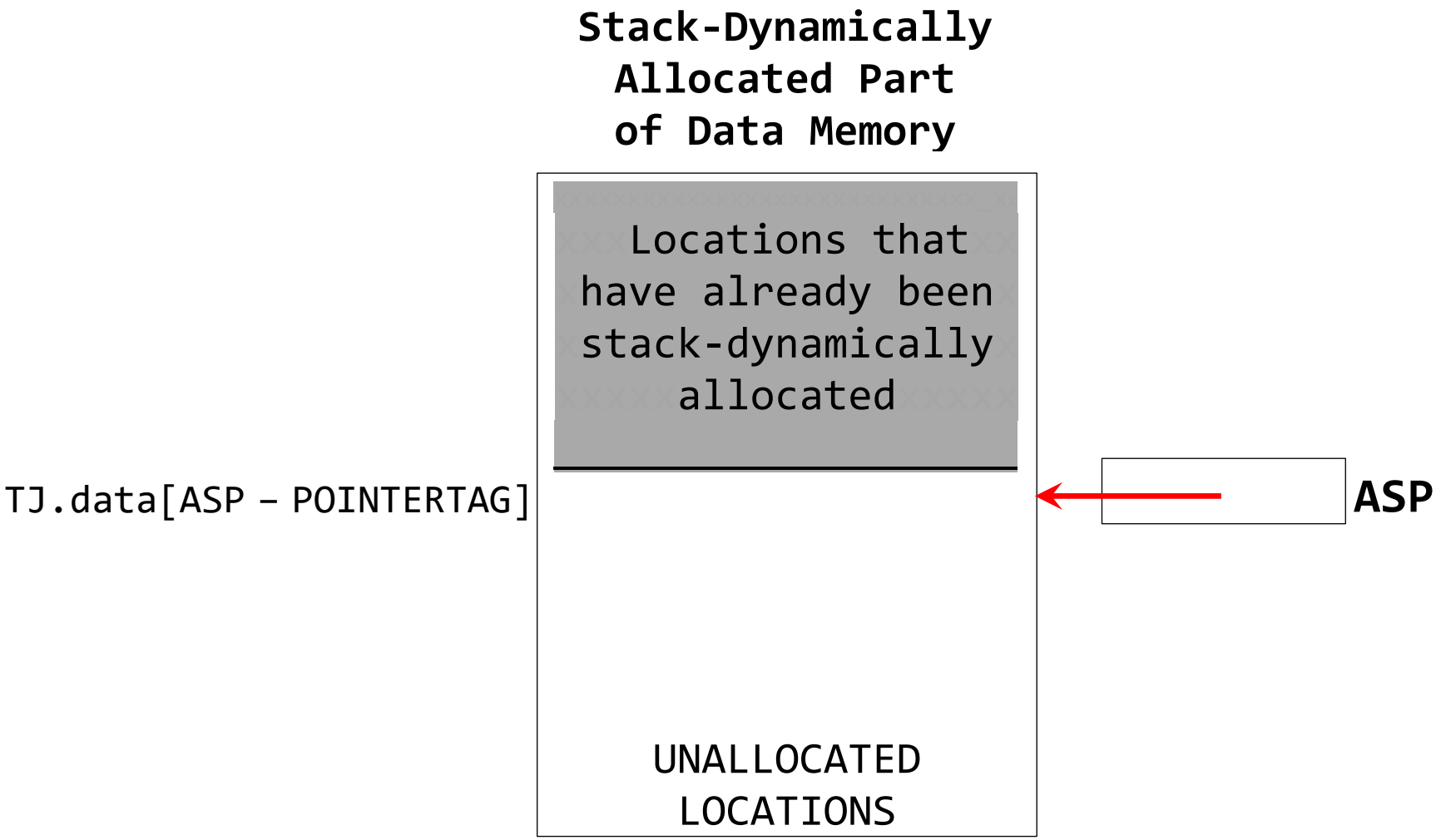
Execution of Method Call and Return

S-PUSH *y* is equivalent to:

```
TJ.data[ASP – POINTERTAG] = y;  ASP++;
```

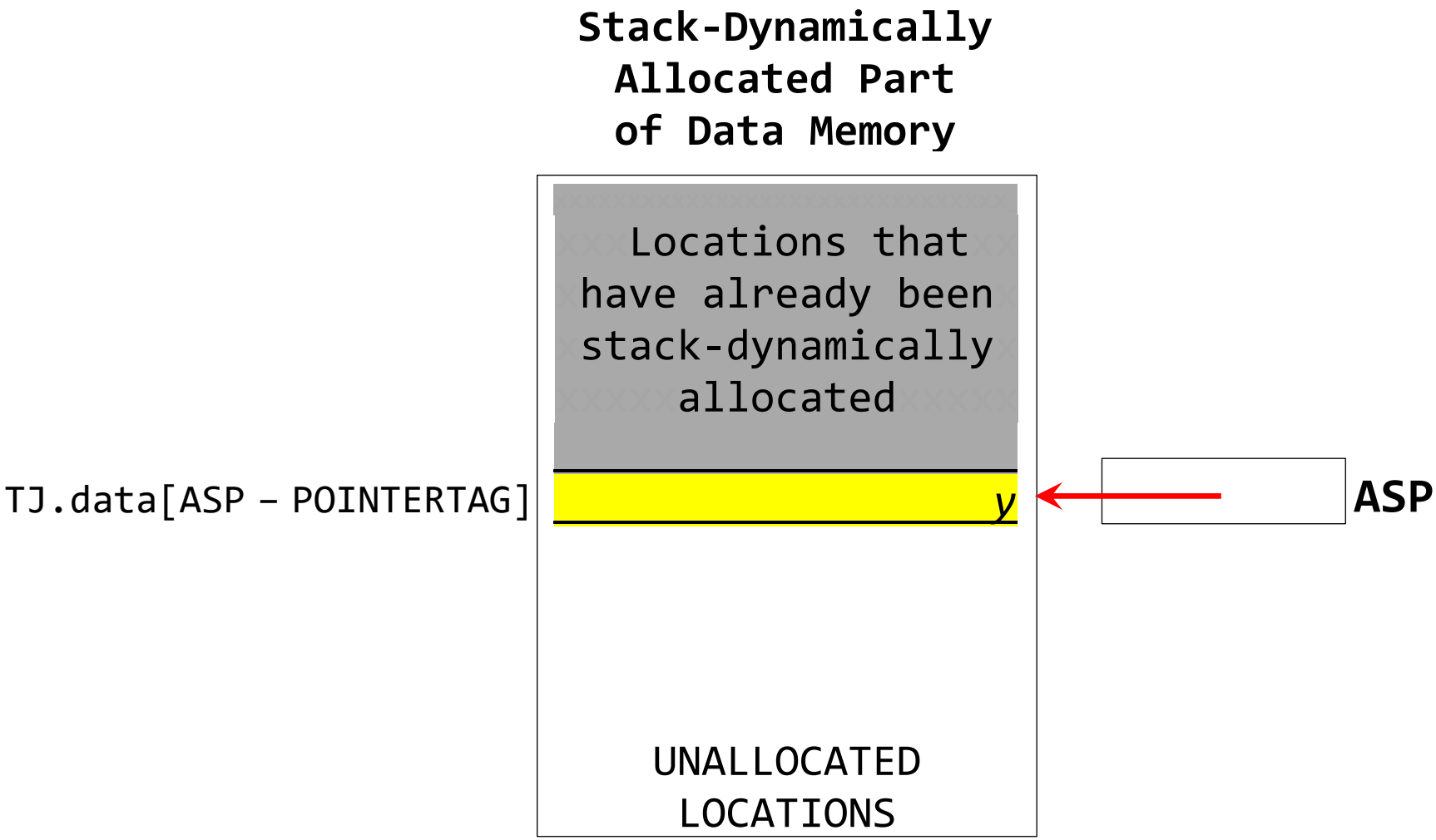
BEFORE execution of* S-PUSH *y



S-PUSH *y* is equivalent to:

```
TJ.data[ASP – POINTERTAG] = y;  ASP++;
```

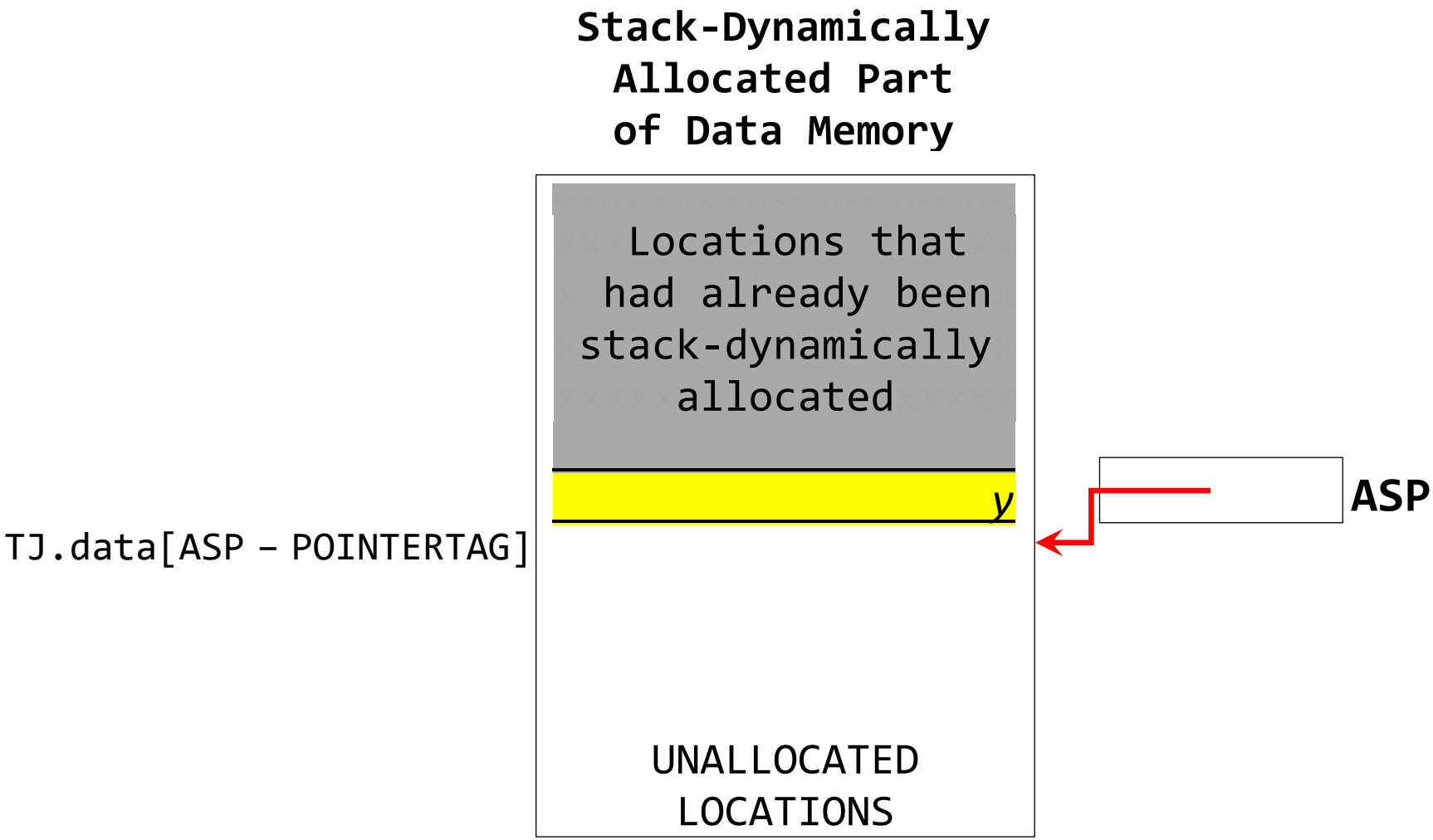
AFTER execution of `TJ.data[ASP – POINTERTAG] = y;`



