In 1522, ADAM RIES moved to Annaberg, an up-and-coming city in the Erz Mountains that had become wealthy from silver mining. There, he composed a third book on arithmetic, *Rechenung nach der lenge/ auff den Linihen und Feder* (calculation with proportions, on lines and with the quill), which, however, he was at first unable to print because of the high costs associated with publication. The book finally appeared in 1550, under the patronage of MAURICE, ELECTOR OF SAXONY. It contains the only known portrait of ADAM RIES, which is reproduced on the postage stamp pictured above.

In 1525, ADAM RIES married ANNA LEUBER, daughter of a Freiberg locksmith; the pair produced (at least) eight children. He purchased a house in Annaberg and there fulfilled the civic duties required of a new citizen.

At first, ADAM RIES earned his living as a *Rezessschreiber*; that is, he acted as bookkeeper for a mining company, keeping track of profits and losses. In 1532, he was appointed by the ELECTOR OF SAXONY to the post of *Berg- und Gegenschreiber*; he thereby assumed responsibility for the management of the mines, with personal financial liability for any inaccuracies in the books. In the following year, the ELECTOR appointed him *Zehntner* of the mining authority. This job included the responsibility of calculating, collecting, and delivering a tenth part (*zehnt* = tenth) of the mining profits to the sovereign.

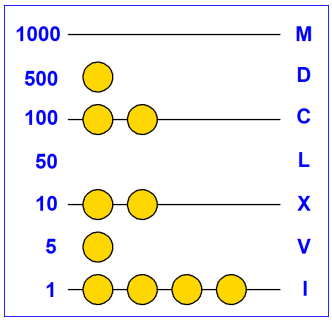
In 1533, to protect the simple folk who were unable to read, write, and calculate from being swindled, he formulated the *Brotordnung*, or bread law. This law presented a table that declared the weight that a loaf of bread costing a penny must have based on the current prices of grain and flour. Three years later, his book *Ein Gerechnent Büchlein auff den Schöffel, Eimer und Pfundgewicht* (a booklet for calculating by the scoop, the bucket, and the pound) appeared, in which it was explained how to convert between various weights and measures.

In 1539, he was named to the post of *Kurfürstlich Sächsischen Hofarithmeticus*, an honorary appointment as ducal arithmetician as a reward for his services. On his death in 1559, three of his sons continued his work as arithmeticians in Annaberg.

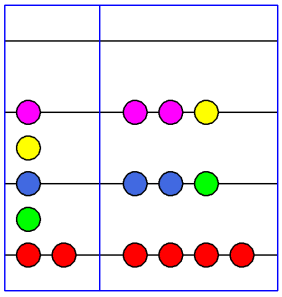
With his books, written in German instead of the usual Latin and at a level understandable to the layman, ADAM RIES made a significant contribution to universal education in arithmetic in that now more people could learn to calculate than had previously been the case. His books also accelerated the process of creating a unified German language.

The first book that ADAM RIES wrote, whose complete title is *Rechenung auff der linihen gemacht durch Adam Riesen vonn Staffelsteyn in massen man es pflegt tzu lern in allen rechenschulen gruntlich begriffen anno 1518*, contains a large collection of exercises (with solutions but not the reasoning) oriented towards problems that arise in everyday life, above all, the calculation of prices according to the "*rule of three*," which involved conversions that were more complicated than what we have today (1 *gulden* = 21 *groschen* = 252 *pfennigs*).

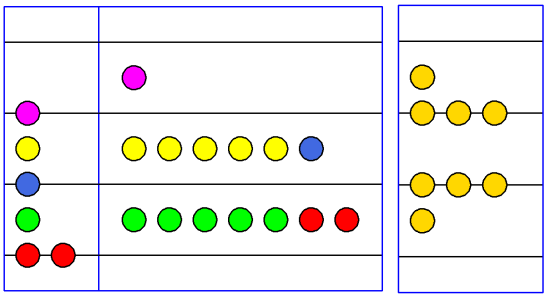
To calculate "*on the lines*", one uses "*calculating pennies*", which are laid out on a cloth or board equipped with lines. The lines represent – from bottom to top – ones, tens, hundreds, and thousands (corresponding to the Roman numerals I, X, C, M). A calculating penny placed between lines (in the *spacium*) corresponds respectively to 5, 50, 500 (that is, V, L, D). In the figure, the number 729 is represented.



