

Fractions

Exact fraction arithmetic for the HP-28S

HEWLETT-PACKARD 28S · C. 1989 · NOTEBOOK PAGE 23

ADD · SUBT · MULT · DIV · GCD · LCM · RDUCE

THE MANUAL

Enter all fractions as a list.

Example: two thirds times four fifths.

{ 2 3 }

{ 4 5 }

MULT

THE PROGRAMS

ADD

« LIST→ DROP → p1 q1

« LIST→ DROP → p2 q2

« p1 q2 * p2 q1 * + q1 q2 * 2 →LIST RDUCE

»

»

»

SUBT

« LIST→ DROP NEG 2 →LIST ADD

»

MULT

« LIST→ DROP → p1 q1

« LIST→ DROP → p2 q2

« p1 p2 * q1 q2 * 2 →LIST RDUCE

»

»

»

DIV

« LIST→ DROP SWAP 2 →LIST MULT

»

```

GCD
«
  WHILE DUP
  REPEAT SWAP OVER MOD
  END DROP
»

LCM
« DUP2 GCD / *
»

RDUCE
« LIST→ DROP DUP2 GCD DUP 3 ROLLD / 3 ROLLD / SWAP 2 →LIST
»

```

NOTES ON THIS EDITION

1. A fraction is a two-element list, so the calculator's own list type carries the numerator and denominator and no new data structure is needed.
 2. GCD is Euclid's algorithm in seven tokens: `WHILE DUP REPEAT SWAP OVER MOD END DROP`. The same loop turns up again in `DG→RD` on page 25, reducing a fraction of π .
 3. `SUBT` is corrected in ink on the page, with a `SWAP` struck out either side of `NEG`. The corrected reading is the one set here.
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The notebook is the manuscript — handwritten, photocopied, and reproduced exactly as scanned at michaelmorrison.com/downloads/hp28s/fractions-notebook.pdf. This is the edited edition. The wording and the voice are the manuscript's and the program listings are unaltered; where the prose has been corrected, the notes above say what was changed, so the two can be held against each other.