Systematisches Programmieren
Spuren-basierte Programmierung

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Sommersemester 2020

Über die Methode

- mentale Repr. eines Algorithmus $\longrightarrow$ Programm

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- grober Ablauf

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  1. Algorithmus ausführen

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  2. Ausführungsspur aufschreiben

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- Vorteil: Trennung verschiedener Aspekte

Binäre Division

- schriftliche Division für Binärzahlen

$$
\begin{array}{l}
1\,4\,2 \div 6 \;=\; 2\,3\,\mathrm{R}\,4 \\
\underline{1\,2\phantom{\,\mathrm{R}\,4}} \\
\quad 2\,2\phantom{\,\mathrm{R}\,4} \\
\quad \underline{1\,8\phantom{\,\mathrm{R}\,4}} \\
\quad\quad 4
\end{array}
$$

Binäre Division

- schriftliche Division für Binärzahlen
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  - Zahlen: $0, 1, =, +$

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  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$

Binäre Division

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  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$,
    - $\circ$

Binäre Division

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  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$

"0" $\circ$ "11" $=$ "011"

Binäre Division

- schriftliche Division für Binärzahlen
- Basisfunktionen
  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$

$$\text{"0"} \circ \text{"11"} = \text{"011"}$$

$$\text{"1"} \circ \varepsilon = \text{"1"}$$

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  - Zahlen: $0, 1, =, +$
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$$|\text{"abc"}| = 3$$

Binäre Division

- schriftliche Division für Binärzahlen
- Basisfunktionen
  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$, $|\cdot|$

$$|\text{"abc"}| = 3$$

$$|\varepsilon| = 0$$

Binäre Division

- schriftliche Division für Binärzahlen
- Basisfunktionen
  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$, $|\cdot|$

Binäre Division

- schriftliche Division für Binärzahlen
- Basisfunktionen
  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$, $|\cdot|$, get

Binäre Division

- schriftliche Division für Binärzahlen
- Basisfunktionen
  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$, $|\cdot|$, get

$$\text{get}(\text{"abc"}, 0) = \text{"a"}$$

Binäre Division

- schriftliche Division für Binärzahlen
- Basisfunktionen
  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$, $|\cdot|$, get

$$\text{get}(\text{"abc"}, 0) = \text{"a"}$$

$$\text{get}(\text{"abc"}, 2) = \text{"c"}$$

Binäre Division

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  - $\geq, -$ auf Binärstrings

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"1" $\geq$ "0" $= 1$

Binäre Division

- schriftliche Division für Binärzahlen
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  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$, $|\cdot|$, get
  - $\geq, -$ auf Binärstrings

$$\text{"1"} \geq \text{"0"} = 1$$

$$\text{"11"} \geq \text{"101"} = 0$$

Binäre Division

- schriftliche Division für Binärzahlen
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  - Zahlen: $0, 1, =, +$
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$$\text{"1"} \geq \text{"0"} = 1$$

$$\text{"11"} \geq \text{"101"} = 0$$

$$\text{"1010"} - \text{"11"} = \text{"111"}$$

Binäre Division

- schriftliche Division für Binärzahlen
- Basisfunktionen
  - Zahlen: $0, 1, =, +$
  - Strings: ε, "0", "1", $=$, $\circ$, $|\cdot|$, get
  - $\geq, -$ auf Binärstrings

$$\text{"1"} \geq \text{"0"} = 1$$

$$\text{"11"} \geq \text{"101"} = 0$$

$$\text{"1010"} - \text{"11"} = \text{"111"}$$

$$\text{"1"} - \text{"0"} = \text{"1"}$$

Algorithmus ausführen

$100101101001 \div 1101$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

Algorithmus ausführen

$$\underbrace{100101101001}_{2409} \div \underbrace{1101}_{13} = \underbrace{10111001}_{185} \text{ R } \underbrace{100}_{4}$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$1$$

Algorithmus ausführen

$$1\,00101101001 \div 1101 =$$

$$\begin{array}{r} 1 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$\begin{array}{r} 1 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$\begin{array}{r} 10 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$10$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$\begin{array}{r} 10 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$1001\,01101001 \div 1101 =$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$1001$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$1001$$

Algorithmus ausführen

$$100101101001 \div 1101 =$$

$$1001$$

Algorithmus ausführen

$$10010\,1101001 \div 1101 =$$

$$\begin{array}{r} 10010 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010\,1101001 \div 1101 =$$

$$\begin{array}{r} 10010 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010\,1101001 \div 1101 = 1$$

$$\begin{array}{r} 10010 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010 1101001 \div 1101 = 1$$

$$\begin{array}{rr} & 10010 \\ - & 1101 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010 1101001 \div 1101 = 1$$

$$\begin{array}{rr} & 10010 \\ - & 1101 \\ \hline & 101 \end{array}$$

Algorithmus ausführen

$$10010\,1101001 \div 1101 = 1$$

$$\underline{}$$
$$101$$

Algorithmus ausführen

$$10010\,1101001 \div 1101 = 1$$

$$\begin{array}{r} 101 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1$$

$$\begin{array}{r} 101 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1$$

$$1011$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1$$

$$\begin{array}{r} 1011 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10$$

$$1011$$

Algorithmus ausführen

$$1001011\,01001 \div 1101 = 10$$

$$\begin{array}{r} 1011 \\ \hline \end{array}$$

Algorithmus ausführen

$$1001011101001 \div 1101 = 10$$

$$10111$$

Algorithmus ausführen

$$10010111\,01001 \div 1101 = 10$$

$$\begin{array}{r} 10111 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010110100 1 \div 1101 = 101$$

$$\begin{array}{r} 10111 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010110100 1 \div 1101 = 101$$

$$\begin{array}{rr} & 10111 \\ - & 1101 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010111010001 \div 1101 = 101$$

$$\begin{array}{rr} & 10111 \\ - & 1101 \\ \hline & 1010 \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 101$$

$$\overline{1010}$$

Algorithmus ausführen

$$10010110100 1 \div 1101 = 101$$

$$\begin{array}{r} 1010 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 101$$

$$\begin{array}{r} 1010 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 101$$

$$\begin{array}{r} 10100 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 101$$

$$\begin{array}{r} 10100 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 1011$$

$$10100$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 1011$$

$$\begin{array}{rr} & 10100 \\ - & 1101 \\ \hline \end{array}$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 1011$$

$$\begin{array}{rr} & 10100 \\ - & 1101 \\ \hline & 111 \end{array}$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 1011$$

$$\underline{\qquad\qquad}$$
$$111$$

Algorithmus ausführen

$$10010110\,1001 \div 1101 = 1011$$

$$\begin{array}{r} 111 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1011$$

$$111$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1011$$

$$1111$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1011$$

$$\begin{array}{r} 1111 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$1111$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{rr} & 1111 \\ - & 1101 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{rr} & 1111 \\ - & 1101 \\ \hline & 10 \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$\underline{}$$
$$10$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{r} 10 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{r} 10 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$100$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 101110$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 101110$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 101110$$

$$\begin{array}{r} 1000 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 101110$$

$$1000$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1011100$$

$$\begin{array}{r} 1000 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1011100$$

$$1000$$

$$\_\_\_\_\_$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1011100$$

$$10001$$

Algorithmus ausführen

$$100101101001 \div 1101 = 1011100$$

$$10001$$

$$\_\_\_\_\_$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{r} 10001 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001$$

```
      10001
-      1101
-------------
```

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{rr} & 10001 \\ - & 1101 \\ \hline & 100 \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001$$

$$\underline{}$$
$$100$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001$$

$$100$$

$$\_\_\_\_\_$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

Variablen:

Algorithmus ausführen

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

Variablen:

- a, b, c, r

Algorithmus ausführen

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c} \text{ R } \underbrace{100}_{r}$$

Variablen:

- a, b, c, r

Algorithmus ausführen

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c} \text{ R } \underbrace{100}_{r}$$

Variablen:

- a, b, c, r
- i : Anz. gelesener Ziffern von a

Algorithmus ausführen

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c} \text{ R } \underbrace{100}_{r}$$

Variablen:

- a, b, c, r
- i : Anz. gelesener Ziffern von a
- x : Zahl die mit b verglichen wird