S-PUSH *y* is equivalent to:

```
TJ.data[ASP – POINTERTAG] = y;  ASP++;
```

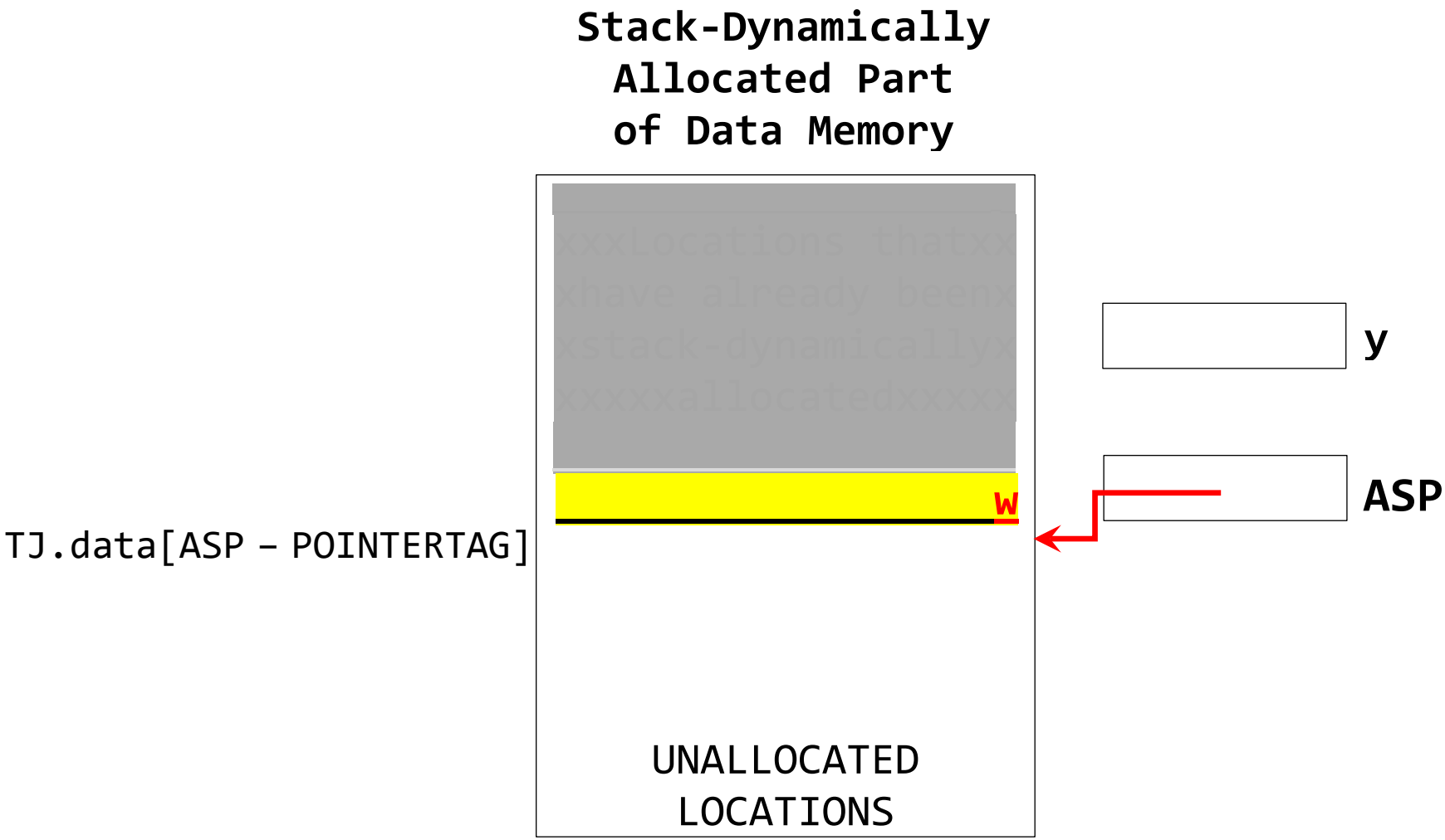
AFTER execution of **S-PUSH** *y*



S-POP *y* is equivalent to:

```
--ASP;  y = TJ.data[ASP – POINTERTAG];
```

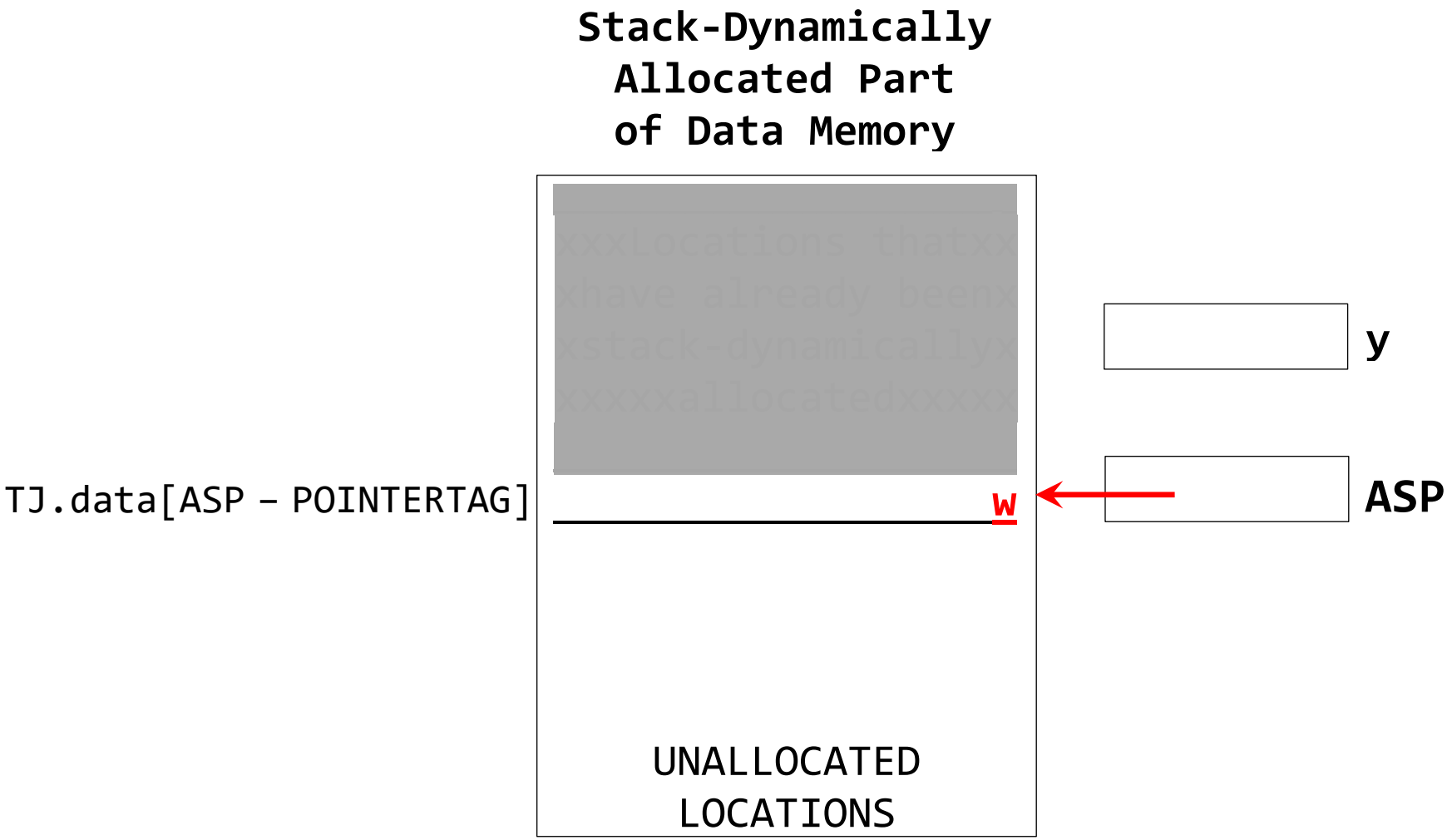
BEFORE execution of* S-POP *y



S-POP *y* is equivalent to:

```
--ASP;  y = TJ.data[ASP – POINTERTAG];
```

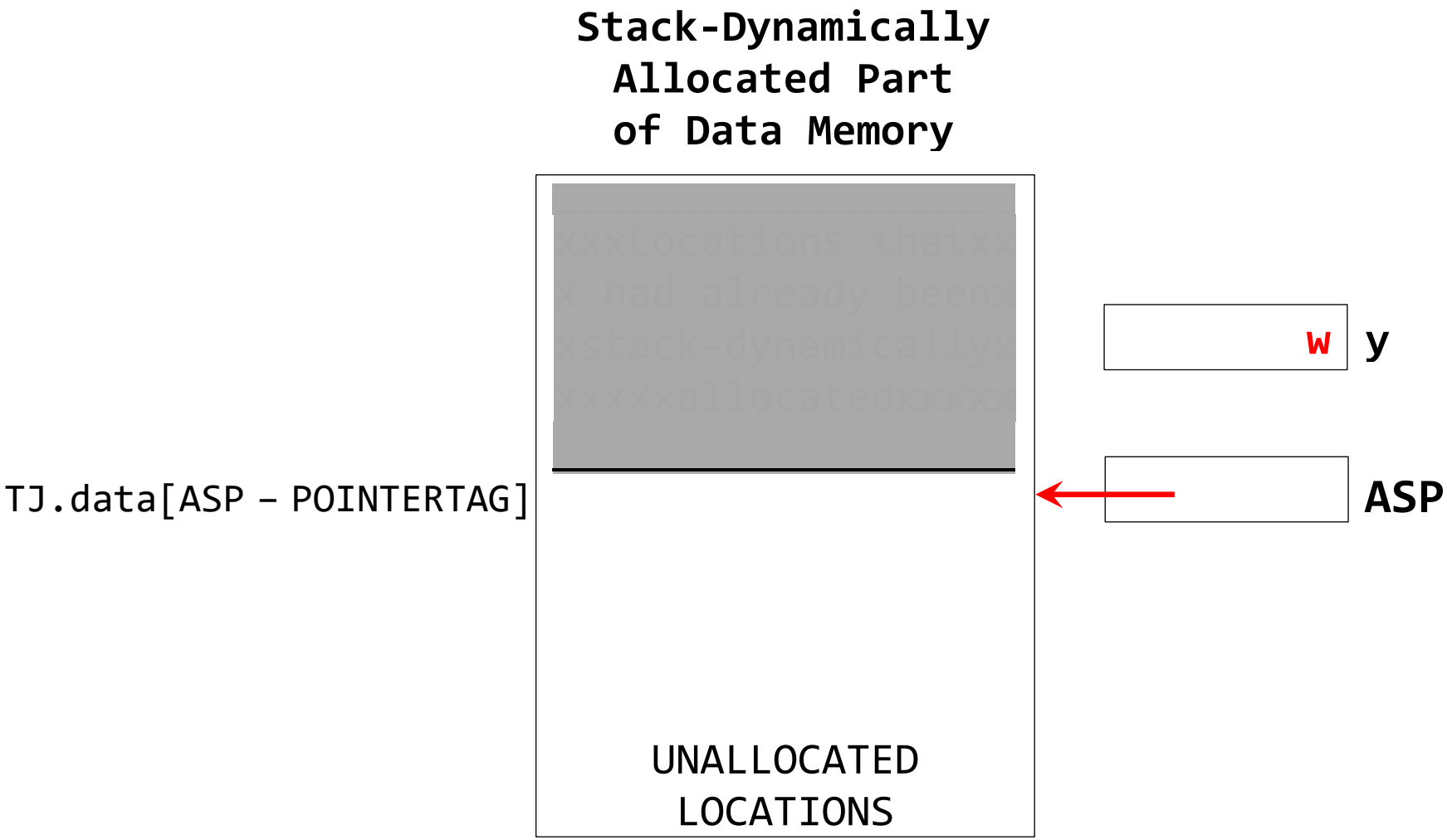
AFTER execution of --ASP;



S-POP *y* is equivalent to:

```
--ASP;  y = TJ.data[ASP - POINTERTAG];
```

AFTER execution of **S-POP** *y*



Diagrams Relating to Sec. 4 on Page 7 of the

TinyJ Assignment 3 Document

Suppose a method **f** calls a method **g** as follows

g(17,23,7,3)

--e.g., within: `System.out.print(g(17,23,7,3));`

Suppose further that:

Diagrams Relating to Sec. 4 on Page 7 of the

TinyJ Assignment 3 Document

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1. **7** stackframe locations are allocated for local variables declared in **g**'s body.

Diagrams Relating to Sec. 4 on Page 7 of the

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Suppose further that:

1. **7** stackframe locations are allocated for local variables declared in **g**'s body.
2. The code memory address of the first VM instruction generated for method **g** is **671**.

Diagrams Relating to Sec. 4 on Page 7 of the

TinyJ Assignment 3 Document

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g(17,23,7,3)

--e.g., within: `System.out.print(g(17,23,7,3));`

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2. The code memory address of the first VM instruction generated for method **g** is **671**.
3. Method **g** returns control to its caller by executing:

713: RETURN 4

Diagrams Relating to Sec. 4 on Page 7 of the TinyJ Assignment 3 Document

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Suppose further that:

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2. The code memory address of the first VM instruction generated for method **g** is **671**.
3. Method **g** returns control to its caller by executing:

   713: RETURN 4
4. The code memory address of the first VM instruction generated for **g(17,23,7,3)** is **44**.

Diagrams Relating to Sec. 4 on Page 7 of the TinyJ Assignment 3 Document

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--e.g., within: `System.out.print(g(17,23,7,3));`

Suppose further that:

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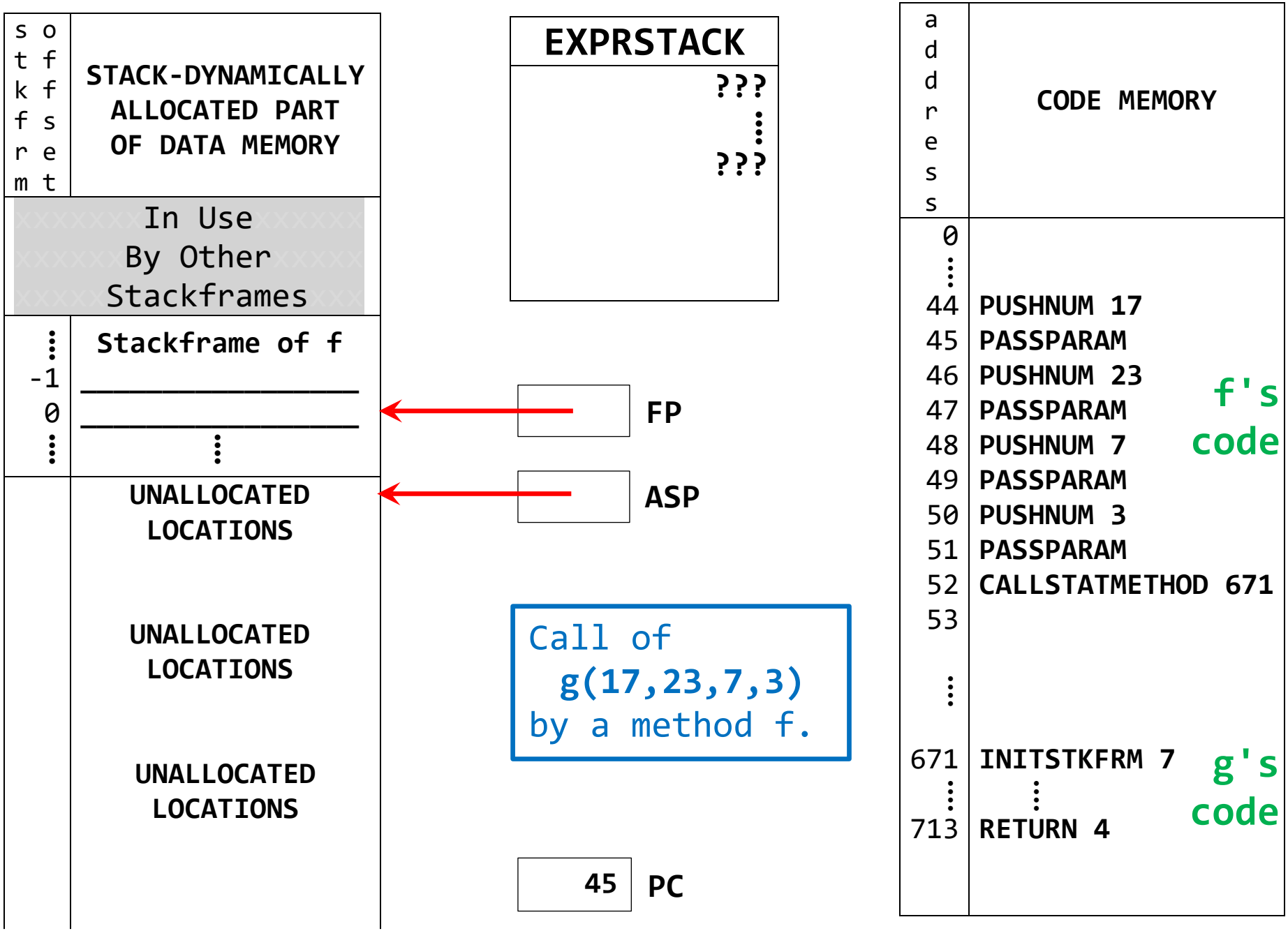
2. The code memory address of the first VM instruction generated for method **g** is **671**.
3. Method **g** returns control to its caller by executing:

