算法

- 辗转相减法
  - 通过不断的两数相减并将结果移给被减数，然后不断重复相减的过程，直到两数相等，则停止，两个数都是最大公约数
  - 若a > b,则(a, b) = (a-b, b)
  - 若a < b,则(a, b) = (a, -(a-b));
  - 若a = b,则最大公约数即a

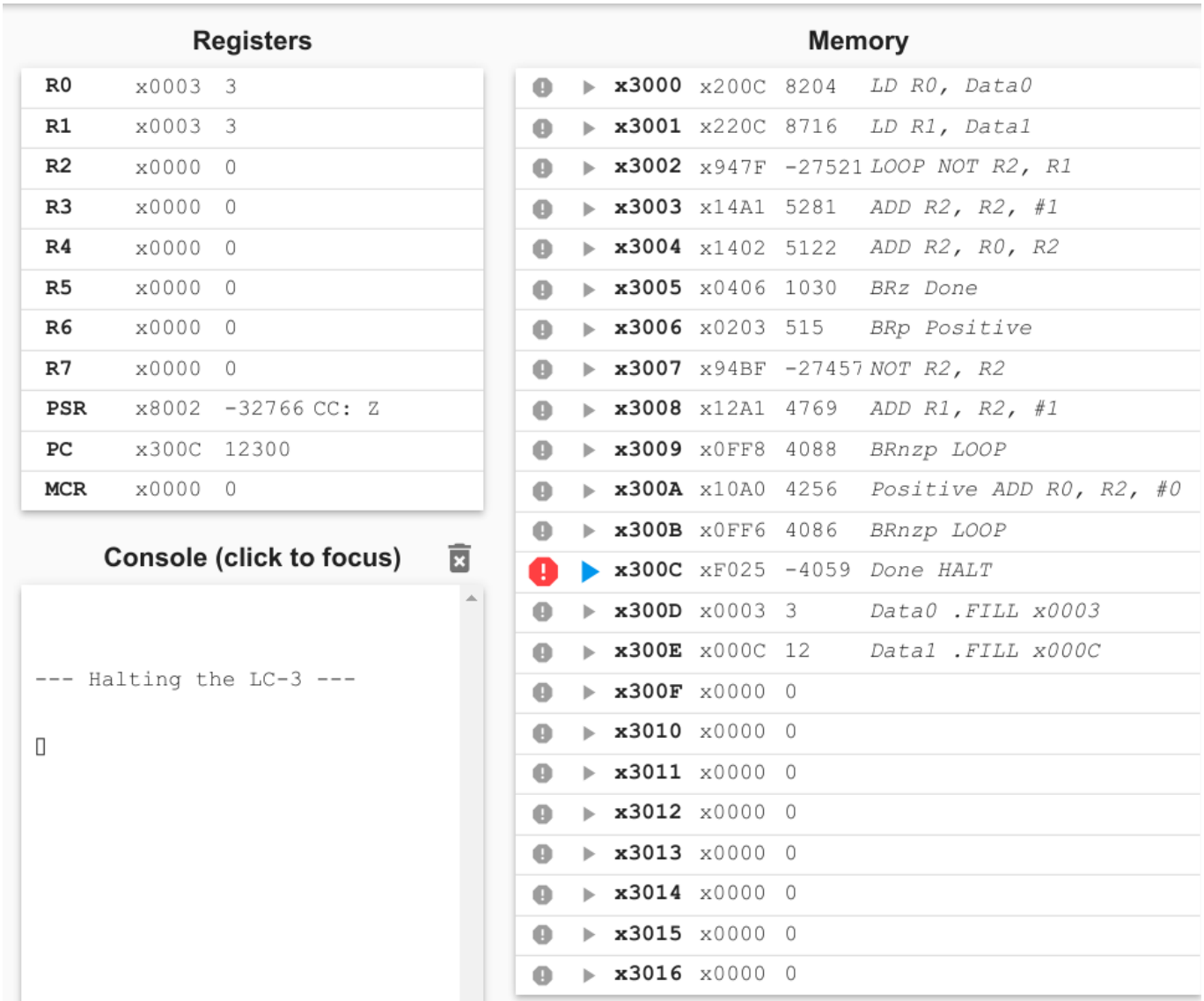
写代码

```
            .ORIG x3000
            LD R0, Data0
            LD R1, Data1
LOOP        NOT R2, R1
            ADD R2, R2, #1  ;   R2 <- -R1
            ADD R2, R0, R2  ;   R2 <- R0-R1
            BRz Done
            BRp Positive    ;   (R0 > R1)?(R0 <- R2):(R1 <- -R2) (R0 != R1)
            NOT R2, R2
            ADD R1, R2, #1  ;   R1 <- -R2
            BRnzp LOOP
Positive    ADD R0, R2, #0  ;   R0 <- R2
            BRnzp LOOP
Done        HALT
Data0       .FILL x0018
Data1       .FILL x0020
            .END
```

