BETA ASSEMBLY

Simulated execution

A SIMPLE PROGRAM

```
1  .include beta.uasm
2      CMOVE(tos, SP)
3      BR(main)
4
5  x:
6      LONG(42)
7
8  f:
9      PUSH(LP)
10     PUSH(BP)
11     MOVE(SP, BP)
12     PUSH(R3)
13     | do smtg, put result in R0
14     POP(R3)
15     POP(BP)
16     POP(LP)
17     RTN() | defined as JMP(LP, R31)
18
19 main:
20     LDR(x, R1)
21     PUSH(R1)
22     CALL(f) | defined as BR(f, R31)
23     DEALLOCATE(1)
24     HALT()
25
26 tos:
27
```

This program only calls a procedure « f » with argument « x ».

A SIMPLE PROGRAM

```
1  .include beta.uasm
2      CMOVE(tos, SP)
3      BR(main)
4
5  x:
6      LONG(42)
7
8  f:
9      PUSH(LP)
10     PUSH(BP)
11     MOVE(SP, BP)
12     PUSH(R3)
13     | do smtg, put result in R0
14     POP(R3)
15     POP(BP)
16     POP(LP)
17     RTN() | defined as JMP(LP, R31)
18
19 main:
20     LDR(x, R1)
21     PUSH(R1)
22     CALL(f) | defined as BR(f, R31)
23     DEALLOCATE(1)
24     HALT()
25
26 tos:
27
```

- f takes 1 argument
- f needs R3 in its computations
- f puts its result in R0

A SIMPLE PROGRAM

```
1  .include beta.uasm
2      CMOVE(tos, SP)
3      BR(main)
4
5  x:
6      LONG(42)
7
8  f:
9      PUSH(LP)
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13     | do smtg, put result in R0
14     POP(R3)
15     POP(BP)
16     POP(LP)
17     RTN() | defined as JMP(LP, R31)
18
19 main:
20     LDR(x, R1)
21     PUSH(R1)
22     CALL(f) | defined as BR(f, R31)
23     DEALLOCATE(1)
24     HALT()
25
26 tos:
27
```

CMOVE(BP, SP) was omitted as it was not necessary

LP ??
BP ?? SP ??
} We don't care

LOADED IN MEMORY

```
1  .include beta.uasm
2      CMOVE(tos, SP)
3      BR(main)
4
5  x:
6      LONG(42)
7
8  f:
9      PUSH(LP)
10     PUSH(BP)
11     MOVE(SP, BP)
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13     | do smtg, put result in R0
14     POP(R3)
15     POP(BP)
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19 main:
20     LDR(x, R1)
21     PUSH(R1)
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23     DEALLOCATE(1)
24     HALT()
25
26 tos:
27
```
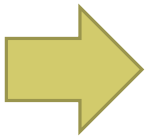



32 bits

PC →

	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	0

LP ??

BP ??

We don't care

PC →

SP →

	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	0

88	0
92	0
96	0
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0

LP ??

BP ??

We don't care

	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	0

PC →

SP →

88	0
92	0
96	0
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0

LP ??

BP ??

We don't care

	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	0

PC →

SP →

88	0
92	0
96	0
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0

LP ??

BP ??

