

Re: Strange result in Excel 2000

Source: <http://www.tech-archive.net/Archive/Excel/microsoft.public.excel/2005-11/msg00671.html>

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 - *Date:* Fri, 11 Nov 2005 23:57:23 -0500
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While `=($A\$1+B\1)- $C\$1$)` returns zero, `=($(A\$1+B\$1)$ - $C\$1$)` does not, and it is this later calculation that `IF()` is basing its decision on.

None of your numbers have exact binary representations, and hence must be approximated (just as $1/3$ must be approximated in decimal). The (IEEE standard) binary approximations to the numbers involved in the final subtraction are

```
84.8999999999999914734871708787977695465087890625
-84.900000000000005684341886080801486968994140625
-----
-0.0000000000000142108547152020037174224853515625
```

so Excel is exactly correct (given the approximations to the inputs) to report the answer for `=($(A\$1+B\$1)$ - $C\$1$)` as $-1.4210854715202E-14$, and `IF` is correct to report that the result is not zero. And almost all other general purpose software will behave in the same manner. The real mystery is why `=($A\$1+B\1)- $C\$1$)` claims that the result is zero.

The key to that mystery is hidden in the knowledge base article (78113) that Bernard referenced. Where it says that "Excel 97, however, introduced an optimization that attempts to correct for this problem" [that finite precision binary math sometimes produces correct but unexpected results when subtracting numbers would be equal in decimal representations]. What they did is to assume that if a final subtraction involves two numbers that are equal to at least 15 decimal digits, then Excel will arbitrarily zero the result on the assumption that the non-zero difference is residue from binary approximations. This arbitrary zeroing does not occur if the subtraction is not the last operation (as when the last operation is surrounding parentheses, or within an `IF` function) since the required assumption may be wrong, in which case the arbitrary zeroing would reduce accuracy that introduced inaccuracy could be magnified by subsequent calculations.

IMHO this "optimization" was a mistake, since it fails to eliminate the situation it was aimed at, and instead makes Excel's math appear inconsistent even to those who do understand the binary issues.

Jerry

Re: Strange result in Excel 2000

ibertram wrote:

Hello folks,

Have you encountered this in your Excel? I am using Excel 2000 SP3.

Let's say you have:

Column A1: 57.16

Column B1: 27.74

Column C1: 84.90