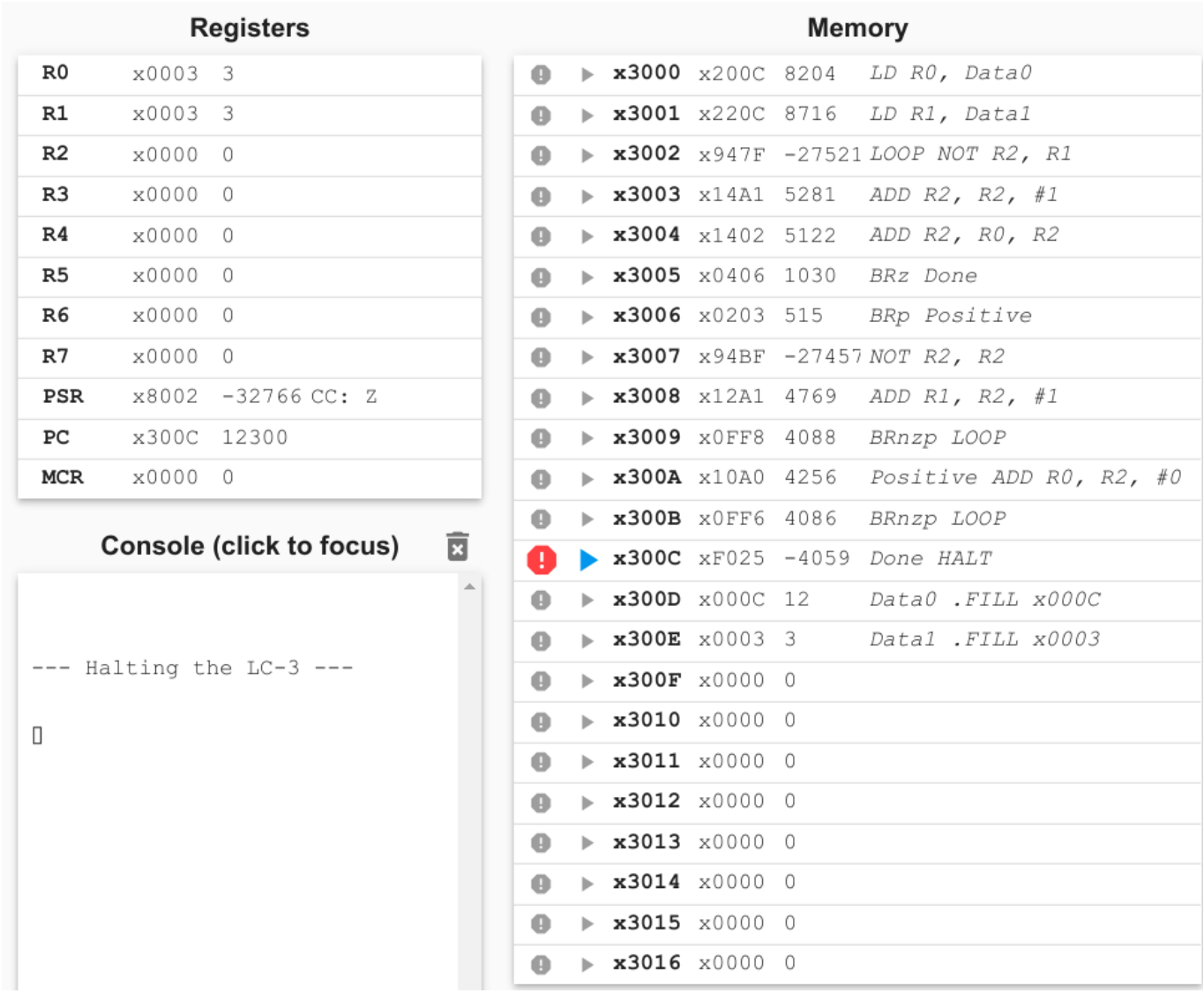
1. 由算法,R0-R1是一个共同操作，如果R0-R1=0则已经找到结果，直接跳转到HALT，否则，判断R0-R1>0，如果成立，则将结果(储存在R2中)赋给R0，否则应将-R2赋给R1，所以整体看来，就是将差的绝对值赋给R0，R1中较大的那个