Ausführungsspur als Tabelle

a	b	i	x	c	r

$100101101001 \div 1101 =$

Ausführungsspur als Tabelle

a	b	i	x	c	r
100101101001	1101				

$$100101101001 \div 1101 =$$

Ausführungsspur als Tabelle

a	b	i	x	c	r
100101101001	1101				
		0			

$$100101101001 \div 1101 =$$

Ausführungsspur als Tabelle

a	b	i	x	c	r
100101101001	1101				
		0	ε	ε	

$$100101101001 \div 1101 =$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	

$$100101101001 \div 1101 =$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	

$$100101101001 \div 1101 =$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	

$$100101101001 \div 1101 =$$

$$1$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	

$$100101101001 \div 1101 =$$

$$1$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		

$$100101101001 \div 1101 =$$

$$1$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		

$$100101101001 \div 1101 =$$

$$1$$

$$\underline{\qquad\qquad}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		

$$100101101001 \div 1101 =$$

$$10$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		

$$100101101001 \div 1101 =$$

$$10$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		

$$100101101001 \div 1101 =$$

$$10$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		

$$100101101001 \div 1101 =$$

$$10$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		

$$100101101001 \div 1101 =$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		

$$100101101001 \div 1101 =$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		

$$100101101001 \div 1101 =$$

100

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		

$$100101101001 \div 1101 =$$

100

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		

$$100101101001 \div 1101 =$$

$$1001$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		

$$100101101001 \div 1101 =$$

$$1001$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		

$$100101101001 \div 1101 =$$

$$1001$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		

$$100101101001 \div 1101 =$$

1001

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		

$$100101101001 \div 1101 =$$

$$10010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		

$$100101101001 \div 1101 =$$

$$10010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		

$$100101101001 \div 1101 =$$

$$10010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		

$$100101101001 \div 1101 = 1$$

$$10010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$100101101001 \div 1101 = 1$$

$$10010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$100101101001 \div 1101 = 1$$

$$\begin{array}{rr} & 10010 \\ - & 1101 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$10010\,1101001 \div 1101 = 1$$

$$\begin{array}{rr} & 10010 \\ - & 1101 \\ \hline & 101 \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$100101101001 \div 1101 = 1$$

$$\underline{\qquad\qquad}$$
$$101$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$100101101001 \div 1101 = 1$$

$$101$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$100101101001 \div 1101 = 1$$

$$101$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$100101101001 \div 1101 = 1$$

$$1011$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	

$$100101101001 \div 1101 = 1$$

$$1011$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		

$$100101101001 \div 1101 = 1$$

$$1011$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		

$$100101101001 \div 1101 = 10$$

$$1011$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	

$$100101101001 \div 1101 = 10$$

$$1011$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	

$$100101101001 \div 1101 = 10$$

$$1011$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	

$$100101101001 \div 1101 = 10$$

$$10111$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	

$$1001011\,01001 \div 1101 = 10$$

$$10111$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		

$$1001011\,01001 \div 1101 = 10$$

$$10111$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		

$$1001011\,01001 \div 1101 = 101$$

$$10111$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$1001011\,01001 \div 1101 = 101$$

$$\begin{array}{r} 10111 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$1001011\,01001 \div 1101 = 101$$

$$\begin{array}{rr} & 10111 \\ - & 1101 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$1001011\,01001 \div 1101 = 101$$

$$\begin{array}{rr} & 10111 \\ - & 1101 \\ \hline & 1010 \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$1001011\,01001 \div 1101 = 101$$

$$\underline{\qquad\qquad}$$
$$1010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$1001011\,01001 \div 1101 = 101$$

$$1010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$10010110\,1001 \div 1101 = 101$$

$$1010$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$10010110\,1001 \div 1101 = 101$$

$$10100$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	

$$10010110\,1001 \div 1101 = 101$$

$$\begin{array}{r} 10100 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		

$$10010110\,1001 \div 1101 = 101$$

$$\begin{array}{r} 10100 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		

$$10010110\,1001 \div 1101 = 1011$$

$$10100$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$10010110\,1001 \div 1101 = 1011$$

$$10100$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$10010110\,1001 \div 1101 = 1011$$

$$\begin{array}{rr} & 10100 \\ - & 1101 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$10010110\,1001 \div 1101 = 1011$$

$$\begin{array}{rr} & 10100 \\ - & 1101 \\ \hline & 111 \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$10010110\,1001 \div 1101 = 1011$$

$$\underline{\qquad\qquad}$$
$$111$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$10010110\,1001 \div 1101 = 1011$$

$$\begin{array}{r} 111 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$100101101001 \div 1101 = 1011$$

111

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$100101101001 \div 1101 = 1011$$

$$1111$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	

$$100101101001 \div 1101 = 1011$$

$$\begin{array}{r} 1111 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		

$$100101101001 \div 1101 = 1011$$

$$\begin{array}{r} 1111 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
0	ε	ε	
1	1		
2	10		
3	100		
4	1001		
5	10010		
		1	
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{r} 1111 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		

$$100101101001 \div 1101 = 10111$$

$$1111$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$1111$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{rr} & 1111 \\ - & 1101 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$\begin{array}{rr} & 1111 \\ - & 1101 \\ \hline & 10 \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$\overline{\qquad 10}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$10$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$10$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	

$$100101101001 \div 1101 = 10111$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		

$$100101101001 \div 1101 = 10111$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		

$$100101101001 \div 1101 = 101110$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	

$$100101101001 \div 1101 = 101110$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	

$$100101101001 \div 1101 = 101110$$

$$100$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	

$$100101101001 \div 1101 = 101110$$

$$1000$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	

$$100101101001 \div 1101 = 101110$$

$$1000$$

$$\underline{\qquad\qquad}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		

$$100101101001 \div 1101 = 101110$$

$$1000$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		

$$100101101001 \div 1101 = 1011100$$

$$1000$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	

$$100101101001 \div 1101 = 1011100$$

$$1000$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	

$$100101101001 \div 1101 = 1011100$$

$$1000$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	

$$100101101001 \div 1101 = 1011100$$

$$10001$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	

$$100101101001 \div 1101 = 1011100$$

$$\begin{array}{r} 10001 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		

$$100101101001 \div 1101 = 1011100$$

$$\begin{array}{r} 10001 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{r} 10001 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		
		10111001	

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{r} 10001 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		
		10111001	

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{rr} & 10001 \\ - & 1101 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		
		10111001	

$100101101001 \div 1101 = 10111001$

```
    10001
-    1101
-------
     100
```

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		
		10111001	

$$100101101001 \div 1101 = 10111001$$

$$\underline{}$$
$$100$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		
		10111001	

$$100101101001 \div 1101 = 10111001$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		
		10111001	

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Ausführungsspur als Tabelle

i	x	c	r
6	1011		
		10	
7	10111		
		101	
8	10100		
		1011	
9	1111		
		10111	
10	100		
		101110	
11	1000		
		1011100	
12	10001		
		10111001	
			100

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

$$\begin{array}{r} 100 \\ \hline \end{array}$$

Operationen finden 1/2

	i	x	c	r
	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
	0	ε	ε

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

i	x

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

i	x
$i+1$	

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

i	x
$i+1$	$x \circ \text{get}(a, i)$

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
	2	10		
	3	100		
	4	1001		
	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
	$c \circ$ "1"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$10010\,1101001 \div 1101 = 1$$

$$10010$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$10010\,1101001 \div 1101 = 1$

```
   10010
 -  1101
 -------
```

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$10010\,1101001 \div 1101 = 1$

```
   10010
 -  1101
 -------
    101
```

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$10010\,1101001 \div 1101 = 1$$

$$\underline{}$$
$$101$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$10010\,1101001 \div 1101 = 1$$

$$101$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

$$101$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$10010\,1101001 \div 1101 = 1$$

$$1011$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

$$1011$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

$$1011$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$ $i+1$	$x \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

1011

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

1011

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

$$1011$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

$$1011$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$100101101001 \div 1101 = 1$$

$$1011$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
			101	
	8	10100		
			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
	8	10100		
RES1			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
	8	10100		
RES1			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
	8	10100		
RES1			1011	
	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
			10111	
	10	100		
			101110	
	11	1000		
			1011100	
	12	10001		
			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
	10	100		
			101110	
	11	1000		
			1011100	
	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
	10	100		
RES0			101110	
	11	1000		
RES0			1011100	
	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$\underbrace{100101101001}_{a} \div \underbrace{1101}_{b} = \underbrace{10111001}_{c}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$100101101001 \div 1101 = 1011100$

$$\begin{array}{r} 10001 \\ \hline \end{array}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$100101101001 \div 1101 = 1011100$

10001

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$100101101001 \div 1101 = 10111001$

$$\begin{array}{r} 10001 \\ \hline \end{array}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$100101101001 \div 1101 = 10111001$

```
    10001
-    1101
-------
```

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$100101101001 \div 1101 = 10111001$

```
    10001
-    1101
-------
     100
```

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$100101101001 \div 1101 = 10111001$

$$\frac{}{100}$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001$$

$$100$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001$$

$$100$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001$$

$$100$$

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

100

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c	r
INIT	0	ε	ε	

	i	x
GET	$i+1$	$x \circ \text{get}(a, i)$
GET2	$i+1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

100

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	r
	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

100

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
				100

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

100

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
REM				100

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

100

Operationen finden 1/2

	i	x	c	r
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		
RES1			10111	
GET2	10	100		
RES0			101110	
GET	11	1000		
RES0			1011100	
GET	12	10001		
RES1			10111001	
REM				100

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$100101101001 \div 1101 = 10111001 \text{ R } 100$$

100

Operationen finden 2/2

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

Operationen finden 2/2

- alle Operationen?