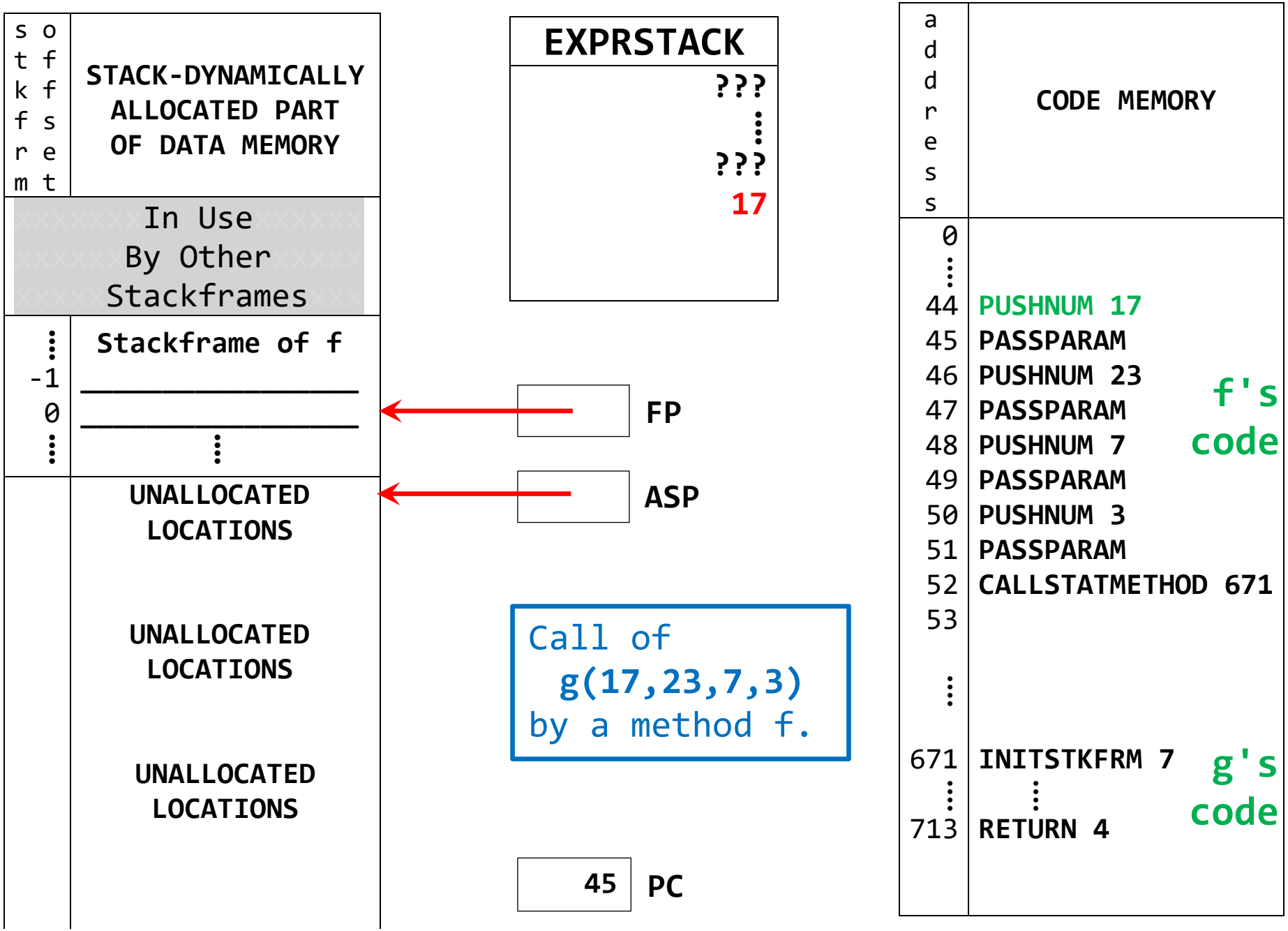
   713: RETURN 4
4. The code memory address of the first VM instruction generated for **g(17,23,7,3)** is **44**.

The following slides show how the call g(17,23,7,3) would be executed, and how 713: RETURN 4 would be executed.