测试数据

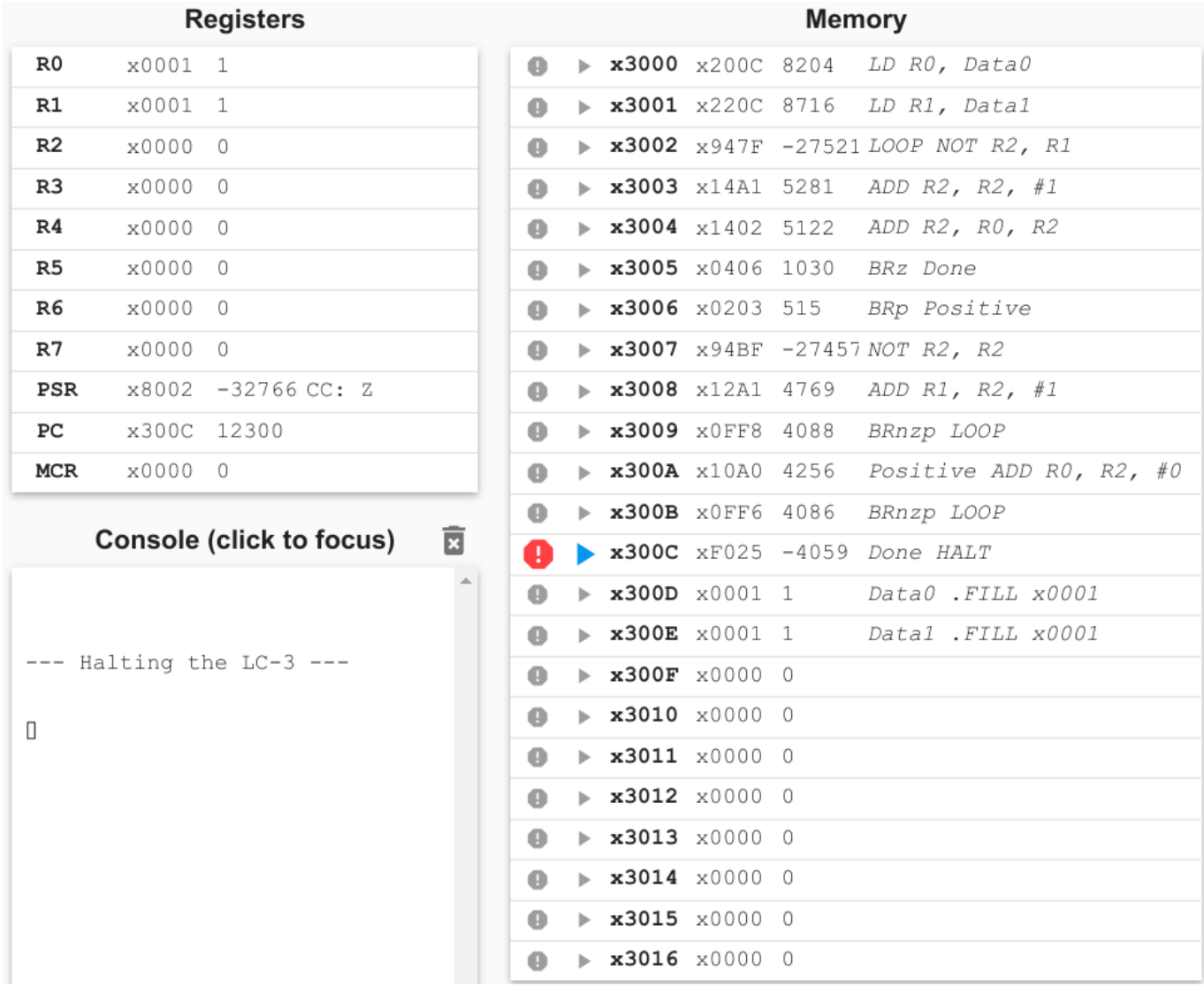
Example (3, 12)


