

## MERAC Evaluator Summary

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The machine has:

- two registers with 3 digits each
- an elementary modification unit
- a manually operated programme control

The manual program control consists of a changeable matrix, where the rows can be selected by a rotary switch, and activated once by a push button. The sequence is thus controlled by the operator manually, and represents a control with punched cards, where repeats are done by repeating the code on the card.

Each (micro) instruction word has 7 bits:

- A1: Add to register 1
- R1: Read register 1
- A2: Add to register 2
- R2: Read register 2
- L: Clear (lösche) register(s) while read
- E: Set carry to lowest digit (Einerübertrag)
- N: Nine-complement by the modification unit

Examples:

Add register 1 to register 2:

.R A. . . .

Subtract in opposite direction:

A. .R .EN

Increment register:

A. . . .E.

Clear register 2:

.R . . L . .

Decrement register 1:

A. . . . .N

Register 1 is denoted as a, and register 2 as b.

### Triangle Numbers

Triangle numbers are the sum of the first natural numbers:

$$b_{n+1} = b_n + n$$

Programme:

```

.R .R L..      clear both registers

A. .. .E.     increment register 1
.R A. ...     add to register 2 (result)

```

After the first row resets both registers, the next two rows (after the empty line) are to be repeated.

## Fibonacci Numbers

Fibonacci numbers are the sum of the two previous ones:

$$x_{n+1} = x_n + x_{n-1}$$

The registers are used alternatingly:

```

.R .R L..      a=0, b=0
A. .. .E.     a=1

.R A. ...     b =+ a
A. .R ...     a =+ b

```

## Square Numbers

Using the first binominal formula gives:

$$(x+1)^2 = x^2 + 2x + 1$$

The argument is in the first register a, the result in b:

```

.R .R L..      a=0, b=0
A. A. .E.     a=1, b=1

.R A. ...     b =+ a
.R A. ...     b =+ a
A. . . .1     a =+ 1
.. A. ..1     b =+ 1

```

The argument may be increased first (details left to the reader):

$$(x+1)^2 = x^2 + 2(x+1) - 1$$

To enumerate square numbers, the difference method is better:

$$(x+1)^2 - x^2 = 2x + 1$$

Thus:

```

.R .R L..      a =: b, b =: 0
A. A. ..1     a =+ 1, b =+ 1

A. .. ..1     a =+ 1
A. .. ..1     a =+ 1
.R A. ...     b =+ a          resultat is in b

```

## To and Fro

The sequence natural numbers are alternatingly added and subtracted, which will enumerate all numbers from 1 on, alternating the positive and negative ones:

```
.R .R L..      a=0, b=0
A. .. .E.      a=1
```

```
.R A. ...      b =+ a           positive number
A. .. .E.      a =+ 1
.R A. .EN      b =- a           negative number
A. .. .E.      a =+ 1
```

## Square Root

To determine a square root, square numbers may be enumerated and the process stopped, when the next larger square is found.

For enumerating, the difference method is used, so that 1, 3, 5, 7 etc. are subtracted, until the result is zero or negative. The number of rounds (count yourself) is the root. The argument has to be entered manually after the second line:

```
.R .R L..      a=0, b=0
A. .. .E.      a=1           enter argument in b

.R A. .EN      b =- a
A. .. .E.      a =+ 1
A. .. .E.      a =+ 1
```