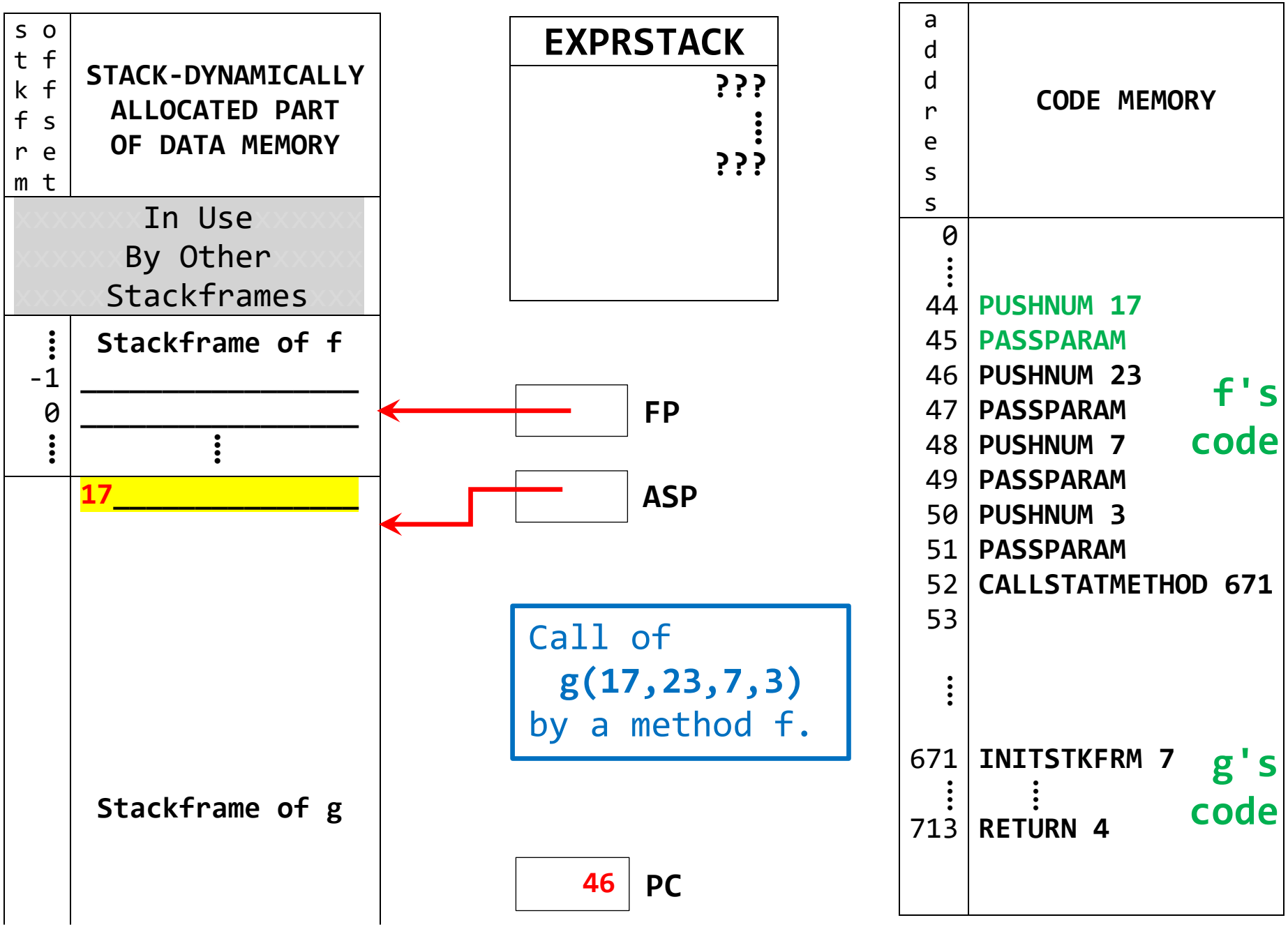
BEFORE Execution of: 44: PUSHNUM 17



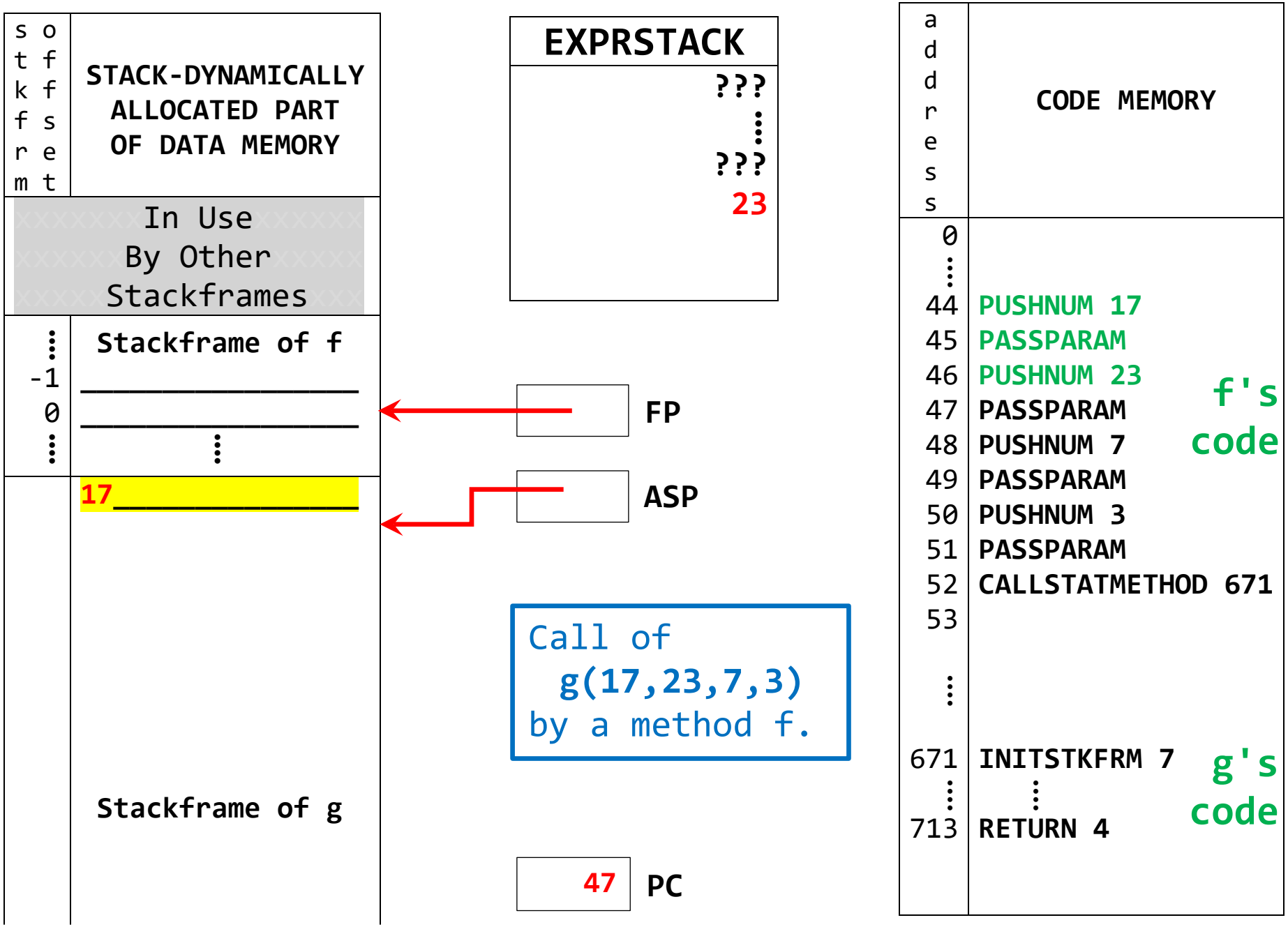
AFTER Execution of: 44: PUSHNUM 17



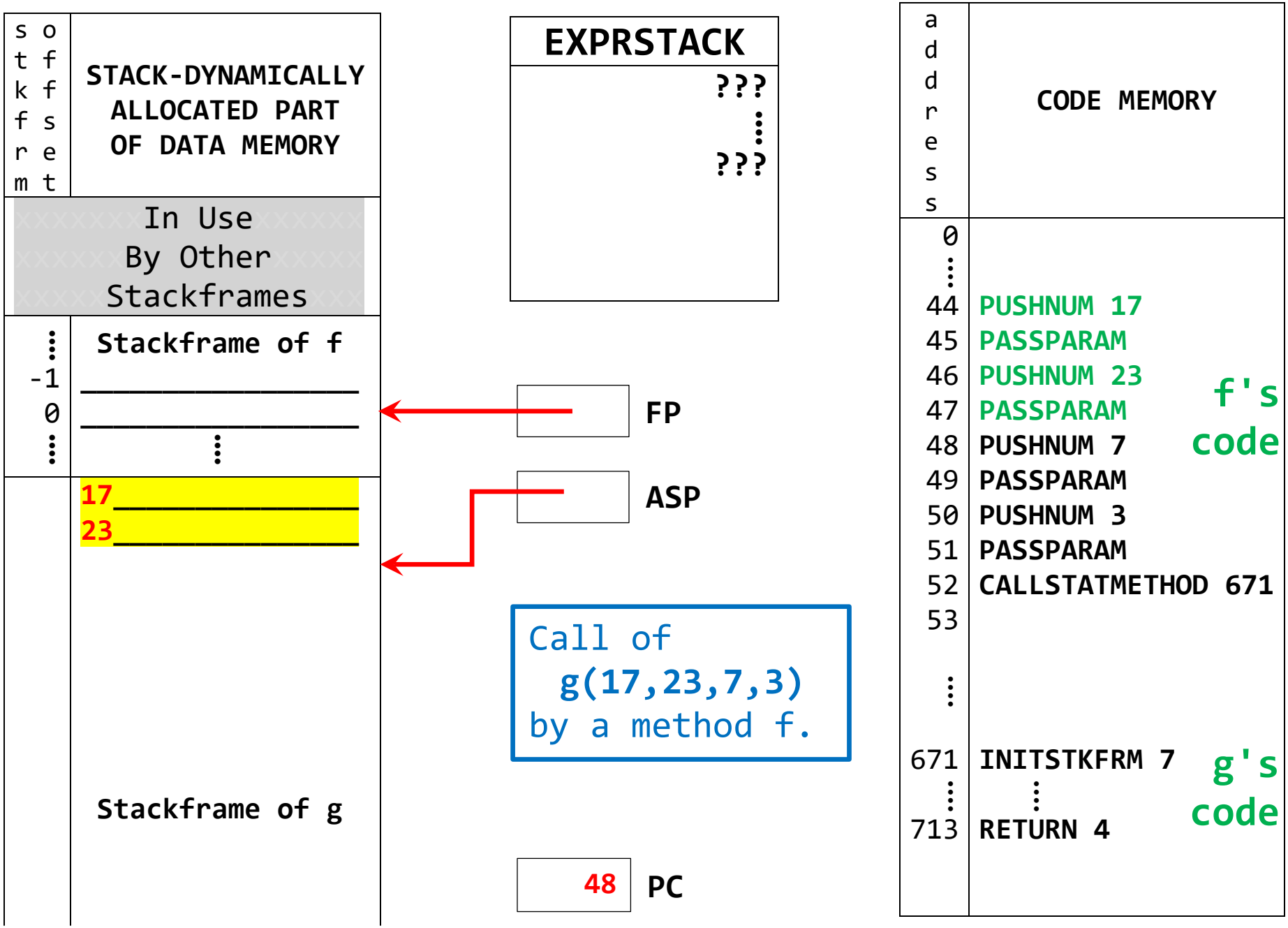
AFTER Execution of 45: PASSPARAM