Registers
R0 x0003 3
R1 x0003 3
R2 x0000 0
R3 x0000 0
R4 x0000 0
R5 x0000 0
R6 x0000 0
R7 x0000 0
PSR x8002 -32766 CC: Z
PC x300C 12300
MCR x0000 0
Console (click to focus)
--- Halting the LC-3 ---
Memory
x3000 x200C 8204 LD R0, Data0
x3001 x220C 8716 LD R1, Data1
x3002 x947F -27521 LOOP NOT R2, R1
x3003 x14A1 5281 ADD R2, R2, #1
x3004 x1402 5122 ADD R2, R0, R2
x3005 x0406 1030 BRz Done
x3006 x0203 515 BRp Positive
x3007 x94BF -27457 NOT R2, R2
x3008 x12A1 4769 ADD R1, R2, #1
x3009 x0FF8 4088 BRnzp LOOP
x300A x10A0 4256 Positive ADD R0, R2, #0
x300B x0FF6 4086 BRnzp LOOP
x300C xF025 -4059 Done HALT
x300D x0003 3 Data0 .FILL x0003
x300E x000C 12 Data1 .FILL x000C
x300F x0000 0
x3010 x0000 0
x3011 x0000 0
x3012 x0000 0
x3013 x0000 0
x3014 x0000 0
x3015 x0000 0
x3016 x0000 0