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$1 \div 1 = 1 \text{ R } 0$$

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\ \text{R}\ 0$

	i	x	c	r

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\ \text{R}\ 0$

	i	x	c	r
INIT				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\ \text{R}\ 0$

	i	x	c	r
INIT	0	ε	ε	

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\ \text{R}\ 0$

	i	x	c	r
INIT	0	ε	ε	
GET				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
RES1				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
RES1			1	

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\ \text{R}\ 0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
RES1			1	
REM				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$1 \div 1 = 1\ \text{R}\ 0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
RES1			1	
REM				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$$0 \div 1 = 0 \,\mathrm{R}\, 0$$

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
REM				

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
REM				$0 - 1$

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\ \text{R}\ 0$

$11 \div 100 = 0\ \text{R}\ 11$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\ \text{R}\ 0$

$11 \div 100 = 0\ \text{R}\ 11$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$
	x

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\ \text{R}\ 0$

$11 \div 100 = 0\ \text{R}\ 11$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$
REM0	x

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\,\text{R}\,0$

$11 \div 100 = 0\,\text{R}\,11$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$
REM0	x

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\ \text{R}\ 0$

$11 \div 100 = 0\ \text{R}\ 11$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
REM0				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben
- Umbenennung REM zu REM1

	i	x	c
INIT	0	ε	ε

	r
REM	$x - b$
REM0	x

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\ \text{R}\ 0$

$11 \div 100 = 0\ \text{R}\ 11$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
REM0				0

Operationen finden 2/2

- alle Operationen?
- probiere andere Eingaben
- Umbenennung REM zu REM1

	i	x	c
INIT	0	ε	ε

	r
REM1	$x - b$
REM0	x

	i	x
GET	$i + 1$	$x \circ \text{get}(a, i)$
GET2	$i + 1$	$(x - b) \circ \text{get}(a, i)$

	c
RES1	$c \circ$ "1"

	c
RES0	$c \circ$ "0"

$0 \div 1 = 0\ \text{R}\ 0$

$11 \div 100 = 0\ \text{R}\ 11$

	i	x	c	r
INIT	0	ε	ε	
GET	1	0		
RES0			0	
REM0				0

Kontrollflussgraph ableiten

Kontrollflussgraph ableiten

	i	x	c	r
INIT	0	ε	ε	
GET	1	1		
GET	2	10		
GET	3	100		
GET	4	1001		
GET	5	10010		
RES1			1	
GET2	6	1011		
RES0			10	
GET	7	10111		
RES1			101	
GET2	8	10100		
RES1			1011	
GET2	9	1111		

Kontrollflussgraph ableiten

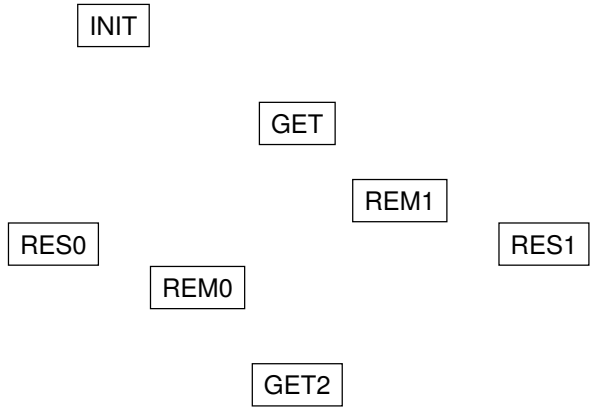
INIT
GET
GET
GET
GET
GET
RES1
GET2
RES0
GET
RES1
GET2
RES1
GET2

Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	

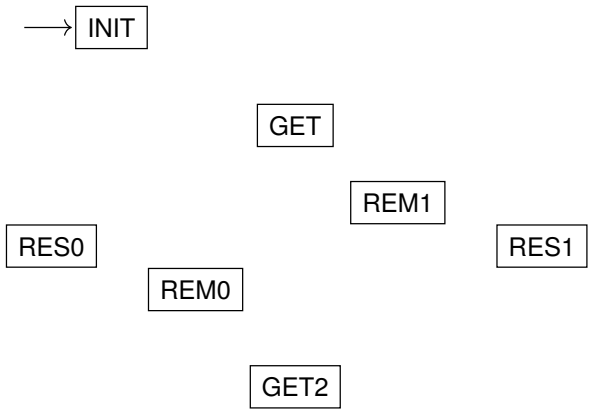
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



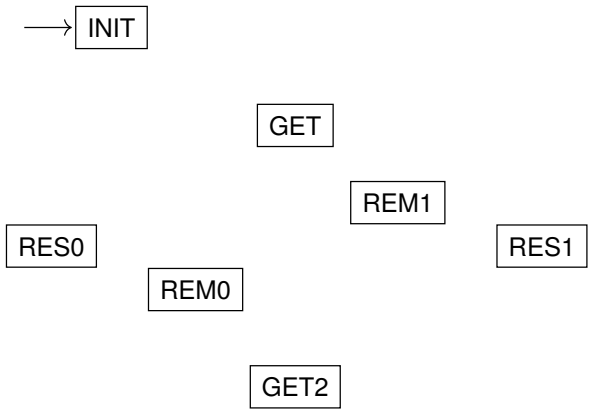
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



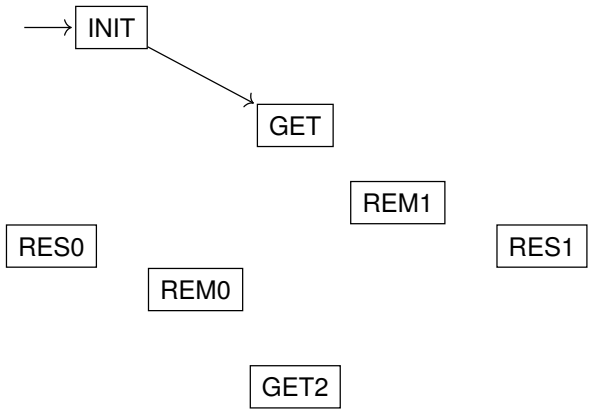
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



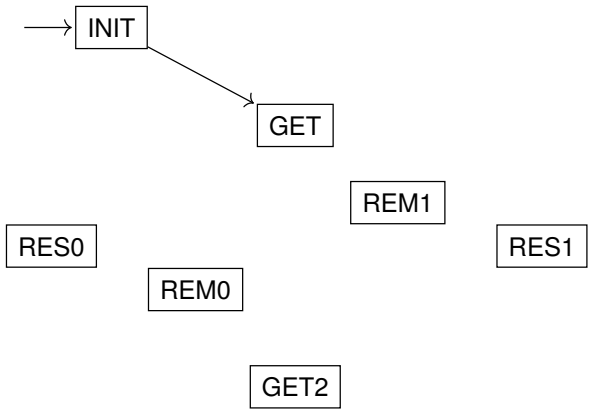
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



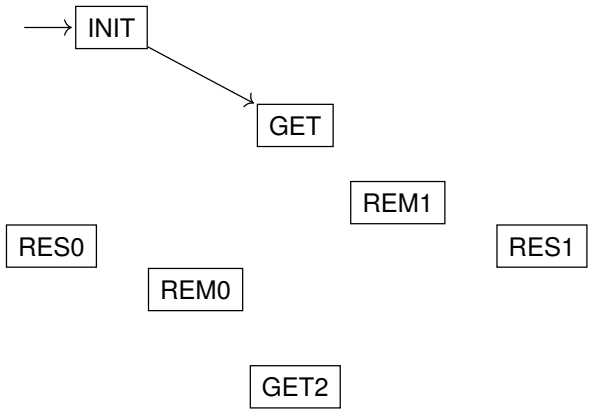
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



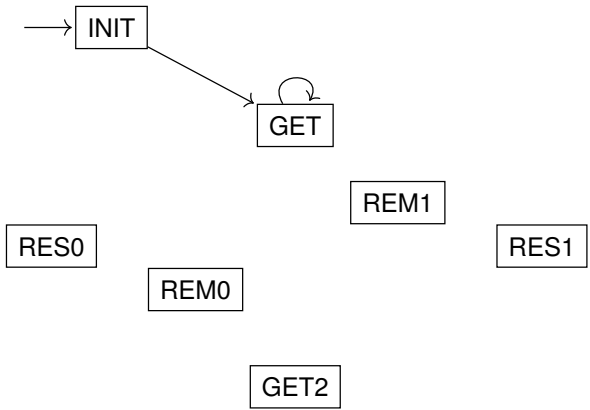
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



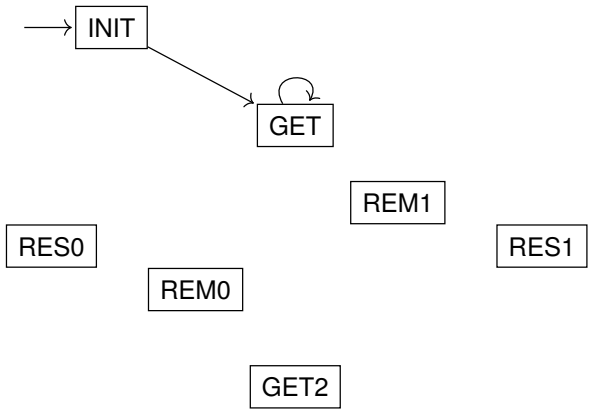
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



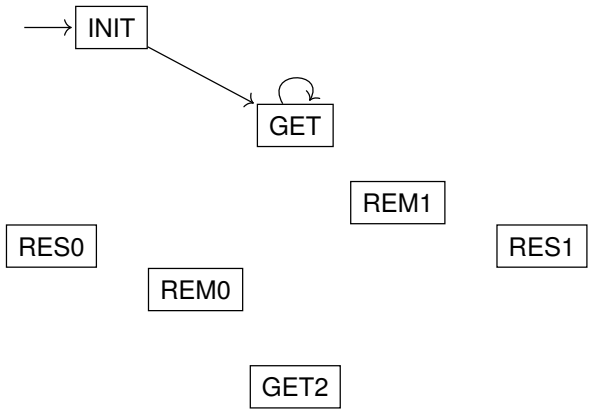
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