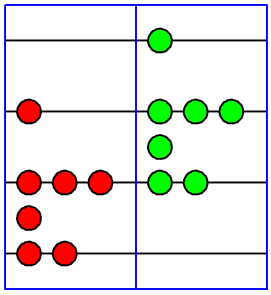
For addition and multiplication, one uses the technique of *elevation*: when five coins appear on a line, they are replaced with a single coin in the "*spacium*" above, and when two coins are lying in the space, they are replaced by a single coin on the line above. For subtraction and addition, one has to – as necessary – employ *resolution*. In multiplying by single-digit factors, the number of coins on a line or in a space is first multiplied, and then elevated. The factor 10 causes the coins to jump to the next line or space as required.



doubling 167



multiply 167 by 5 & elevation



multiply 137 by 10

RIES's second book, whose complete title is *Rechenung auff der linihen unnd federn in zal/maß vnd gewicht auff allerley handierung gemacht vnd zusamen gelesen durch Adam Riesen vö Staffelsteyn Rechenmeyster zu Erffurdt im 1522.* It contains, along with typical exercises from commercial life (calculations in simple and compound interest, problems with mixtures, converting weights and measures), exercises from recreational mathematics. Moreover, RIES uses the *false position method*, or *regula falsi*.

Here is an example of the *regula falsi*. A passer-by encounters a group of people and says, "*Greetings, thirty companions*." One of them replies, "*If we were as many again and half as many, we would be thirty altogether*." The question: *How many people were there*?

Using the "recipe" presented by RIES for the solution of the problem, one makes two attempts at guessing the answer:

Suppose the group consisted of 18 people. Then there would be 18 + 18 + 9 = 45, which is 15 too many (which RIES calls the *deficit* or falsehood). If one begins with a guess of 10 companions, then one obtains 10 + 10 + 5 = 25, which is 5 too few. The correct answer is obtained by cross multiplying the two values 18 and 10 by the deficits and then dividing their sum by the sum of the deficits.

The third book of arithmetic, *Rechenung nach der lenge auff der linihen und Feder. Darzu forteil und behendigkeit durch die Proportiones / Practica genant / Mit grüntlichem vnterricht des visierens. Durch Adam Riesen*, contains as an appendix the customary targeting method for determining the volume of a barrel – a method that JOHANNES KEPLER (1571-1630) adapted in developing his own method of calculating volumes (SIMPSON's rule).

ADAM RIES was more than just a methodologically gifted calculator. He was also one of the leading *cossists*, that is, he was a mathematician—an algebraist—who used variables. The word comes from the Italian *cosa*, or *thing*, used by LUCA PACIOLI (1445-1517) in the sense of *variable*. RIES's algebra books with the title *Coss* from the years 1524 and 1550 did not appear in print until the five hundredth anniversary of his birth, in 1992.

While his books on arithmetic describe the rules of calculation in words, in *Coss*, he uses algebraic notation throughout; for example, he uses, like the other *cossists*, separate symbols for variables and their powers. He makes reference to the algebra of MOHAMMED IBN MUSA AL-KHARIZMI (780-850) when he explains how various types of equations of the first and second degree are to be solved, that is, as we would write them today,

$ax = b$, $ax^2 = b$, $ax^3 = b$, $ax^4 = b$, $x^2 + ax = b$, $x^2 - ax = -b$, $x^2 - ax = b$

as well as $x^{2k} + ax^k = b$ with $a, b, k \in \mathbb{N}$ and $k > 1$.

In *Coss*, RIES also describes the method of casting out nines to verify the correctness of sums, differences, and products. First one draws a cross (see the picture on the postage stamp); then one writes down the *excesses* – that is, the remainders on dividing by 9 – placing that of the first operand on the left, that of the second on the right. Above goes the excess of the sum (difference, product) of the two remainders, below the excess of the previously calculated result. The verification is successful if the sums above and below are the same. (Of course, the method cannot detect an error that is a multiple of 9.)

An example (from Coss):
For the sum of 7869 and 8796 you have calculated 16665.

If you divide 7869 by 9, the excess is 3 (entry on the left). You obtain the same excess for the second summand 8796 (entry on the right). The sum of the two excesses is 6 (above). Finally, dividing the number 16665 by 9 also yields the excess 6.

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https://www.spektrum.de/wissen/adam-riese-1492-1559/977292

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