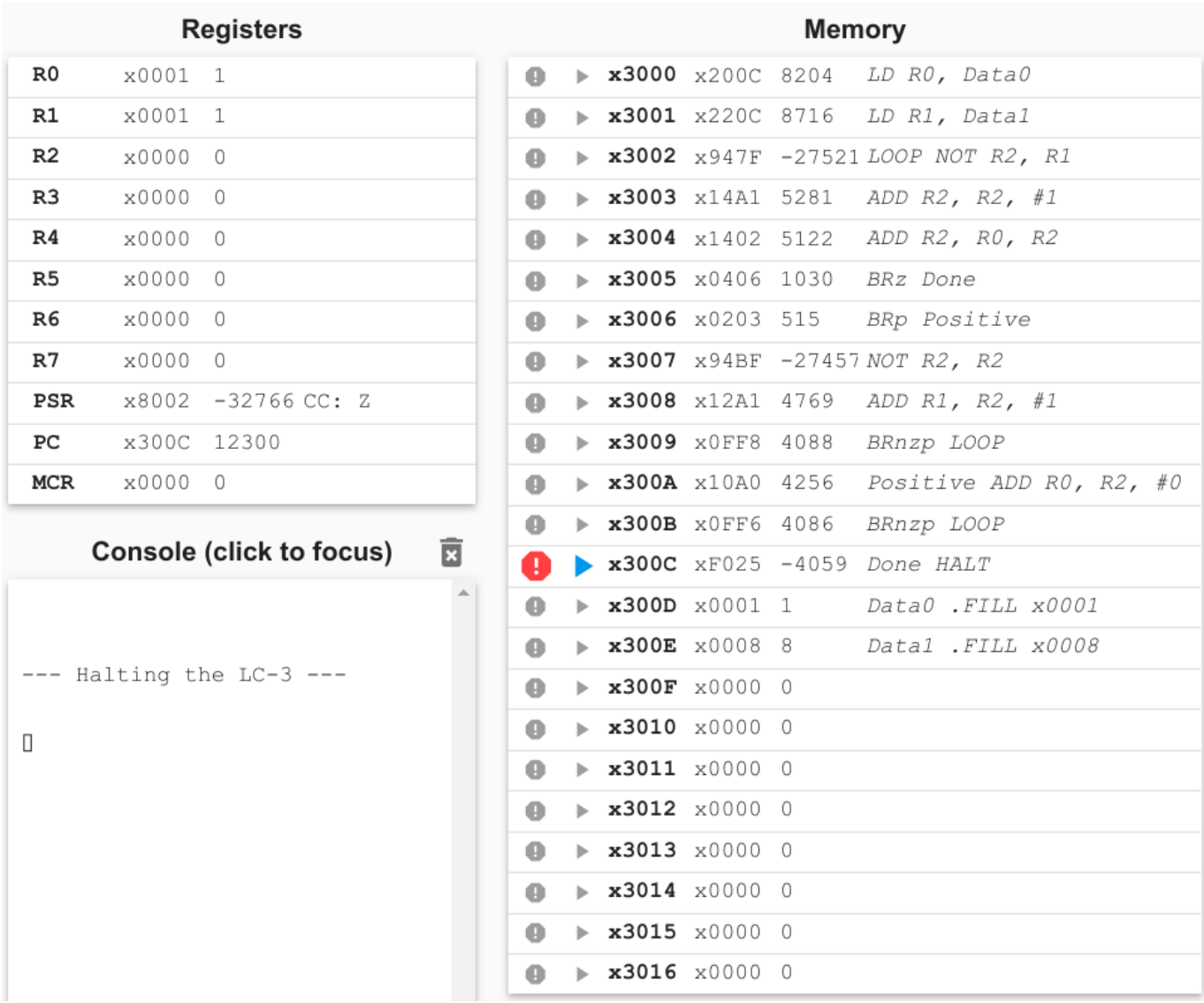
反过来 (12, 3)


Registers
R0 x0003 3
R1 x0003 3
R2 x0000 0
R3 x0000 0
R4 x0000 0
R5 x0000 0
R6 x0000 0
R7 x0000 0
PSR x8002 -32766 CC: Z
PC x300C 12300
MCR x0000 0
Console (click to focus)
--- Halting the LC-3 ---
Memory
x3000 x200C 8204 LD R0, Data0
x3001 x220C 8716 LD R1, Data1
x3002 x947F -27521 LOOP NOT R2, R1
x3003 x14A1 5281 ADD R2, R2, #1
x3004 x1402 5122 ADD R2, R0, R2
x3005 x0406 1030 BRz Done
x3006 x0203 515 BRp Positive
x3007 x94BF -27457 NOT R2, R2
x3008 x12A1 4769 ADD R1, R2, #1
x3009 x0FF8 4088 BRnzp LOOP
x300A x10A0 4256 Positive ADD R0, R2, #0
x300B x0FF6 4086 BRnzp LOOP
x300C xF025 -4059 Done HALT
x300D x000C 12 Data0 .FILL x000C
x300E x0003 3 Data1 .FILL x0003
x300F x0000 0
x3010 x0000 0
x3011 x0000 0
x3012 x0000 0
x3013 x0000 0
x3014 x0000 0
x3015 x0000 0
x3016 x0000 0