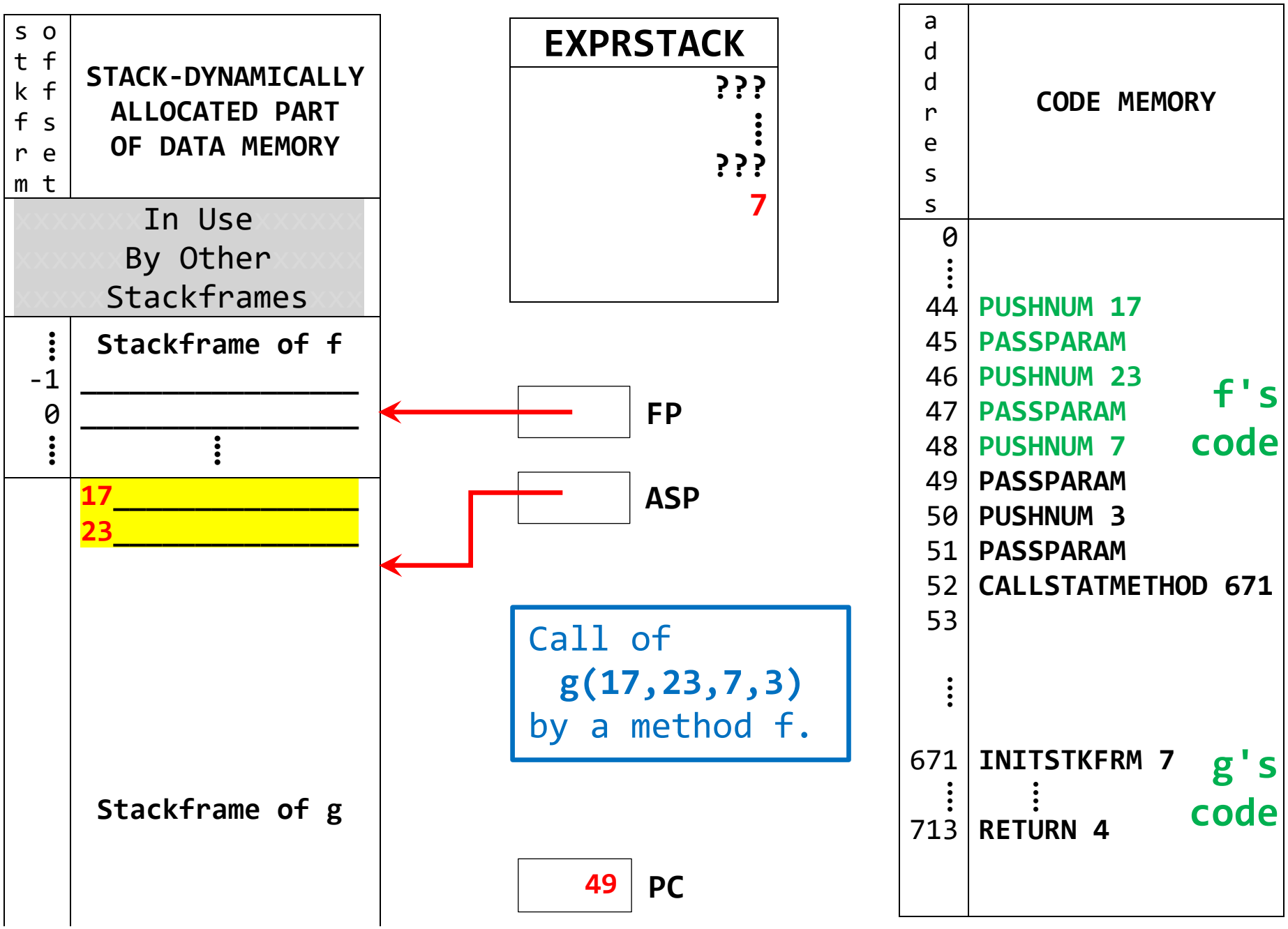
AFTER Execution of 46: PUSHNUM 23



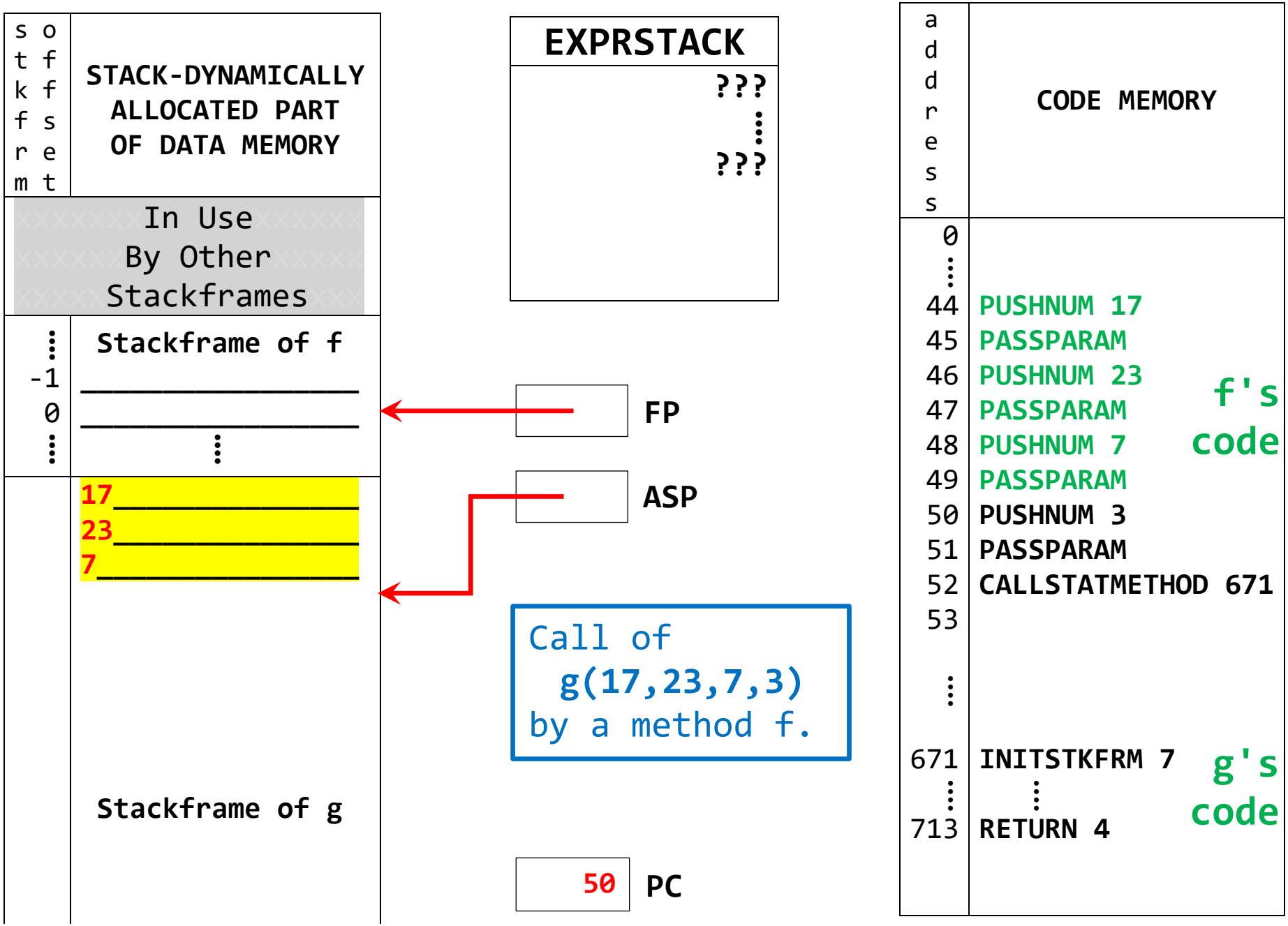
AFTER Execution of 47: PASSPARAM



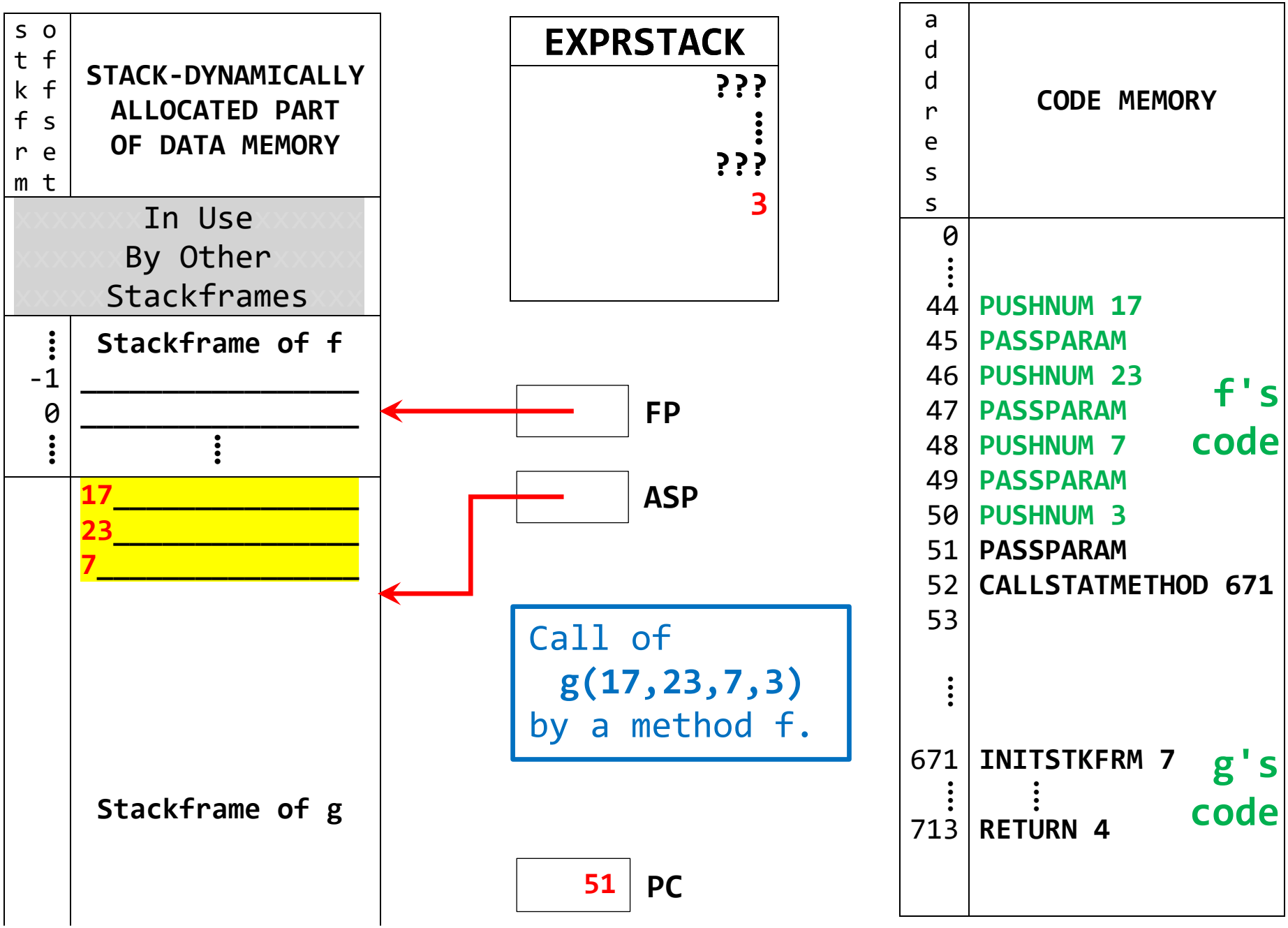
AFTER Execution of 48: PUSHNUM 7