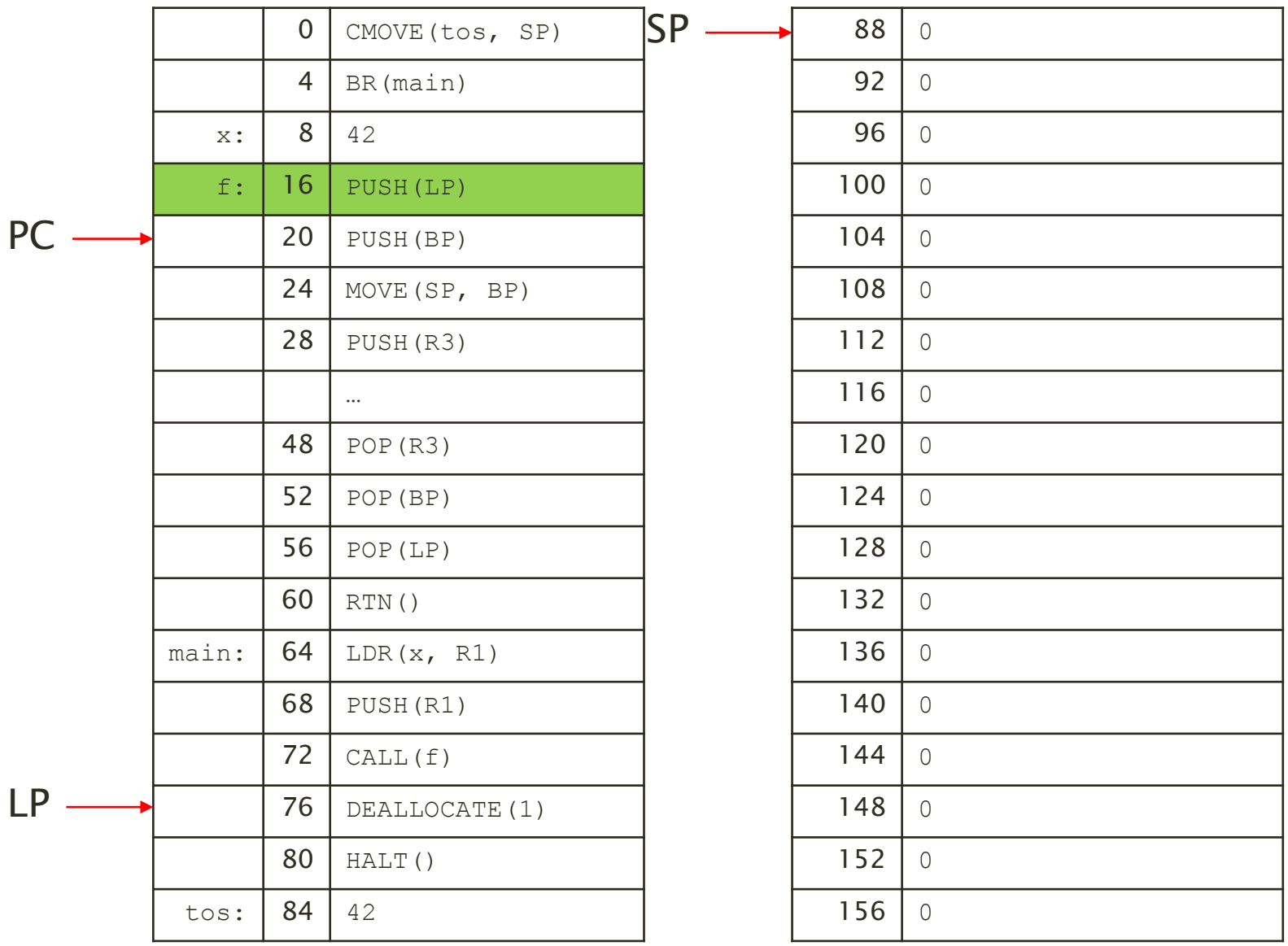
We don't care

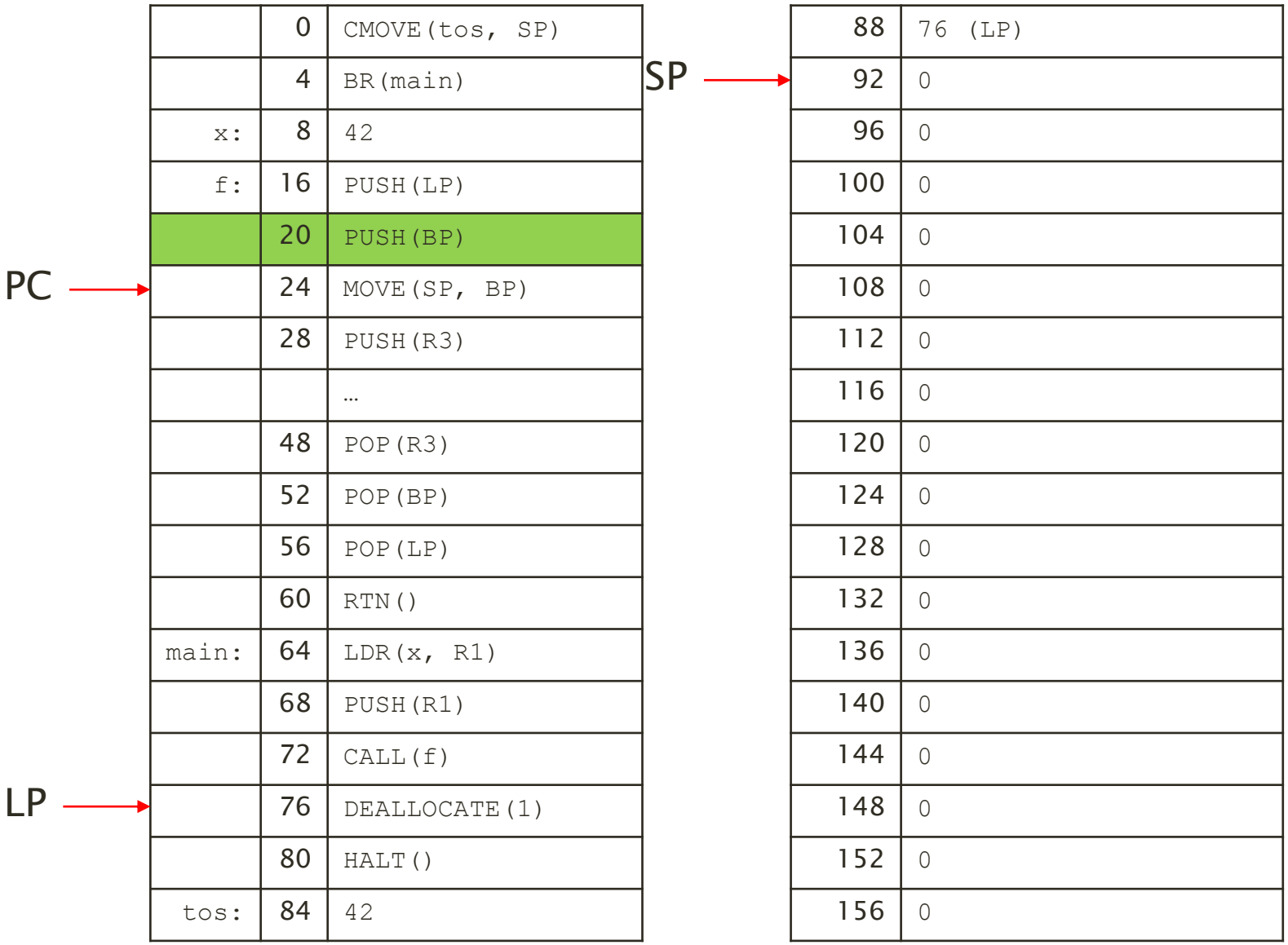
	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	42