1,1较为特殊 (1, 1)


Registers
R0 x0001 1
R1 x0001 1
R2 x0000 0
R3 x0000 0
R4 x0000 0
R5 x0000 0
R6 x0000 0
R7 x0000 0
PSR x8002 -32766 CC: Z
PC x300C 12300
MCR x0000 0
Console (click to focus)
--- Halting the LC-3 ---
Memory
x3000 x200C 8204 LD R0, Data0
x3001 x220C 8716 LD R1, Data1
x3002 x947F -27521 LOOP NOT R2, R1
x3003 x14A1 5281 ADD R2, R2, #1
x3004 x1402 5122 ADD R2, R0, R2
x3005 x0406 1030 BRz Done
x3006 x0203 515 BRp Positive
x3007 x94BF -27457 NOT R2, R2
x3008 x12A1 4769 ADD R1, R2, #1
x3009 x0FF8 4088 BRnzp LOOP
x300A x10A0 4256 Positive ADD R0, R2, #0
x300B x0FF6 4086 BRnzp LOOP
x300C xF025 -4059 Done HALT
x300D x0001 1 Data0 .FILL x0001
x300E x0001 1 Data1 .FILL x0001
x300F x0000 0
x3010 x0000 0
x3011 x0000 0
x3012 x0000 0
x3013 x0000 0
x3014 x0000 0
x3015 x0000 0
x3016 x0000 0

(1, 8)


Registers
R0 x0001 1
R1 x0001 1
R2 x0000 0
R3 x0000 0
R4 x0000 0
R5 x0000 0
R6 x0000 0
R7 x0000 0
PSR x8002 -32766 CC: Z
PC x300C 12300
MCR x0000 0
Console (click to focus)
--- Halting the LC-3 ---
Memory
x3000 x200C 8204 LD R0, Data0
x3001 x220C 8716 LD R1, Data1
x3002 x947F -27521 LOOP NOT R2, R1
x3003 x14A1 5281 ADD R2, R2, #1
x3004 x1402 5122 ADD R2, R0, R2
x3005 x0406 1030 BRz Done
x3006 x0203 515 BRp Positive
x3007 x94BF -27457 NOT R2, R2
x3008 x12A1 4769 ADD R1, R2, #1
x3009 x0FF8 4088 BRnzp LOOP
x300A x10A0 4256 Positive ADD R0, R2, #0
x300B x0FF6 4086 BRnzp LOOP
x300C xF025 -4059 Done HALT
x300D x0001 1 Data0 .FILL x0001
x300E x0008 8 Data1 .FILL x0008
x300F x0000 0
x3010 x0000 0
x3011 x0000 0
x3012 x0000 0
x3013 x0000 0
x3014 x0000 0
x3015 x0000 0
x3016 x0000 0

两个偶数，且最大公约数不是这两个数 (24, 32)

Registers

R0	x0008	8
R1	x0008	8
R2	x0000	0
R3	x0000	0
R4	x0000	0
R5	x0000	0
R6	x0000	0
R7	x0000	0
PSR	x8002	-32766 CC: Z
PC	x300C	12300
MCR	x0000	0

Console (click to focus)

```
--- Halting the LC-3 ---


--- Halting the LC-3 ---