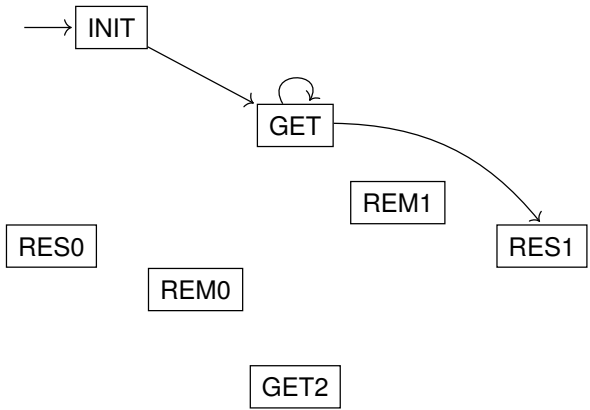
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



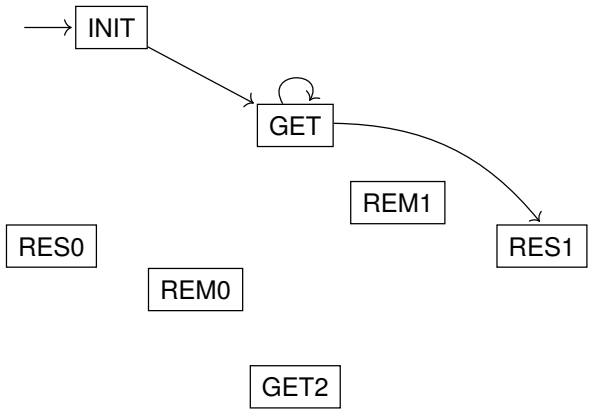
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



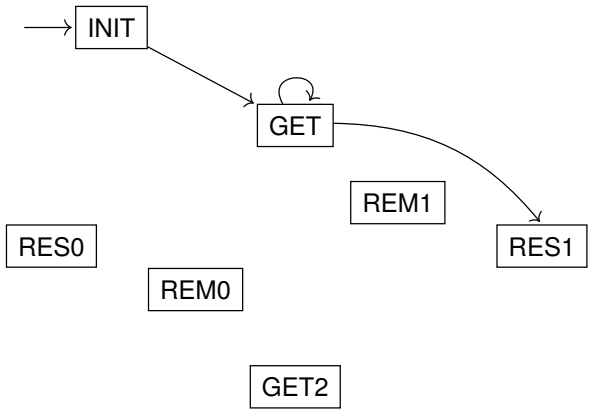
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



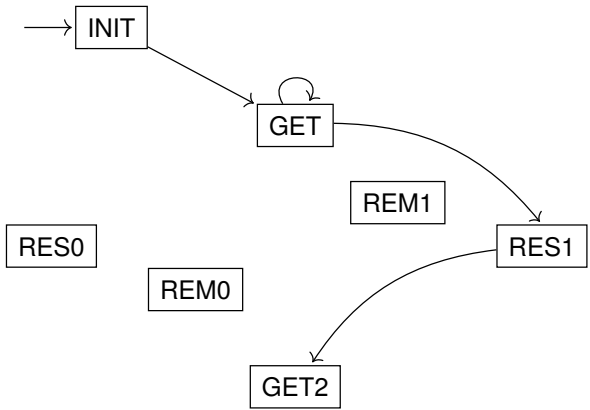
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



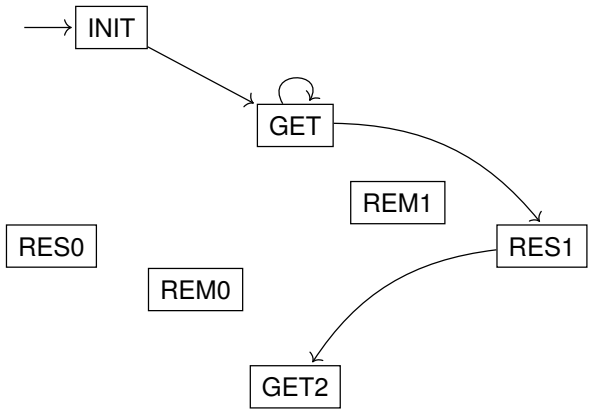
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



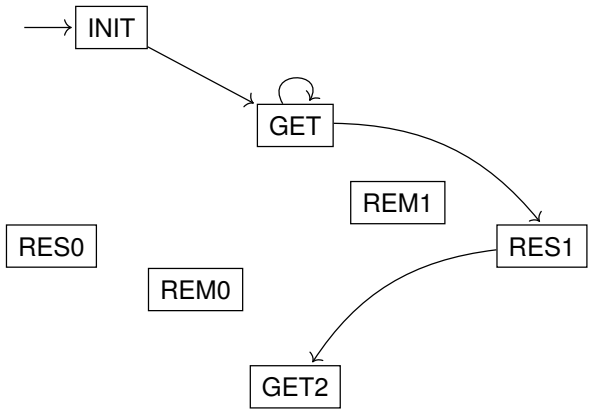
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



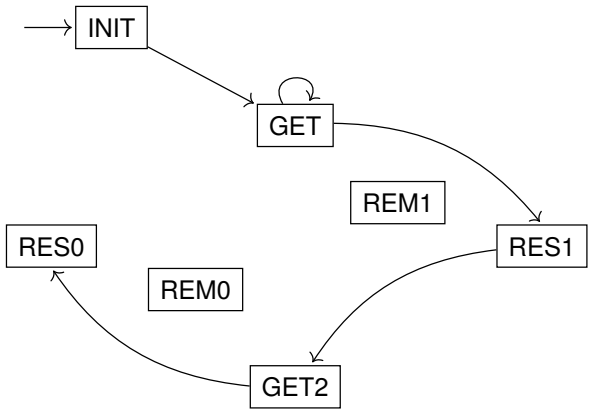
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



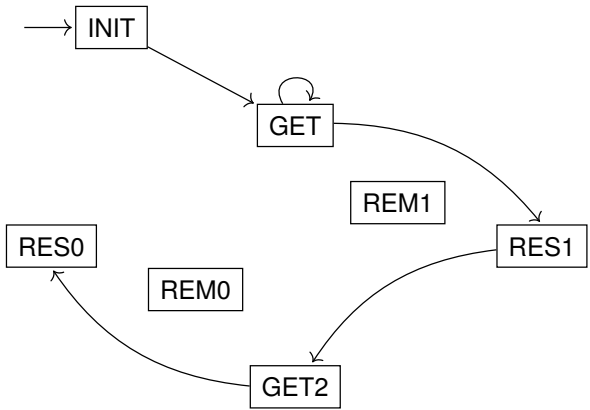
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



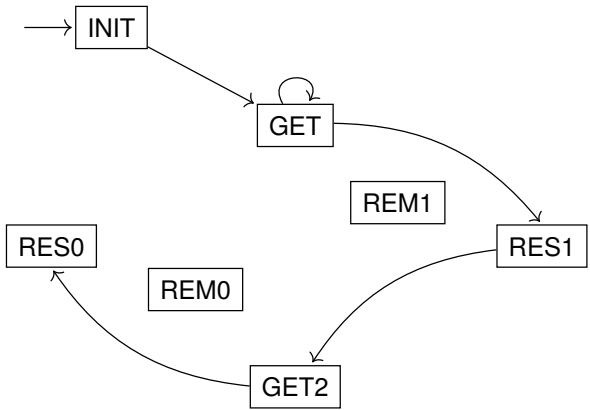
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



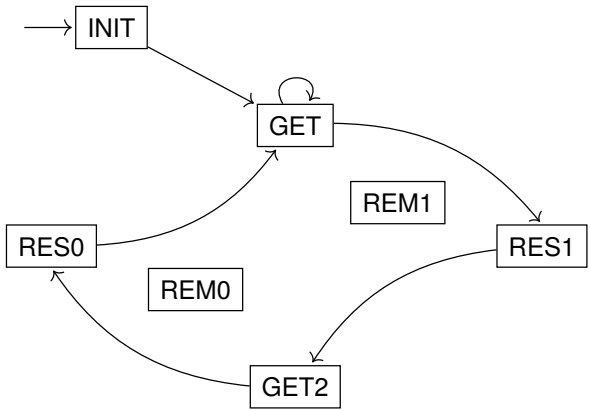
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



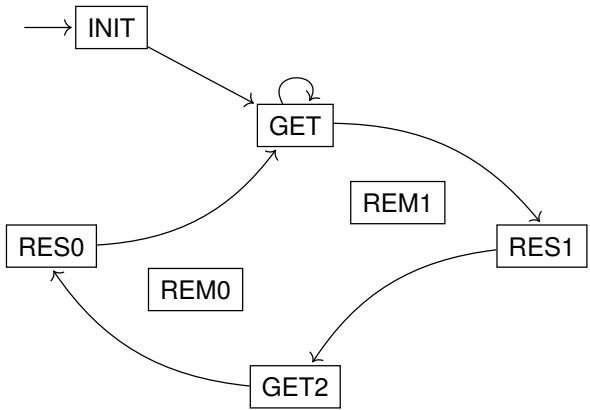
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



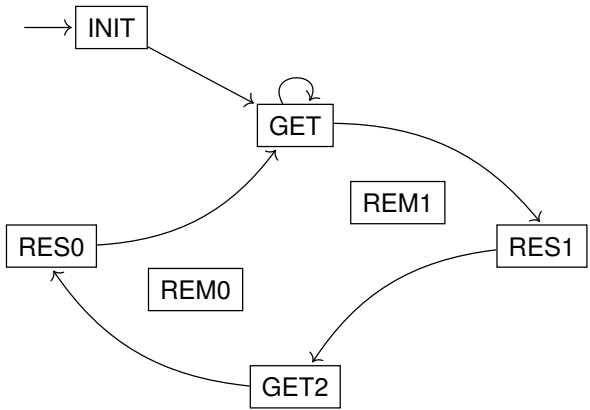
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