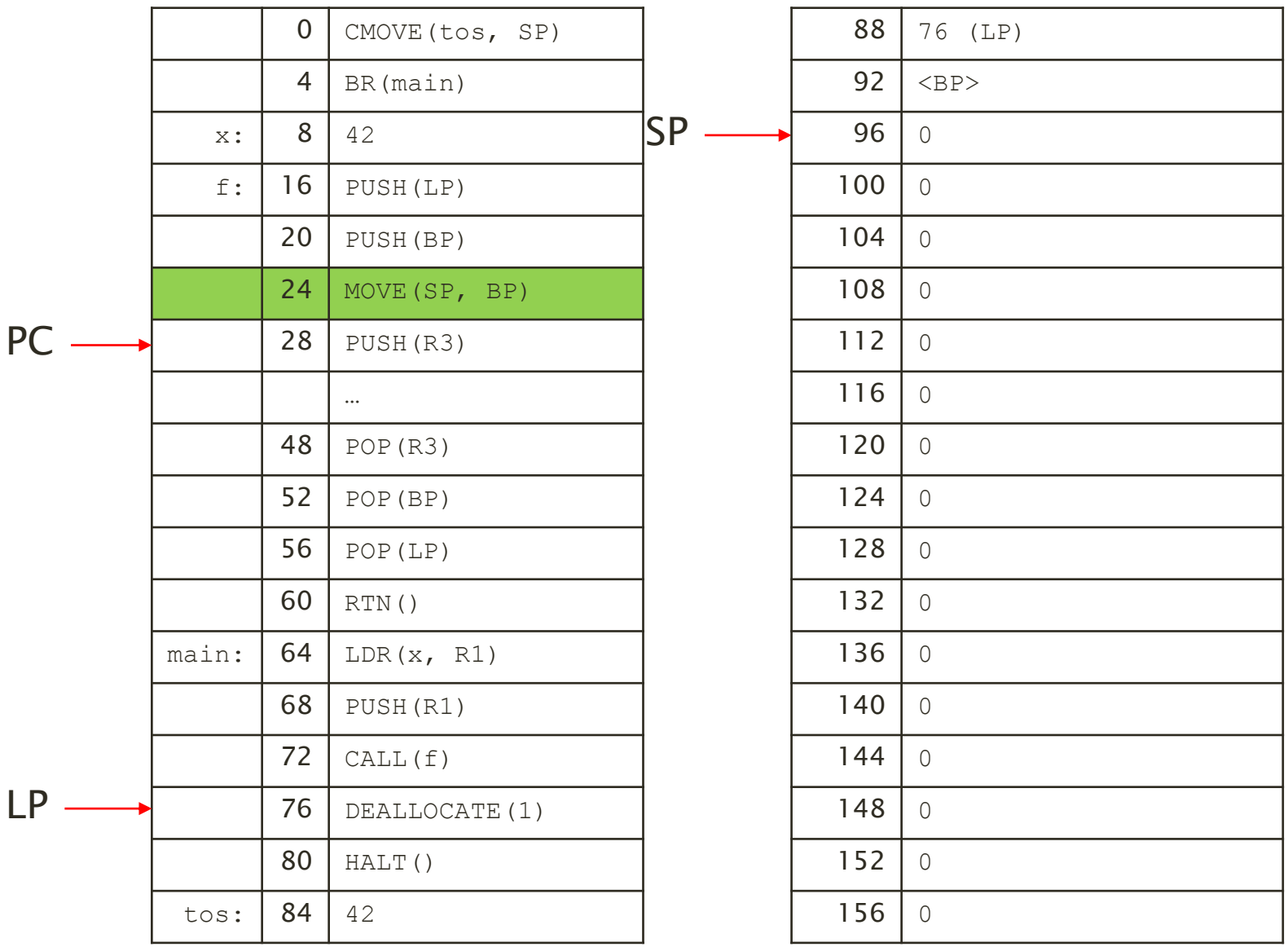
PC →

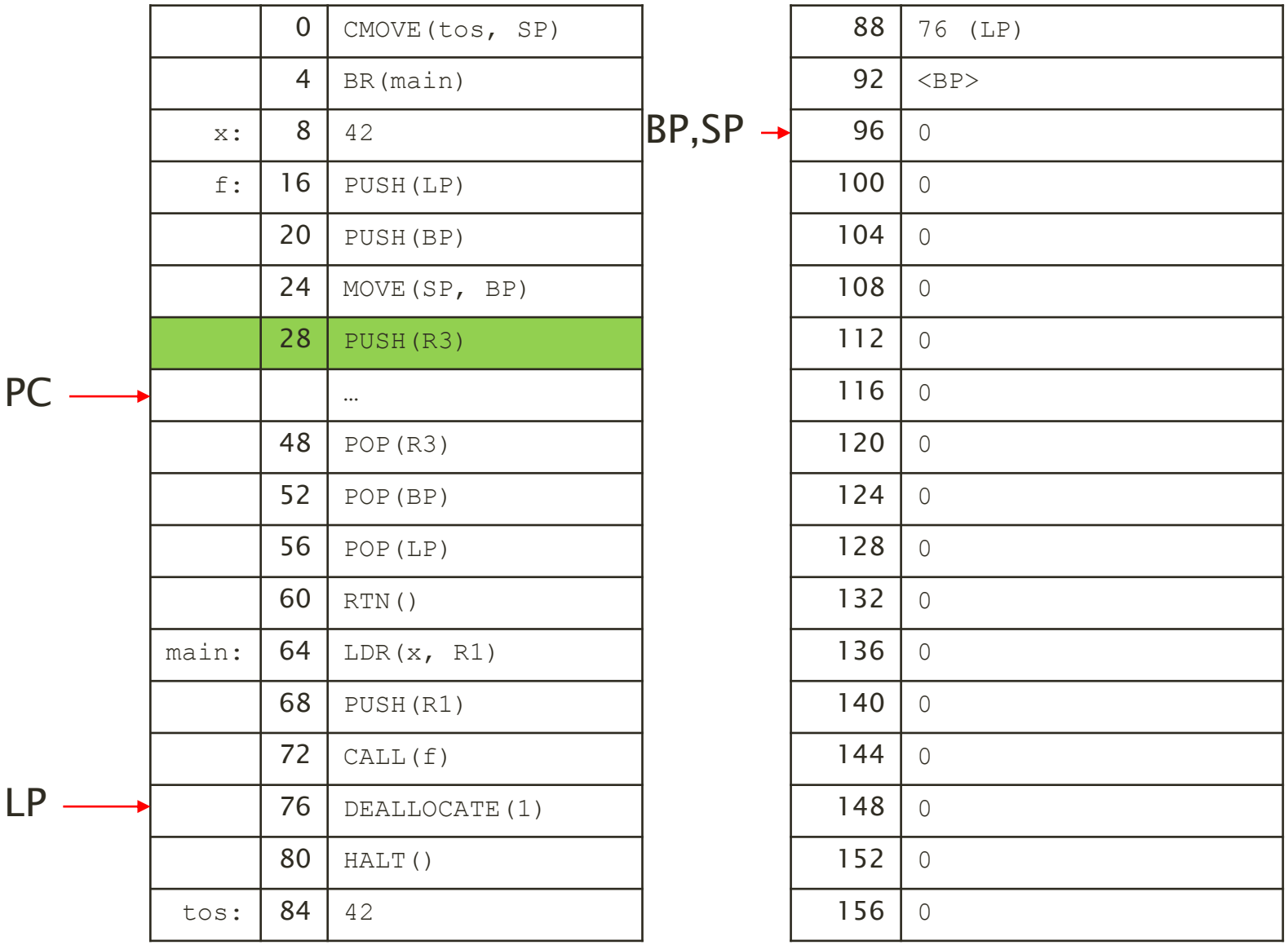
SP →

88	0
92	0
96	0
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0

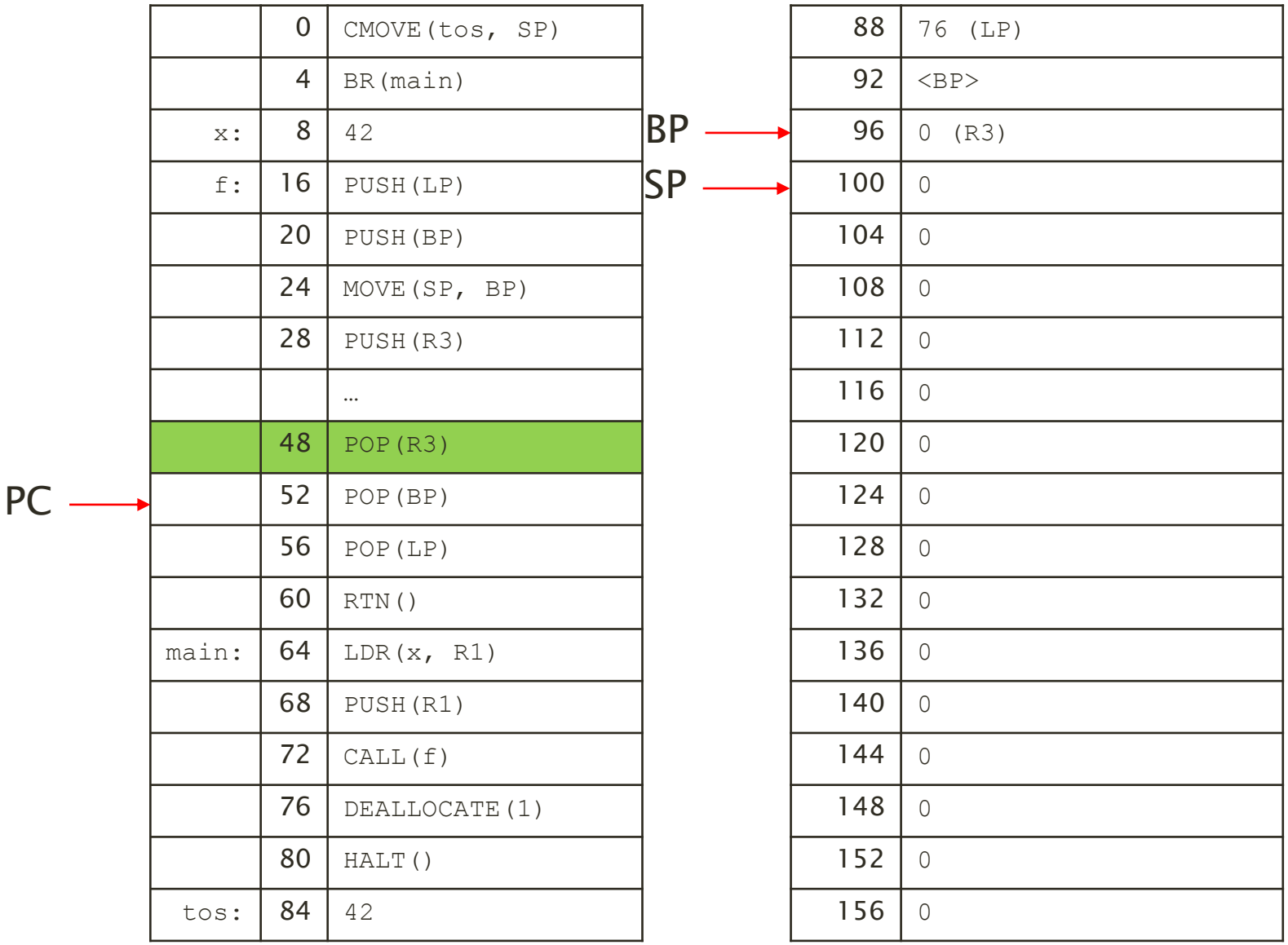

PC
LP
SP
0 CMOVE(tos, SP)
4 BR(main)
x: 8 42
f: 16 PUSH(LP)
20 PUSH(BP)
24 MOVE(SP, BP)
28 PUSH(R3)
…
48 POP(R3)
52 POP(BP)
56 POP(LP)
60 RTN()
main: 64 LDR(x, R1)
68 PUSH(R1)
72 CALL(f)
76 DEALLOCATE(1)
80 HALT()
tos: 84 42
88 0
92 0
96 0
100 0
104 0
108 0
112 0
116 0
120 0
124 0
128 0
132 0
136 0
140 0
144 0
148 0
152 0
156 0


PC
LP
SP
0 CMOVE(tos, SP)
4 BR(main)
x: 8 42
f: 16 PUSH(LP)
20 PUSH(BP)
24 MOVE(SP, BP)