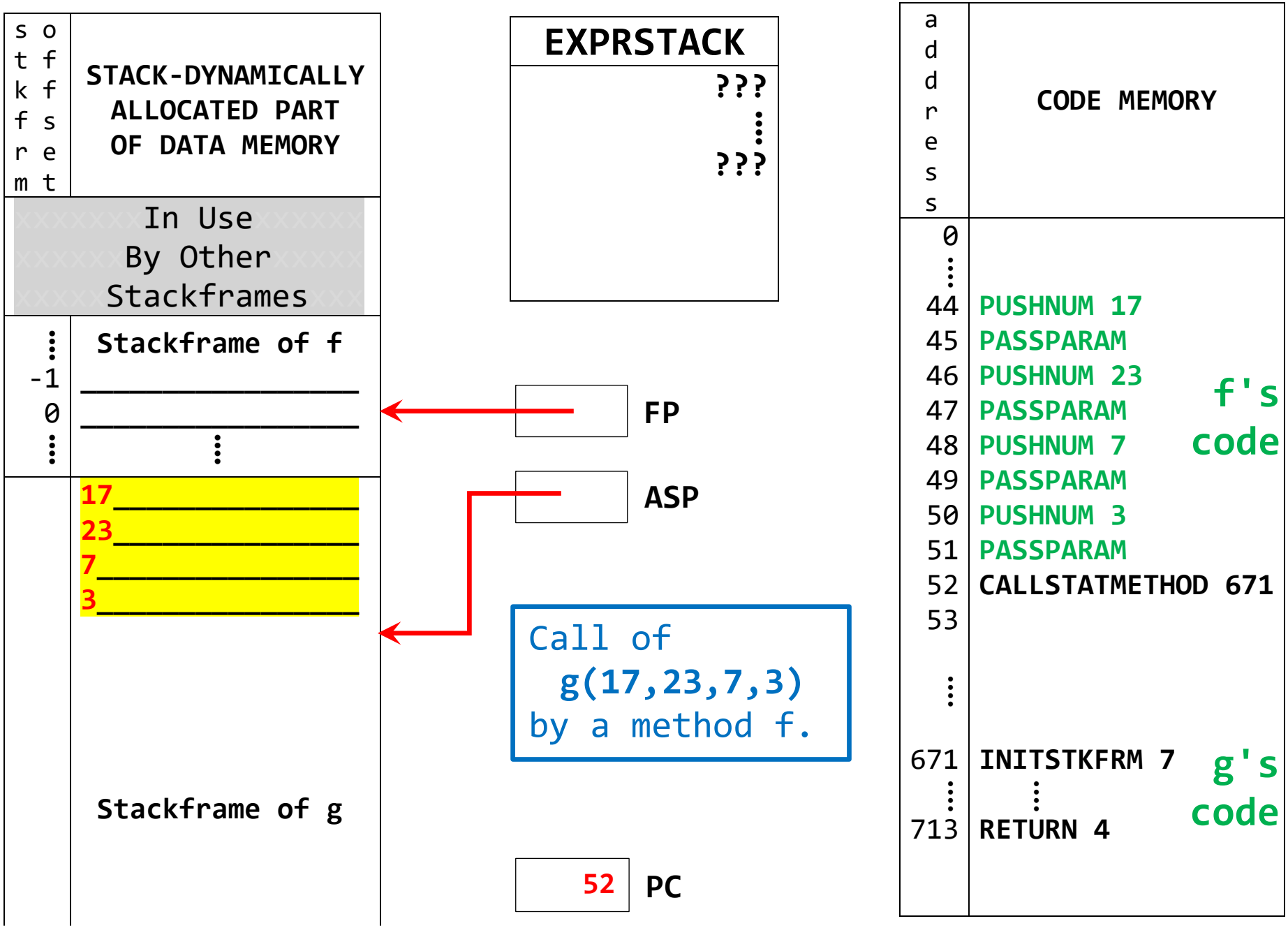
AFTER Execution of 49: PASSPARAM



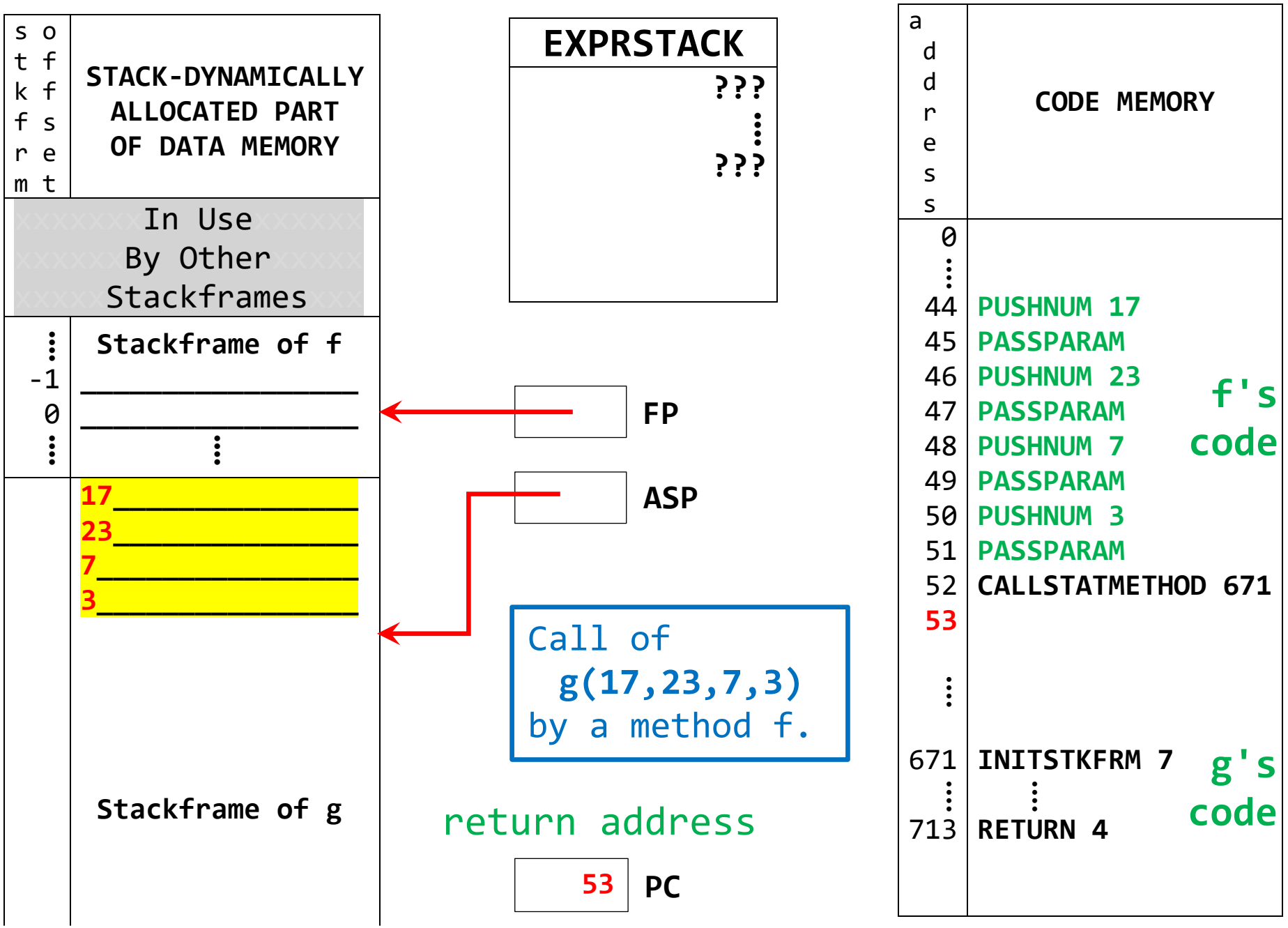
AFTER Execution of 50: PUSHNUM 3



AFTER Execution of 51: PASSPARAM



After FETCH (BEFORE Execution) of 52: CALLSTATMETHOD 671