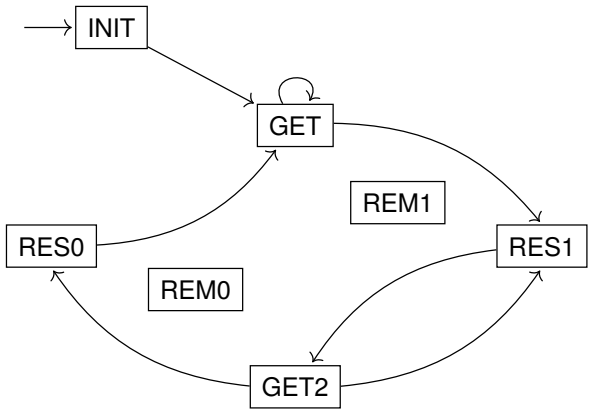
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



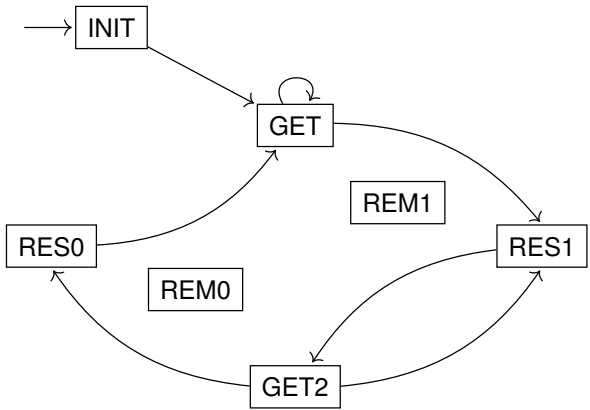
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



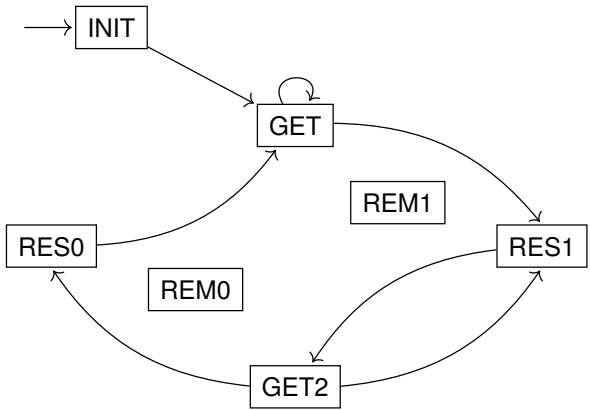
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
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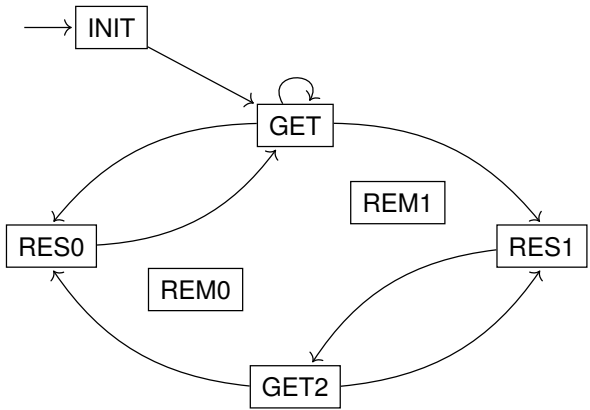
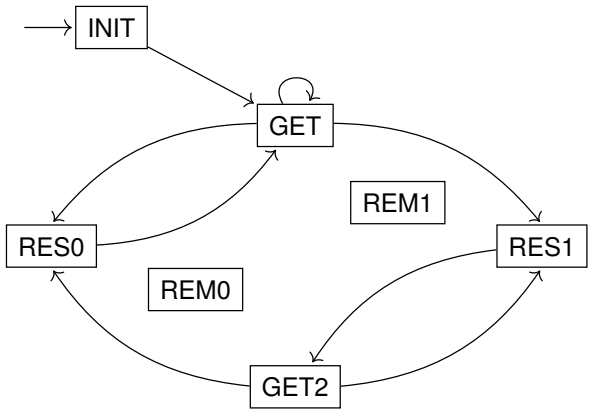
GET	
RES1	
GET2	
RES1	
GET2	



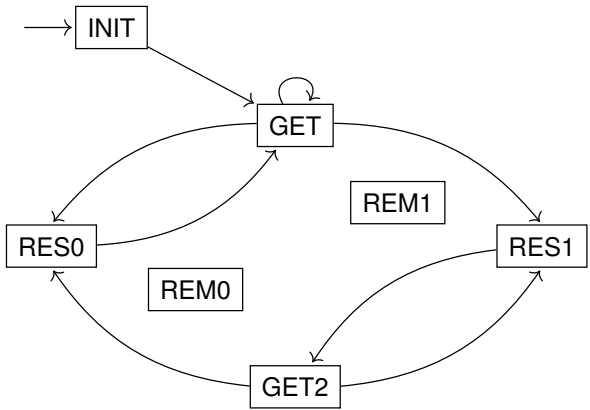
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



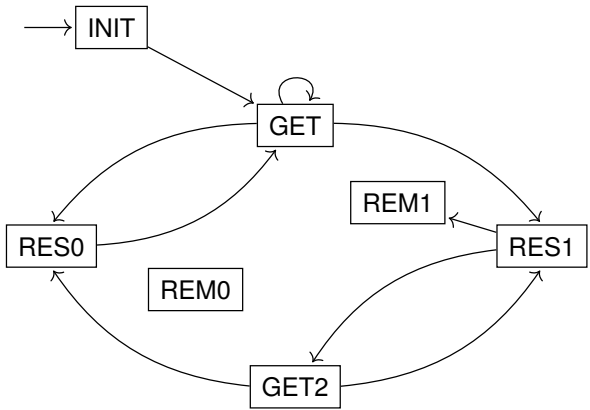
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



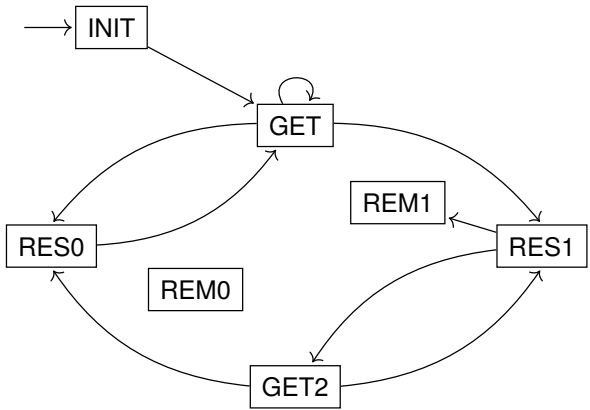
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	



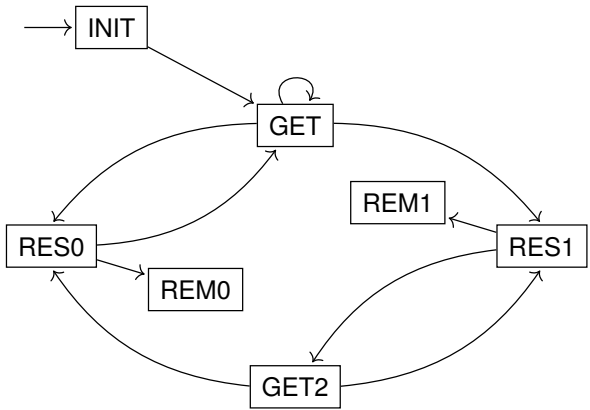
Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	

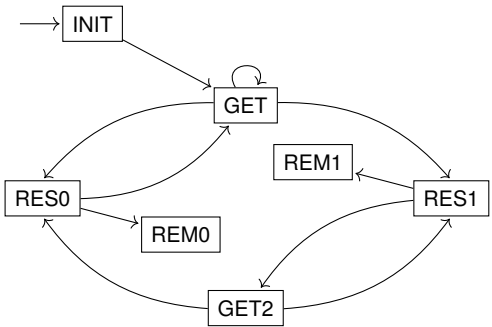


Kontrollflussgraph ableiten

INIT	RES1
GET	GET2
GET	RES0
GET	GET
GET	RES0
GET	GET
RES1	RES1
GET2	REM1
RES0	
GET	
RES1	
GET2	
RES1	
GET2	

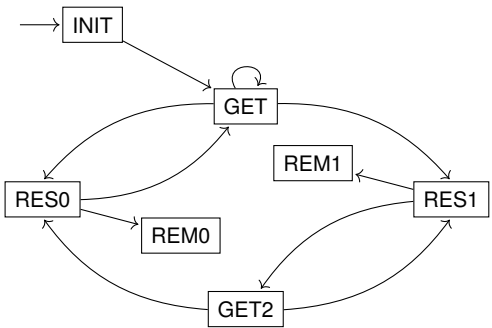


Binäre Entscheidungsbäume



Binäre Entscheidungsbäume

überlege ob Kanten fehlen!