28 PUSH(R3)
…
48 POP(R3)
52 POP(BP)
56 POP(LP)
60 RTN()
main: 64 LDR(x, R1)
68 PUSH(R1)
72 CALL(f)
76 DEALLOCATE(1)
80 HALT()
tos: 84 42
88 76 (LP)
92 0
96 0
100 0
104 0
108 0
112 0
116 0
120 0
124 0
128 0
132 0
136 0
140 0
144 0
148 0
152 0
156 0


PC
LP
SP
0 CMOVE(tos, SP)
4 BR(main)
x: 8 42
f: 16 PUSH(LP)
20 PUSH(BP)
24 MOVE(SP, BP)
28 PUSH(R3)
…
48 POP(R3)
52 POP(BP)
56 POP(LP)
60 RTN()
main: 64 LDR(x, R1)
68 PUSH(R1)
72 CALL(f)
76 DEALLOCATE(1)
80 HALT()
tos: 84 42
88 76 (LP)
92 <BP>
96 0
100 0
104 0
108 0
112 0
116 0
120 0
124 0
128 0
132 0
136 0
140 0
144 0
148 0
152 0
156 0


PC
LP
BP,SP
0 CMOVE(tos, SP)
4 BR(main)
x: 8 42
f: 16 PUSH(LP)
20 PUSH(BP)
24 MOVE(SP, BP)
28 PUSH(R3)
…
48 POP(R3)
52 POP(BP)
56 POP(LP)
60 RTN()
main: 64 LDR(x, R1)
68 PUSH(R1)
72 CALL(f)
76 DEALLOCATE(1)
80 HALT()
tos: 84 42
88 76 (LP)
92 <BP>
96 0
100 0
104 0
108 0
112 0
116 0
120 0
124 0
128 0
132 0
136 0
140 0
144 0
148 0
152 0
156 0

LP??



	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	42

88	76 (LP)
92	<BP>
96	0 (R3)
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0

LP??

	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	42

PC →

BP,SP →

88	76 (LP)
92	<BP>
96	0 (R3)
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0