```

Memory

x3000	x200C	8204	*LD R0, Data0*
x3001	x220C	8716	*LD R1, Data1*
x3002	x947F	-27521	*LOOP NOT R2, R1*
x3003	x14A1	5281	*ADD R2, R2, #1*
x3004	x1402	5122	*ADD R2, R0, R2*
x3005	x0406	1030	*BRz Done*
x3006	x0203	515	*BRp Positive*
x3007	x94BF	-27457	*NOT R2, R2*
x3008	x12A1	4769	*ADD R1, R2, #1*
x3009	x0FF8	4088	*BRnzp LOOP*
x300A	x10A0	4256	*Positive ADD R0, R2, #0*
x300B	x0FF6	4086	*BRnzp LOOP*
x300C	xF025	-4059	*Done HALT*
x300D	x0018	24	*Data0 .FILL x0018*
x300E	x0020	32	*Data1 .FILL x0020*
x300F	x0000	0	
x3010	x0000	0	
x3011	x0000	0	
x3012	x0000	0	
x3013	x0000	0	
x3014	x0000	0	
x3015	x0000	0	
x3016	x0000	0	

一个偶数，一个奇数，但不互质 (33, 24)

Registers

R0	x0003	3
R1	x0003	3
R2	x0000	0
R3	x0000	0
R4	x0000	0
R5	x0000	0
R6	x0000	0
R7	x0000	0
PSR	x8002	-32766 CC: Z
PC	x300C	12300
MCR	x0000	0

Memory

x3000	x200C	8204	*LD R0, Data0*	
x3001	x220C	8716	*LD R1, Data1*	
x3002	x947F	-27521	*LOOP NOT R2, R1*	
x3003	x14A1	5281	*ADD R2, R2, #1*	
x3004	x1402	5122	*ADD R2, R0, R2*	
x3005	x0406	1030	*BRz Done*	
x3006	x0203	515	*BRp Positive*	
x3007	x94BF	-27457	*NOT R2, R2*	
x3008	x12A1	4769	*ADD R1, R2, #1*	
x3009	x0FF8	4088	*BRnzp LOOP*	
x300A	x10A0	4256	*Positive ADD R0, R2, #0*	
x300B	x0FF6	4086	*BRnzp LOOP*	
x300C	xF025	-4059	*Done HALT*	
x300D	x0021	33	*Data0 .FILL x0021*	
x300E	x0018	24	*Data1 .FILL x0018*	
x300F	x0000	0		
x3010	x0000	0		

Console (click to focus)

```
--- Halting the LC-3 ---
```

两个奇数，互质 (5, 7)

Registers

R0	x0001	1
R1	x0001	1
R2	x0000	0
R3	x0000	0
R4	x0000	0
R5	x0000	0
R6	x0000	0
R7	x0000	0
PSR	x8002	-32766 CC: Z
PC	x300C	12300
MCR	x0000	0

Memory

x3000	x200C	8204	*LD R0, Data0*	
x3001	x220C	8716	*LD R1, Data1*	
x3002	x947F	-27521	*LOOP NOT R2, R1*	
x3003	x14A1	5281	*ADD R2, R2, #1*	
x3004	x1402	5122	*ADD R2, R0, R2*	
x3005	x0406	1030	*BRz Done*	
x3006	x0203	515	*BRp Positive*	
x3007	x94BF	-27457	*NOT R2, R2*	
x3008	x12A1	4769	*ADD R1, R2, #1*	
x3009	x0FF8	4088	*BRnzp LOOP*	
x300A	x10A0	4256	*Positive ADD R0, R2, #0*	
x300B	x0FF6	4086	*BRnzp LOOP*	
x300C	xF025	-4059	*Done HALT*	
x300D	x0005	5	*Data0 .FILL x0005*	
x300E	x0007	7	*Data1 .FILL x0007*	
x300F	x0000	0		
x3010	x0000	0		
x3011	x0000	0		
x3012	x0000	0		
x3013	x0000	0		
x3014	x0000	0		

Console (click to focus)

```
--- Halting the LC-3 ---


--- Halting the LC-3 ---

```

一个偶数，一个奇数，互质 (5, 12)