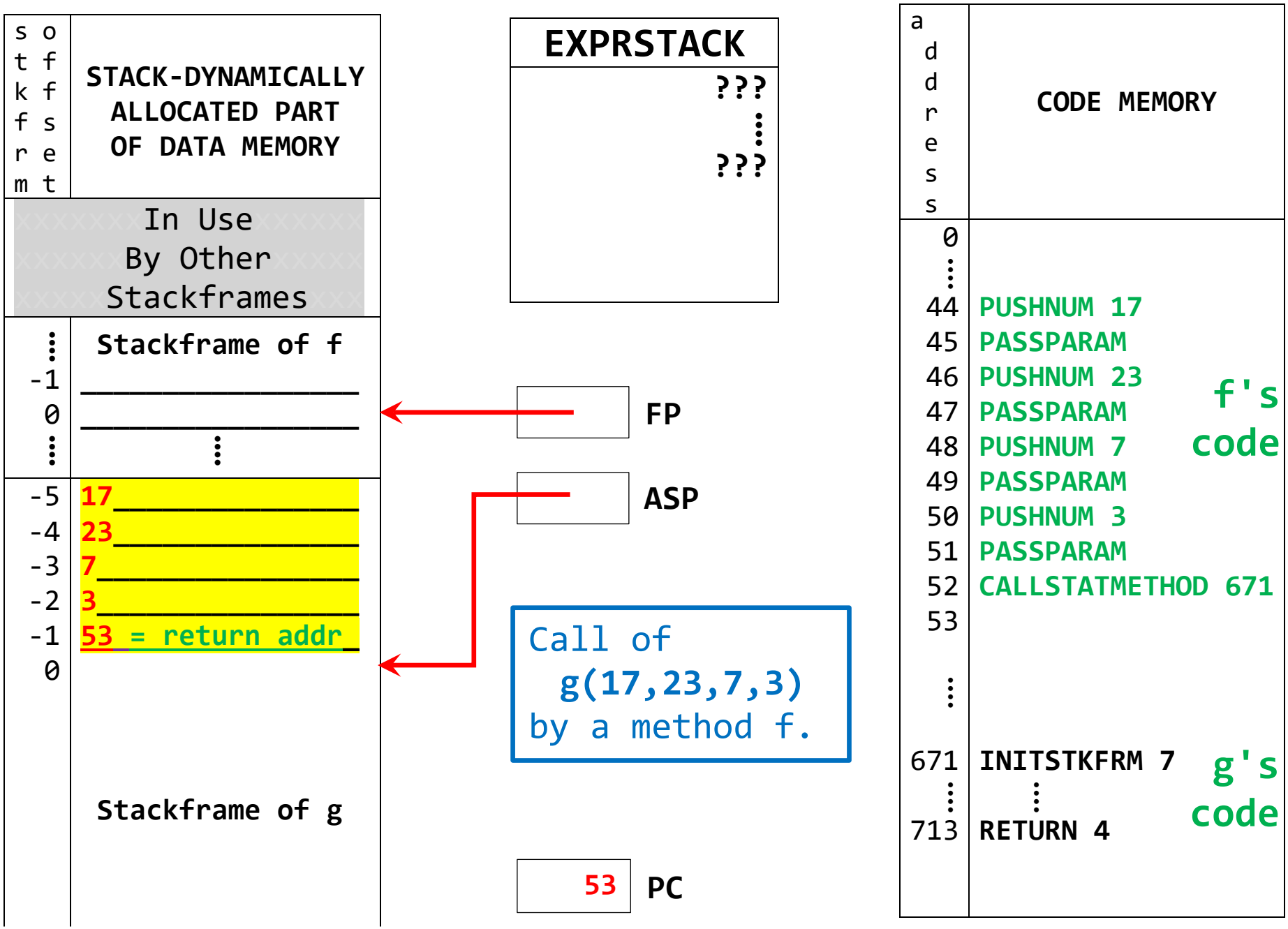
52: CALLSTATMETHOD 671

should **S-PUSH** PC [saves return addr (here, **53**) into new frame*]

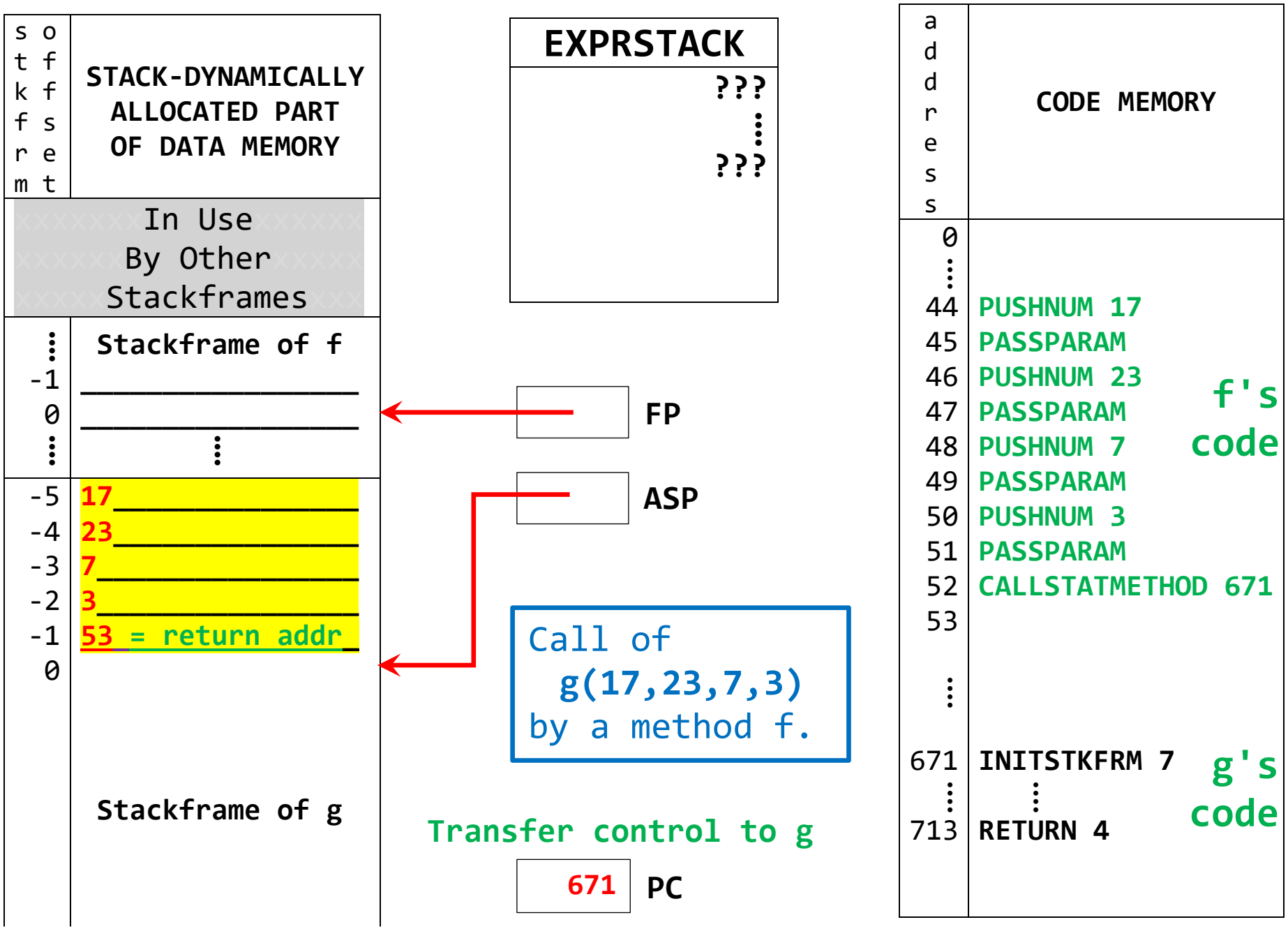
and then set PC to 671 [transfers control to g's code]