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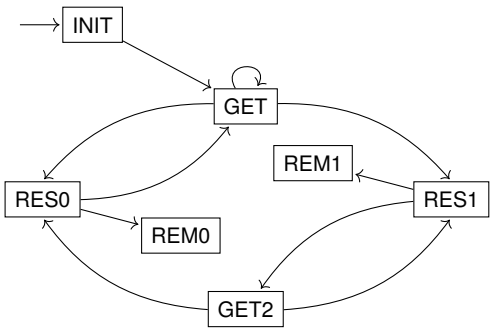
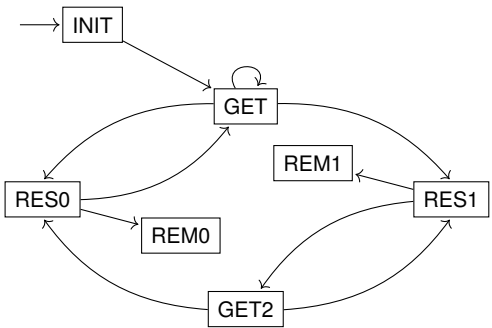


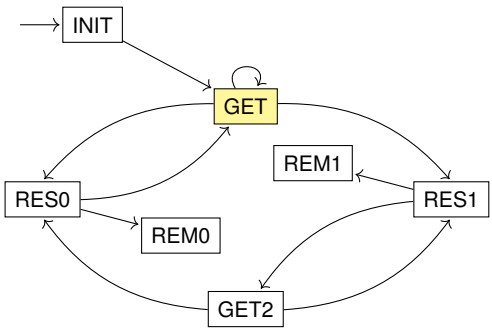
INIT: GET

Binäre Entscheidungsbäume



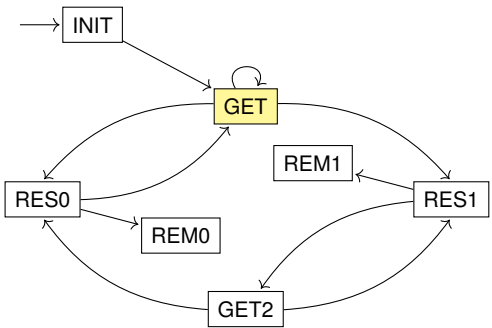
INIT: GET REM0, REM1: HALT

Binäre Entscheidungsbäume



INIT: GET REM0, REM1: HALT

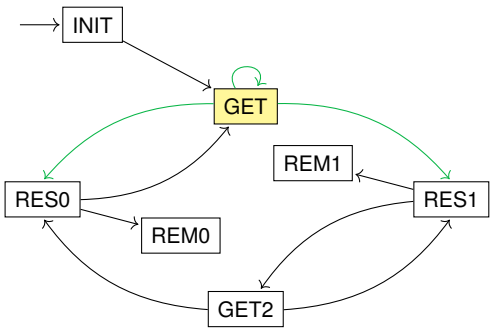
Binäre Entscheidungsbäume



INIT: GET REM0, REM1: HALT

GET:

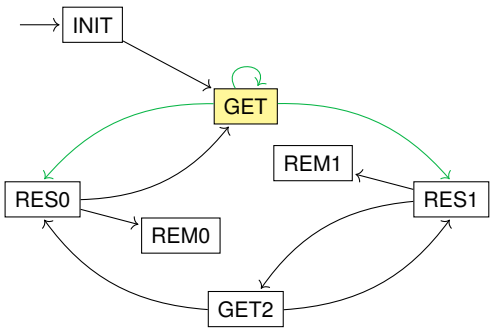
Binäre Entscheidungsbäume



INIT: GET REM0, REM1: HALT

GET:

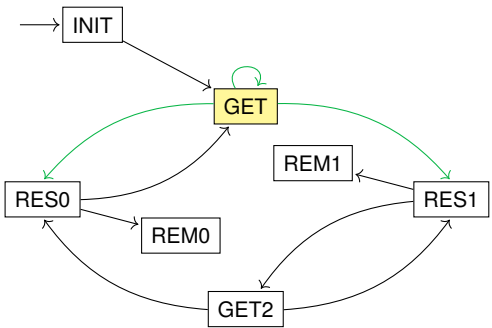
Binäre Entscheidungsbäume



INIT: GET REM0, REM1: HALT

GET: $x \geq b$

Binäre Entscheidungsbäume

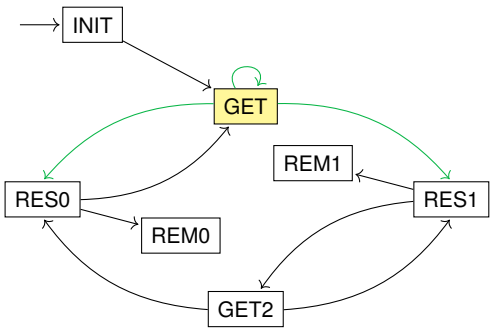


INIT: GET REM0, REM1: HALT

GET: $x \geq b$

RES1

Binäre Entscheidungsbäume

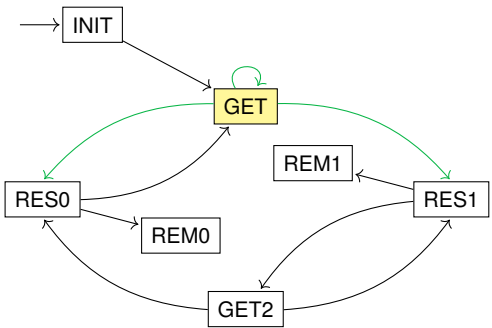


INIT: GET REM0, REM1: HALT

GET: $x \geq b$

$c = \varepsilon$ RES1

Binäre Entscheidungsbäume



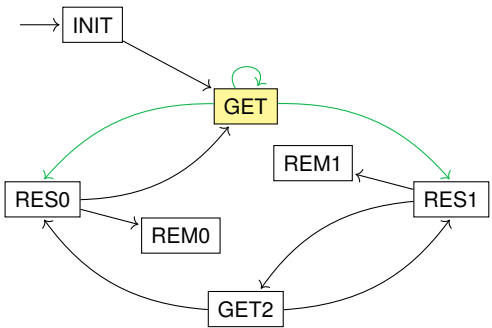
INIT: GET REM0, REM1: HALT

GET: $x \geq b$

$c = \varepsilon$ RES1

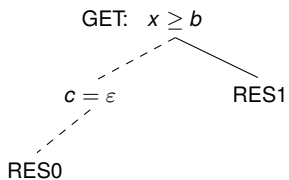
RES0

Binäre Entscheidungsbäume

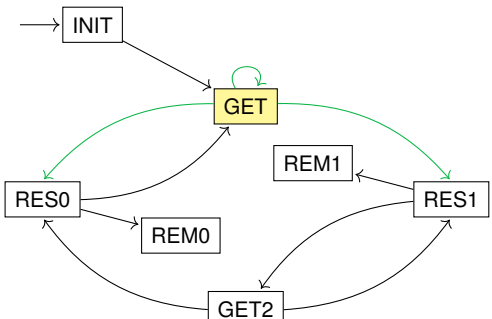


$0 \div 1 = 0$

INIT: GET REM0, REM1: HALT



Binäre Entscheidungsbäume



$$0 \div 1 = 0$$
$$11 \div 100 = 0$$

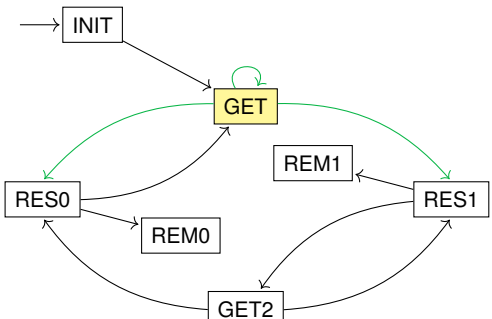
INIT: GET REM0, REM1: HALT

GET: $x \geq b$

$c = \varepsilon$ RES1

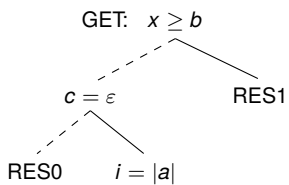
RES0

Binäre Entscheidungsbäume



$0 \div 1 = 0$
$11 \div 100 = 0$

INIT: GET REM0, REM1: HALT



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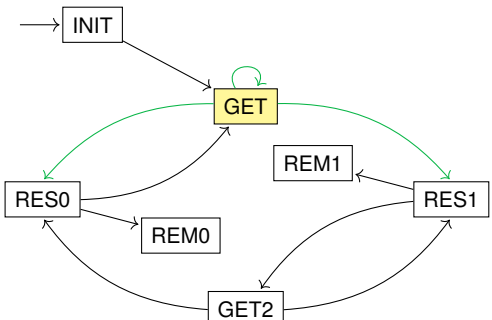
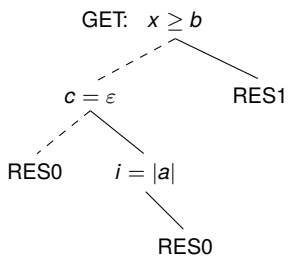
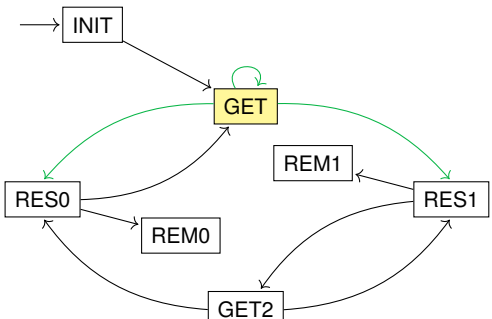