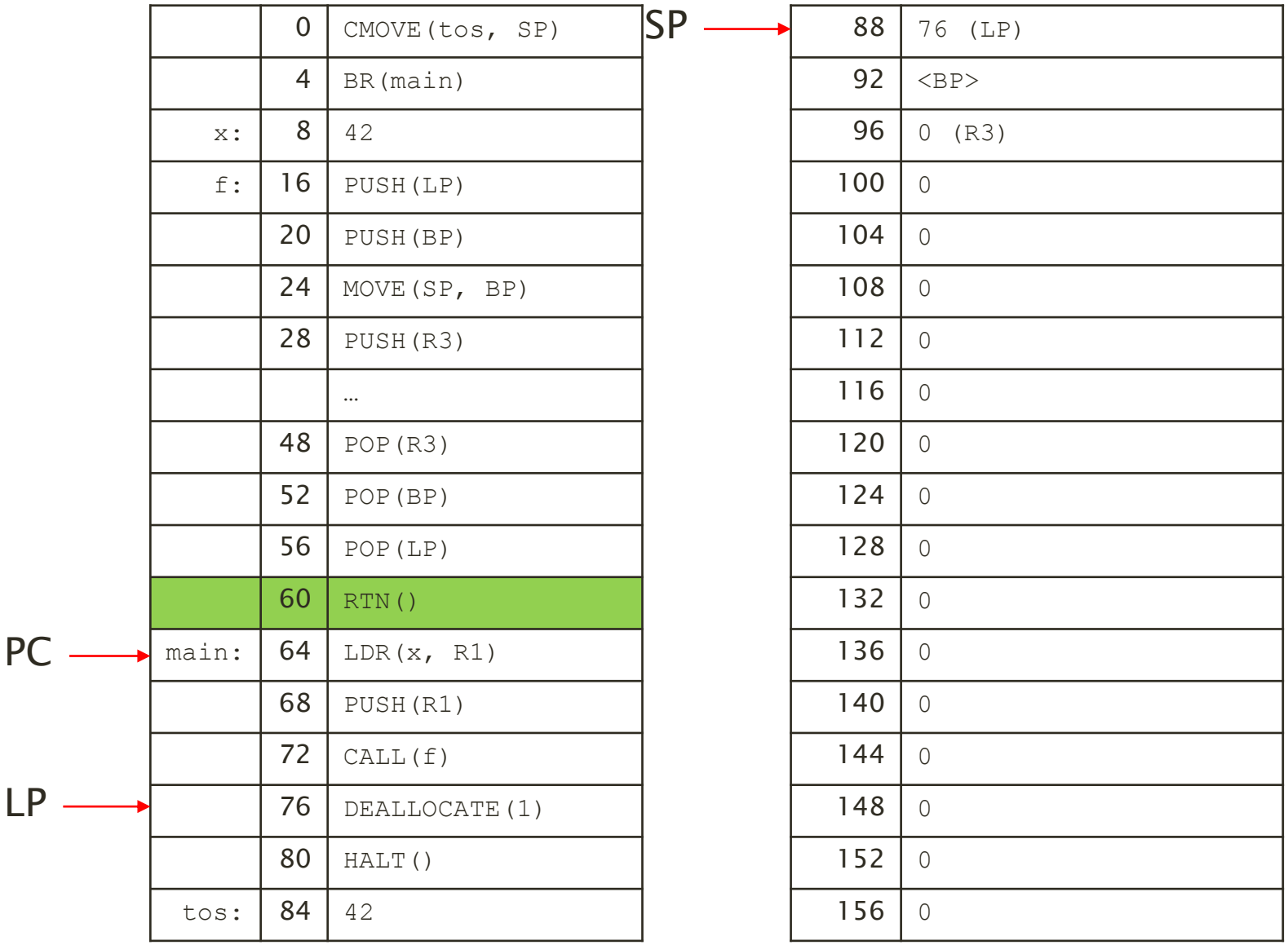
BP = <BP>

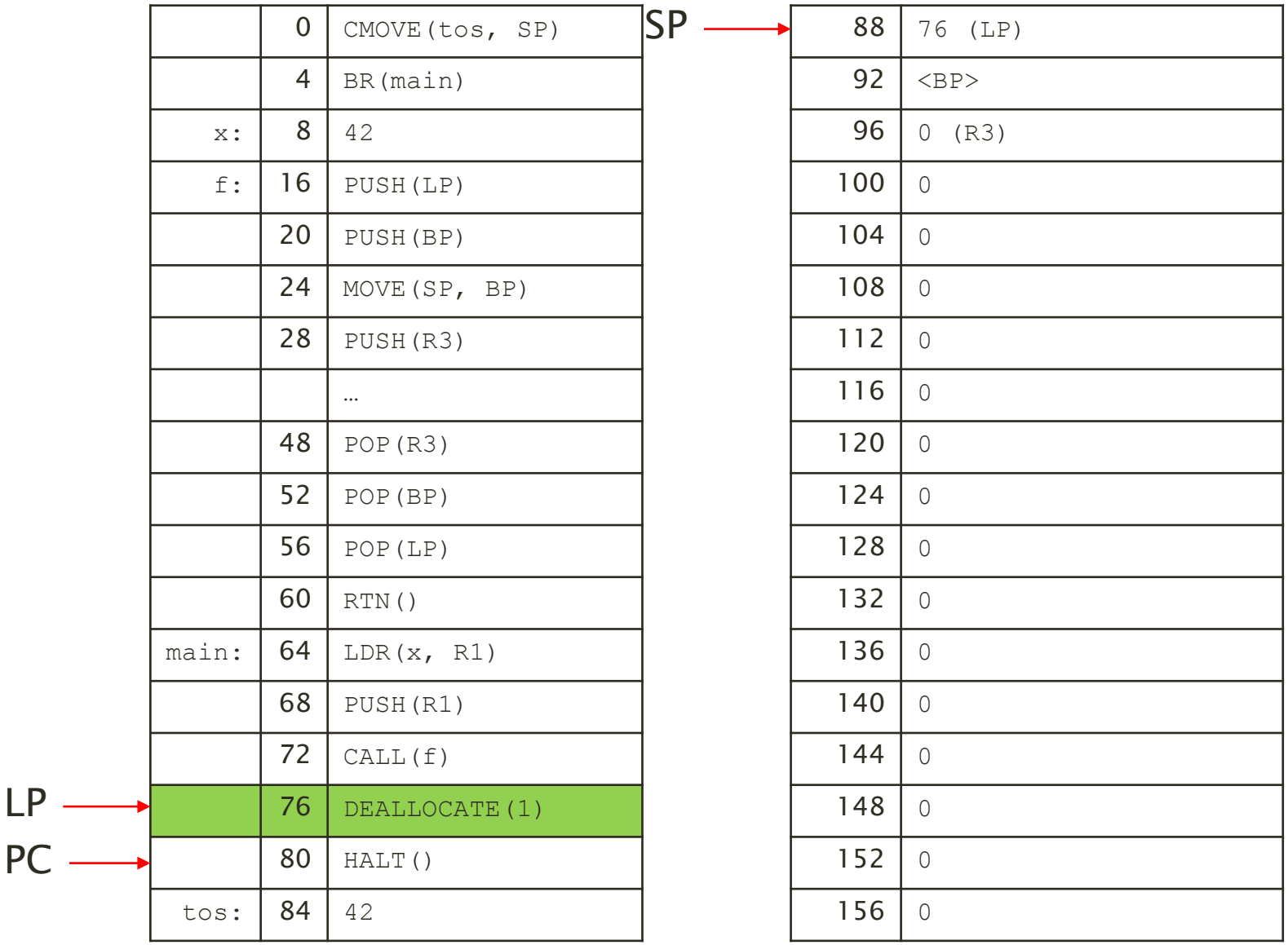
	0	CMOVE(tos, SP)
	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	42

PC →

SP →

88	76 (LP)
92	<BP>
96	0 (R3)
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0


PC
LP
SP
0 CMOVE(tos, SP)
4 BR(main)
x: 8 42
f: 16 PUSH(LP)
20 PUSH(BP)
24 MOVE(SP, BP)
28 PUSH(R3)
…
48 POP(R3)
52 POP(BP)
56 POP(LP)
60 RTN()
main: 64 LDR(x, R1)
68 PUSH(R1)
72 CALL(f)
76 DEALLOCATE(1)
80 HALT()
tos: 84 42
88 76 (LP)
92 <BP>
96 0 (R3)
100 0
104 0
108 0
112 0
116 0
120 0
124 0
128 0
132 0
136 0
140 0
144 0
148 0
152 0
156 0


LP
PC
SP
0 CMOVE(tos, SP)
4 BR(main)
x: 8 42
f: 16 PUSH(LP)
20 PUSH(BP)
24 MOVE(SP, BP)
28 PUSH(R3)
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48 POP(R3)
52 POP(BP)
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main: 64 LDR(x, R1)
68 PUSH(R1)
72 CALL(f)
76 DEALLOCATE(1)
80 HALT()
tos: 84 42
88 76 (LP)
92 <BP>
96 0 (R3)
100 0
104 0
108 0
112 0
116 0
120 0
124 0
128 0
132 0
136 0
140 0
144 0
148 0
152 0
156 0

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	4	BR(main)
x:	8	42
f:	16	PUSH(LP)
	20	PUSH(BP)
	24	MOVE(SP, BP)
	28	PUSH(R3)
		…
	48	POP(R3)
	52	POP(BP)
	56	POP(LP)
	60	RTN()
main:	64	LDR(x, R1)
	68	PUSH(R1)
	72	CALL(f)
	76	DEALLOCATE(1)
	80	HALT()
tos:	84	42

LP →

PC,SP →

88	76 (LP)
92	<BP>
96	0 (R3)
100	0
104	0
108	0
112	0
116	0
120	0
124	0
128	0
132	0
136	0
140	0
144	0
148	0
152	0
156	0