

## Period or Comma? Decimal Styles over Time and Place

**Amelia A Williamson**

In the United States, decimals are notated with periods (for example, 1.23), whereas most of Europe uses decimal commas (1,23). That is just one instance in which style rules in the United States clash with those in Europe. How did this style difference arise? What issues does it cause for editors? How do editors deal with the difference? Knowing the answers to those questions can help editors to avoid misunderstandings while working with both styles of decimal separators.

### History of the Decimal Point

The history of decimal notation and the style difference dates back to the 1500s, when decimal fractions were first used. Mathematics historian Florian Cajori explained the history in his 1928 book *A History of Mathematical Notations*.<sup>1</sup>

Simon Stevin, a Belgian mathematician in the 16th century, is credited with establishing the use of decimal fractions. He explained their use in his pamphlet *La Thiende*, published in 1585. Stevin understood the nature and importance of decimal fractions, but his notation was awkward. Stevin notated decimal fractions by putting superscript circled numbers after each digit in the number. A superscript circled 0 was put after the units-place digit, a superscript circled 1 after the tenths-place digit, a superscript circled 2 after the hundredths-place digit, and so on.

Franciscus Vieta, a French mathematician in the late 1500s, came close to the modern notation of decimals when he used a vertical stroke to separate the integer part of the number from the fractional part.

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Historians sometimes refer to Bartholomaeus Pitiscus—a German mathematician, astronomer, and theologian—as the first to use the decimal point. Pitiscus did use decimal fractions in his writing, and there were dots within the numbers in his text. Some historians argue, however, that the dots were not used as decimal points and were merely punctuation points written before and after numbers in running text, as was common in medieval manuscripts.

Pitiscus used three other notations for decimal fractions: he put a zero in front of the decimal numbers (for example, 0123 for our 0.123), he used a vertical stroke as a decimal separator (1|234 for our 1.234), and he used the common fraction form (1 234/1000 for our 1.234). The dots in his text were used for other purposes.

John Napier, a Scottish mathematician, appears to have been the first to intentionally use the period as a decimal separator in his 1617 book *Rabdologia*. In one part of the book, he explicitly says that whatever is written after the period is a fraction. Later in the book, however, he uses the comma as a decimal separator and shows a division problem that illustrates his use of the comma as a decimal. “Thus, Napier vacillated between the period and the comma,” Cajori stated; “mathematicians have been vacillating in this matter ever since.”

### Other Decimal Notations

During the 17th century, many other notations were used besides the period and the comma. Some mathematicians put the decimal part in superscript and underlined it, some used an “L” shape as a separator, and others used the colon or an inverted and raised comma as a separator.

By the 18th century, the notations for decimal fractions started to converge. “The chaos in notations for decimal fractions gradually gave way to a semblance of order. The situation reduced itself to trials of

strength between the comma and the dot as [decimal separators],” Cajori stated.

In the early 1700s, Gottfried Wilhelm Leibniz, a German polymath, proposed the dot as the symbol for multiplication. Therefore, most of Europe favored the comma as a decimal separator. In England at the time, however, the preferred symbol for multiplication was an “X”, so the dot was used more frequently as a decimal separator there than in the rest of Europe.

During the 19th century in England, the dot continued to be used as a decimal separator and also came to be used as the symbol for multiplication. That did not cause confusion, however, because the dots were placed at different heights. The dot used to signify multiplication was placed on the baseline (where the United States currently places decimals), and the dot used as a decimal separator was placed midway up (where the United States currently places the dot for multiplication).

In the United States, although the comma was used occasionally as a decimal separator, the baseline dot has always been preferred. Historians are not sure why the use of the dot raised halfway as a decimal separator never gained general adoption in the United States.

For a while, the baseline dot had two meanings in the United States: a decimal separator and a multiplication sign. Around 1880, however, the need arose for a distinction, and the decimal notation for the United States was clearly established as a dot on the baseline (for example, 1.234). The dot used as a multiplication sign was raised to the central position, as it is today.

That decision has remained the US standard ever since. The United States writes the decimal on the baseline and England in the raised position, and the United States writes the multiplication dot in the raised position and England on the baseline.

In the early 1900s, the American

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Committee of Mathematicians justified the style decision. The committee stated that because the letter X is used often in mathematics, it is preferable to use the raised dot for multiplication. The committee also stated, "Inasmuch as the period will continue to be used in this country as a decimal point, it is likely to cause confusion, to elementary pupils at least, to attempt to use it as a symbol for multiplication," according to Cajori.

### Current Style and Issues Editors Face

Currently, in European countries except for the United Kingdom, the comma is used as the decimal separator. In the United Kingdom, the raised dot is used, and in the United States, the baseline dot is used. Australia and most Asian countries use the dot, South America uses the comma, and some parts of Africa use the dot and other parts, the comma.

With regard to use of decimals in scientific writing, one would think that such style differences could cause some confusion. Peggy Robinson, chair of the committee that prepared the most recent edition of CSE's *Scientific Style and Format*, says that the style difference is most likely to cause confusion among readers who are not familiar with the difference in convention. An American reading a French article, for example, might misinterpret

1,234 to mean one thousand, two hundred thirty-four instead of the decimal that was intended.

Authors and editors might also find confusion in the style difference, Robinson says, and gives this advice:


**Authors:** Check recent issues of the publication to which you are submitting your article to see what convention is being followed and ensure that your submission conforms. If you are uncertain, check with the editorial office. Keep this convention in mind when you are checking proofs.

**Editors:** Be alert to the possibility that an author from another country may be using a different decimal notation; if in doubt as to intended meaning, seek clarification.

Elise Langdon-Neuner, editor of the European Medical Writers Association journal *The Write Stuff*, mentions another difficulty caused by the style difference. She edits reports and manuscripts written in English by Austrian scientists and says that it can be difficult to ensure that all the decimal commas in the reports are changed to decimal points. "You can be driven mad by spotting the commas and changing them to points," Langdon-Neuner says. "The software for the tables [the scientists] use is set

up for commas . . . and automatic conversion is not possible. Therefore, comma-to-point changes have to be made by hand."

Another potential problem that Langdon-Neuner points out occurs when data files are sent from Europe to the United States. Some computer programs used in the United States are configured to interpret commas within numbers (European decimals) as thousands markers and will convert the decimals to thousands numbers. For example, some programs will convert 1,34 to 1,340 instead of 1.34 as was intended. So before sending data to the United States, European scientists must make sure that all the decimal commas are changed to points.

Although the style difference may be a bit of a nuisance sometimes, it does not appear to cause any major problems. "For most numbers, the convention can be discerned from the context or from other values in the same paper," Robinson says. But authors, editors, and readers should be aware of the difference. 

### Reference

1. Cajori F. A history of mathematical notations. Chicago: The Open Court Publishing Company; 1928. p 314-335.