$0 \div 1 = 0$
$11 \div 100 = 0$

INIT: GET REM0, REM1: HALT

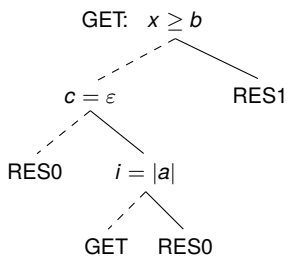


Binäre Entscheidungsbäume

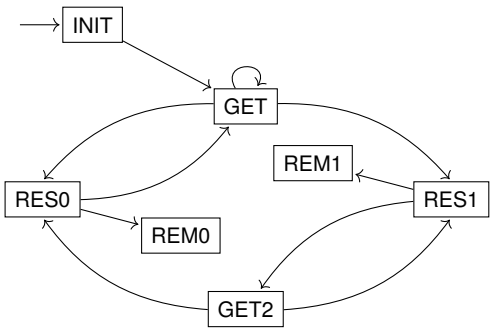


$0 \div 1 = 0$
$11 \div 100 = 0$

INIT: GET REM0, REM1: HALT



Binäre Entscheidungsbäume



INIT: GET REM0, REM1: HALT

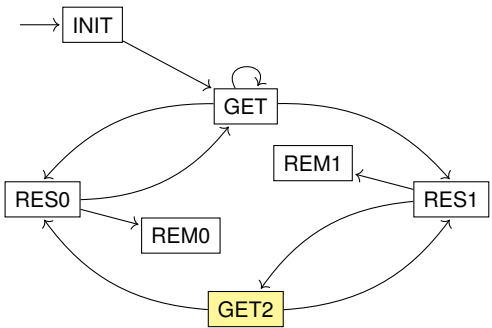
GET: $x \geq b$

$c = \varepsilon$ RES1

RES0 $i = |a|$

GET RES0

Binäre Entscheidungsbäume



INIT: GET REM0, REM1: HALT

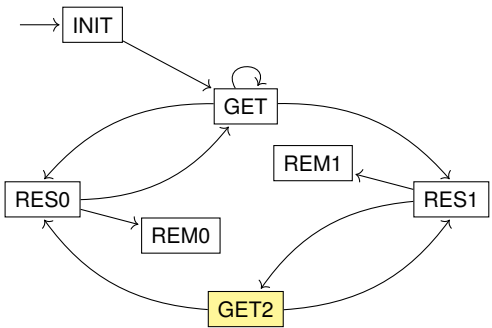
GET: $x \geq b$

$c = \varepsilon$ RES1

RES0 $i = |a|$

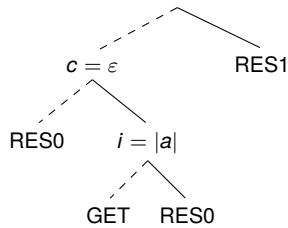
GET RES0

Binäre Entscheidungsbäume

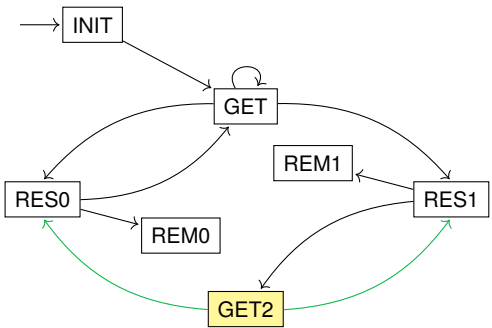


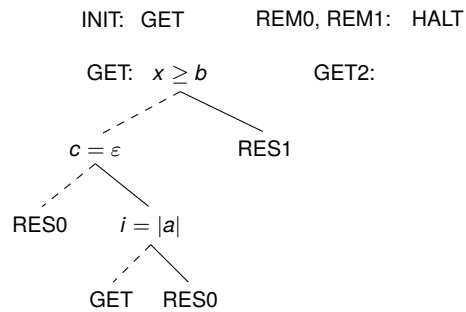
INIT: GET REM0, REM1: HALT

GET: $x \geq b$ GET2:

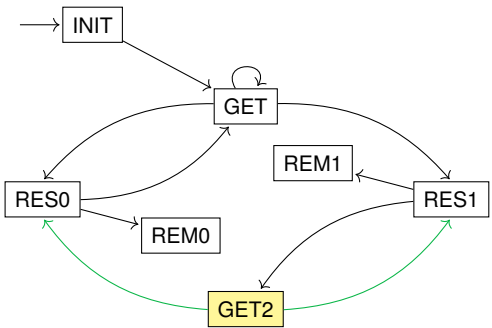


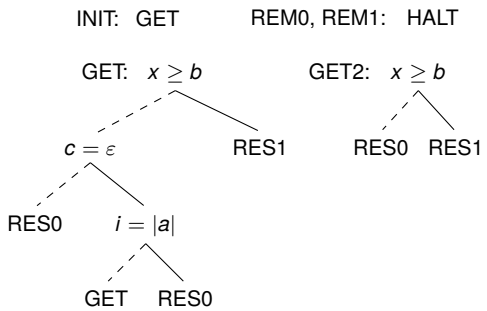
Binäre Entscheidungsbäume



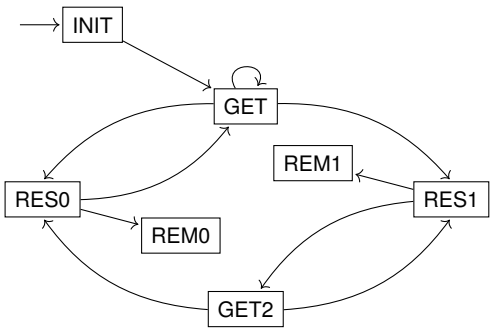


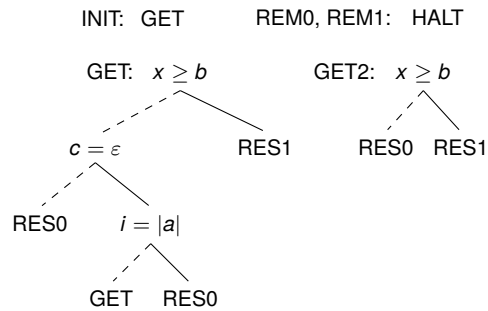
Binäre Entscheidungsbäume



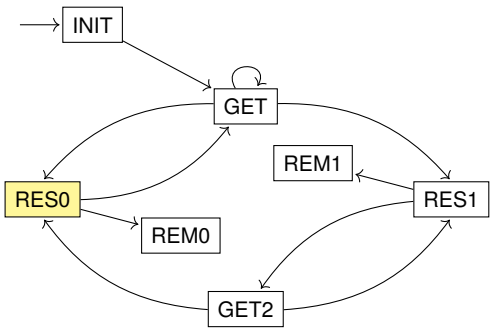


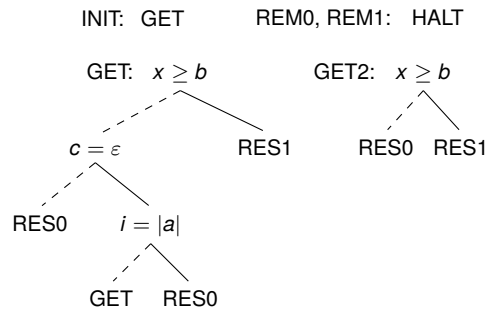
Binäre Entscheidungsbäume



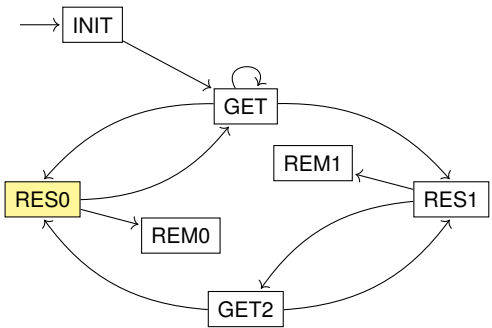


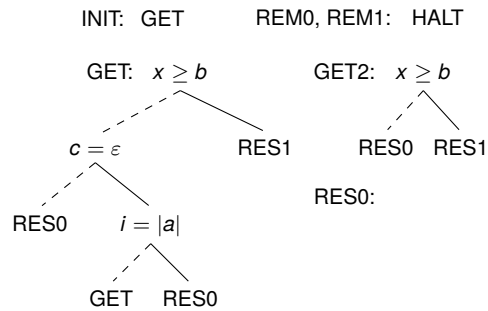
Binäre Entscheidungsbäume



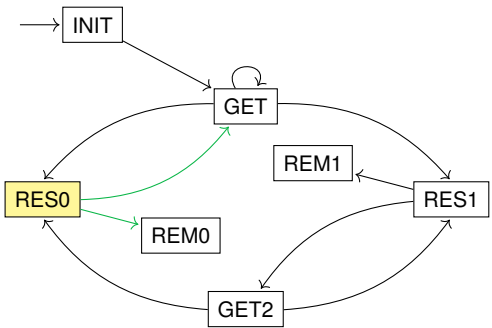


Binäre Entscheidungsbäume





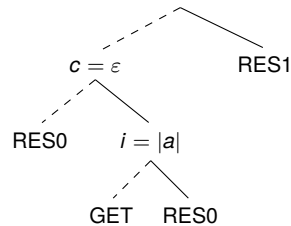
Binäre Entscheidungsbäume



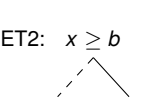
INIT: GET

REM0, REM1: HALT

GET: $x \geq b$

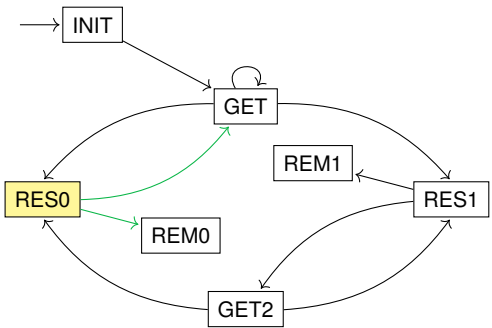


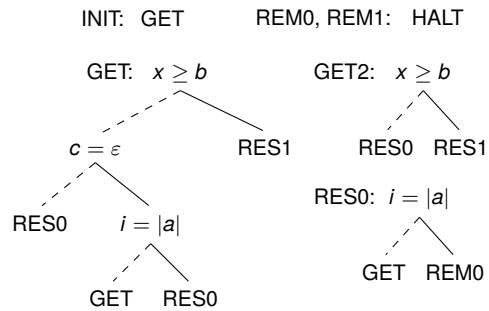
GET2: $x \geq b$



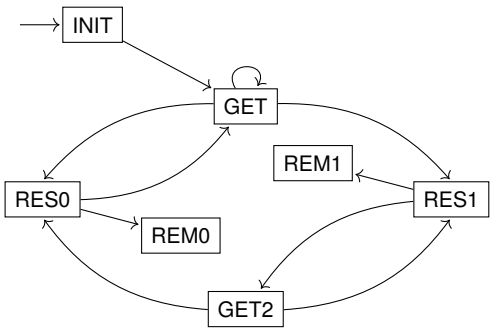
RES0:

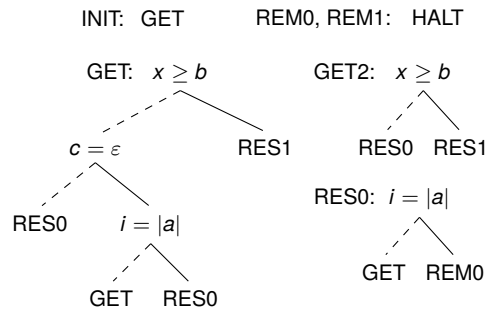
Binäre Entscheidungsbäume



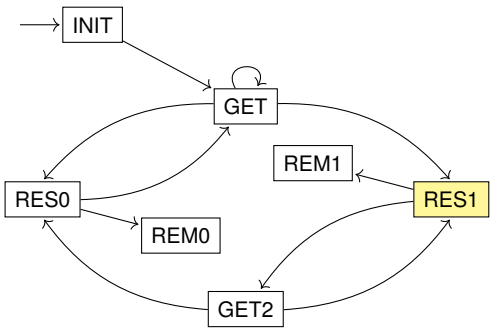


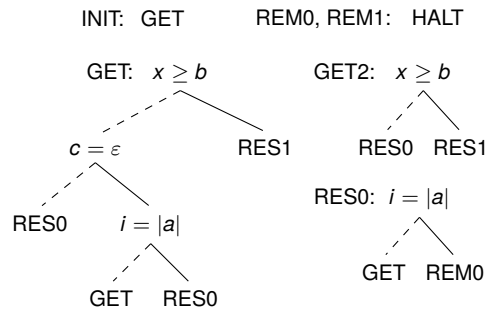
Binäre Entscheidungsbäume





Binäre Entscheidungsbäume





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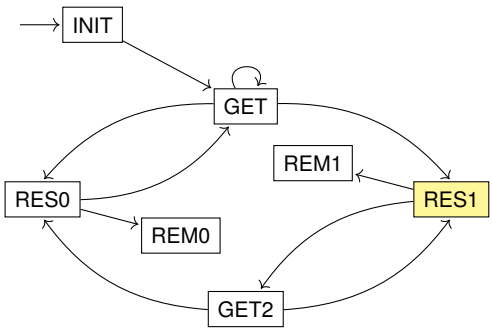
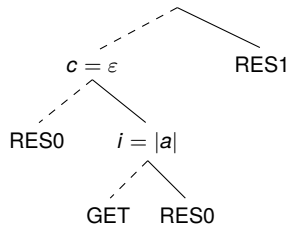


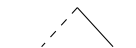
INIT: GET

REM0, REM1: HALT

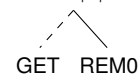
GET: $x \geq b$



GET2: $x \geq b$

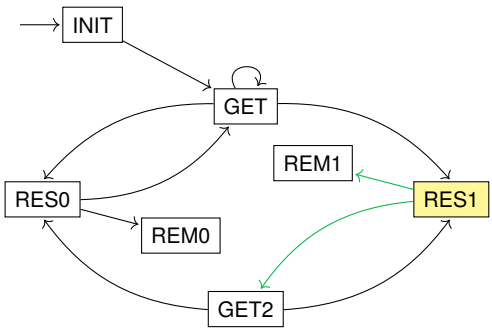


RES0: $i = |a|$



RES1:

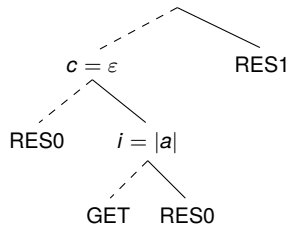
Binäre Entscheidungsbäume



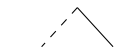
INIT: GET

REM0, REM1: HALT

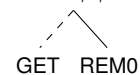
GET: $x \geq b$



GET2: $x \geq b$

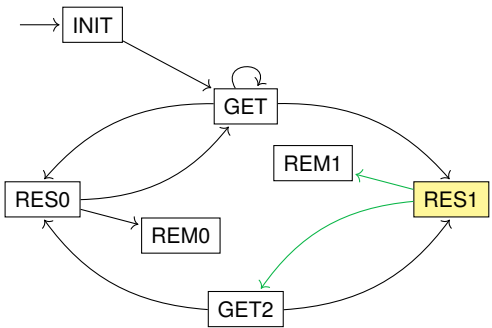


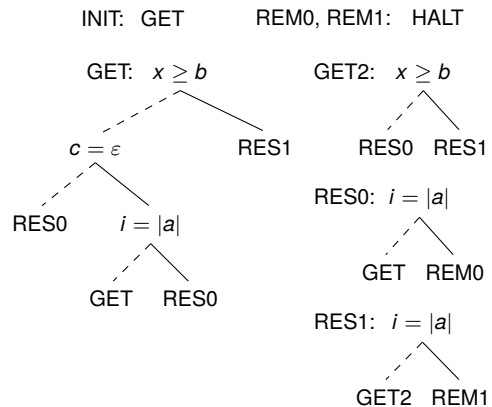
RES0: $i = |a|$



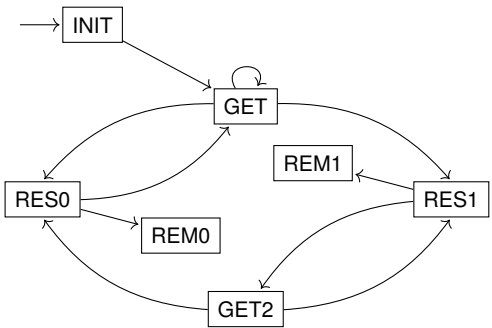
RES1:

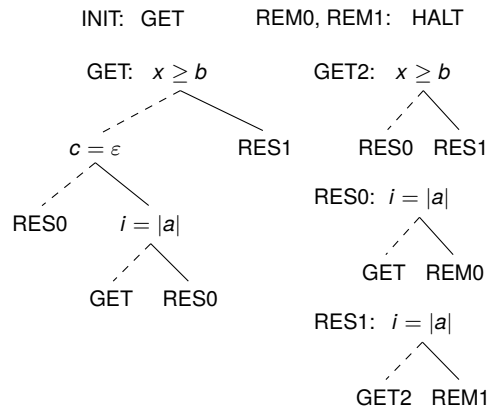
Binäre Entscheidungsbäume





Binäre Entscheidungsbäume





Abschließende Bemerkungen

- Operationen & Entscheidungsbäume beschreiben Programm vollständig

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- Operationen & Entscheidungsbäume beschreiben Programm vollständig
- Anwendungsbereich: Algorithmen mit komplexem Kontrollfluss

Abschließende Bemerkungen

- Operationen & Entscheidungsbäume beschreiben Programm vollständig
- Anwendungsbereich: Algorithmen mit komplexem Kontrollfluss
- häufige Fehler: fehlende Kanten / Operationen

Abschließende Bemerkungen

- Operationen & Entscheidungsbäume beschreiben Programm vollständig
- Anwendungsbereich: Algorithmen mit komplexem Kontrollfluss
- häufige Fehler: fehlende Kanten / Operationen
- Entscheidungsbäume gegen Spuren testbar

Abschließende Bemerkungen

- Operationen & Entscheidungsbäume beschreiben Programm vollständig
- Anwendungsbereich: Algorithmen mit komplexem Kontrollfluss
- häufige Fehler: fehlende Kanten / Operationen
- Entscheidungsbäume gegen Spuren testbar
- Anzahl der Operationen minimieren

Abschließende Bemerkungen

- Operationen & Entscheidungsbäume beschreiben Programm vollständig
- Anwendungsbereich: Algorithmen mit komplexem Kontrollfluss
- häufige Fehler: fehlende Kanten / Operationen
- Entscheidungsbäume gegen Spuren testbar
- Anzahl der Operationen minimieren
- macht Programmieren nachvollziehbar