GEOMETRY

Lecture 3

FUTURE COMPUTERS

by

PROFESSOR HAROLD THIMBLEBY
Gresham Professor of Geometry

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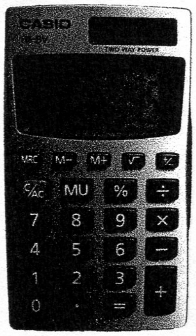
Calculator Problems

Harold Thimbleby

h.thimbleby@cs.ucl.ac.uk



Problems can be tried on the Casio HS-8V or any similar simple pocket calculator.

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1. Why doesn't $2 + 3 \times 5$ equal $3 \times 5 + 2$ on the calculator?

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2. Work out 4×-5 by pressing [AC][4][×][−][5][=], which should be -20 but is -1. What do you have to do to get the right answer?

Answer. [4][×][−][5][=] does get -20 on some calculators, like the Casio *fx–P401*. To get the right answer on the HS-8V you have to press [4][×][5][+/−][=]

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3. **Hard problem**. How do you store another number in memory? First, store a number in memory (e.g., [7][M+]) then try working out and storing, say, $\sqrt{19}$ in memory — without writing it down or memorising it youself.

Clues. You can't use [M+] because this *adds* to memory; and you can't use [MRC] [MRC] to clear the memory to zero, because the first [MRC] will replace the number you want to remember with what's already in memory. Somehow you must store the displayed number without losing it. (There is a general answer to this problem: it takes about five key presses.)

Why would you need to solve this problem? Try a long product like

$$(4 + 5) \times (7 + 3) \times (8 + 9) \times (19 + 74) \ldots$$

You'd have to work it out as follows:

...Zero memory, calculate $4 + 5$, and store in memory: [MRC][MRC][4][+][5][M+]
...Calculate $7 + 3$, and multiply by memory: [7][+][3][×][MRC]
...Store this result in memory (How!? You already have 9 in the memory!)
...Calculate $8 + 9$, and multiply by memory: [8][+][9][×][MRC]
...Store that in memory, and so on.

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4. What does [%] do? What's the meaning of $1 \div 5\%$ compared to $1 \times 5\%$?

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5. Why doesn't $1 + 5\%$ mean the same as $1 + 2 + 3\%$?

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6. What does [+] *really* do? What does [=] *really* do? *Clue*: Try pressing [AC][0][+][1][=][=][=][=][=] and you have a counting machine.

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7. So what does [=] do after *all* the other keys? Why doesn't it work after [%]?

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8. What does [MU] do? *Clue*: [MU] *only* works in sums like [3][MU][4][%]

See `http://www.cs.mdx.ac.uk/harold/srf/hucalc.pdf` for more information, and read *Frege* by Anthony Kenny, Penguin Books, 1995.