*into the loc. at offset -1 of the new frame - see p. 4 of:
euclid.cs.qc.cuny.edu/316/Memory-allocation-VM-instruction-set-and-hints-for-asn-2.pdf

AFTER S-PUSH PC *during Execution of* 52: CALLSTATMETHOD 671



AFTER Execution of 52: CALLSTATMETHOD 671



671: INITSTKFRM 7

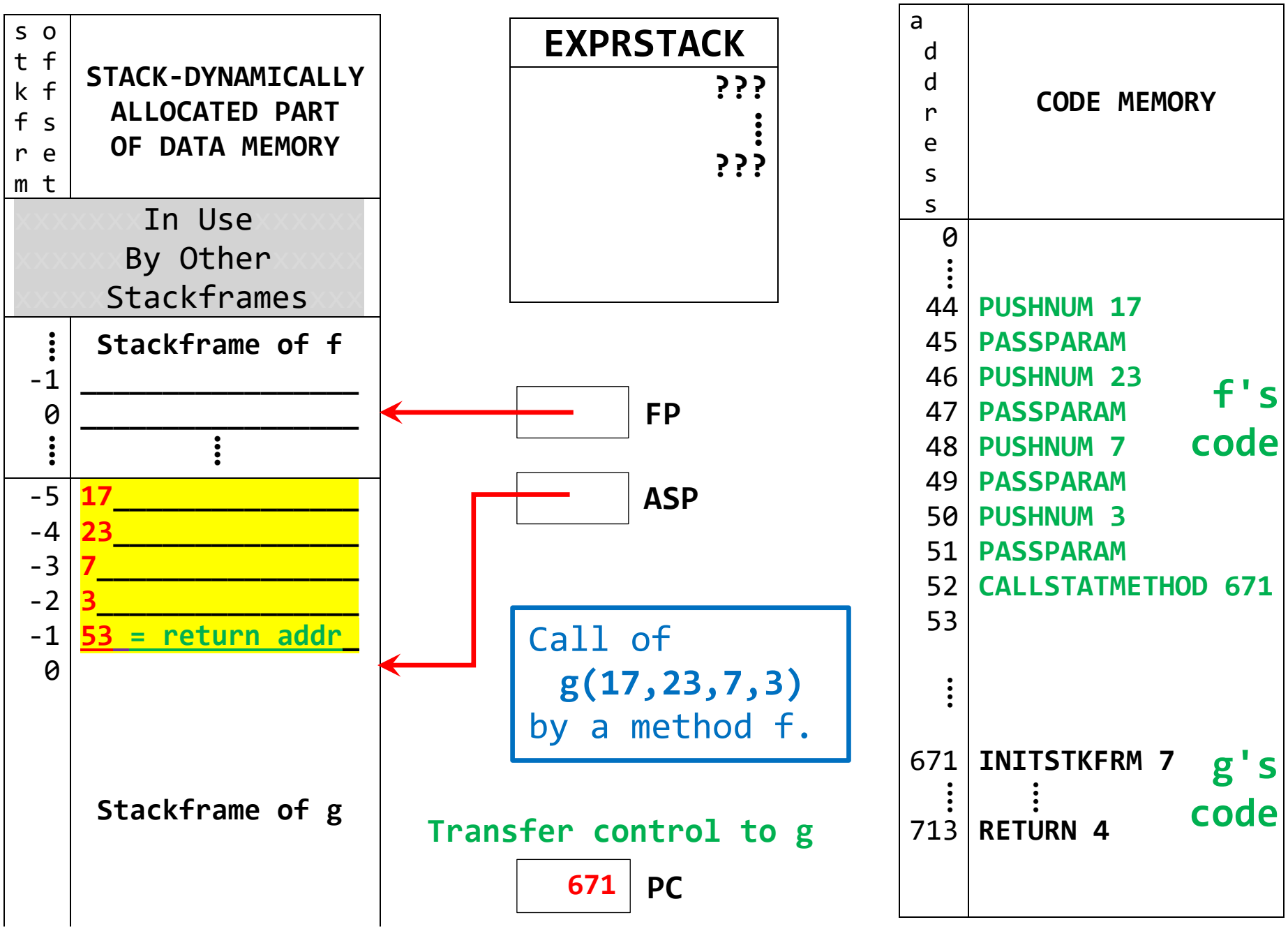
should **S-PUSH** FP [saves caller's FP at offset 0* in the new frame]

and then set FP to ASP – 1 [makes FP point to offset 0* in the new frame]

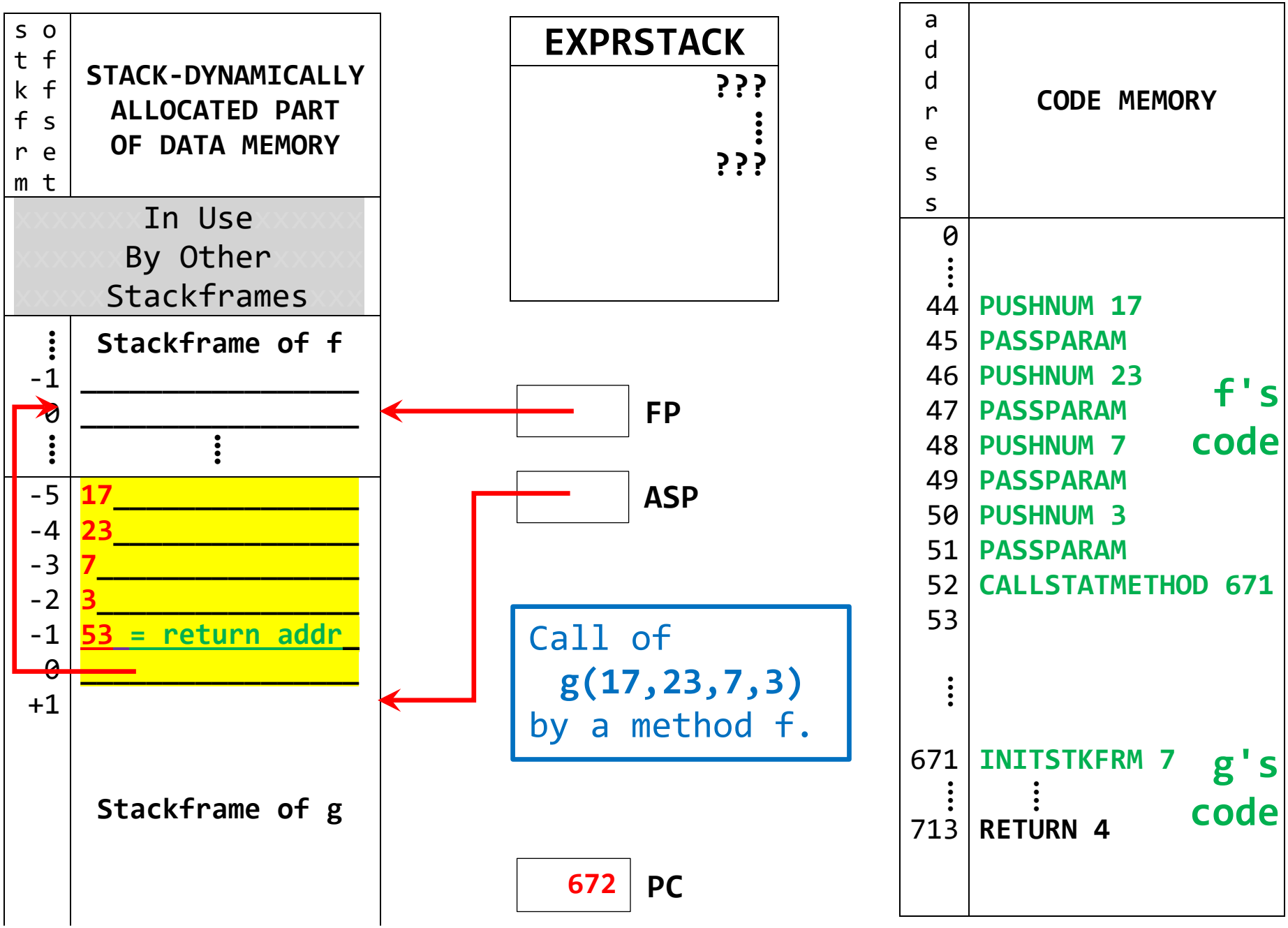
and then increase ASP by 7 [allocates space for callee's local variables]

*After the caller's FP is stored at offset 0 in the new frame, the stored pointer is called the ***dynamic link***.
See p. 4 of:
euclid.cs.qc.cuny.edu/316/Memory-allocation-VM-instruction-set-and-hints-for-asn-2.pdf

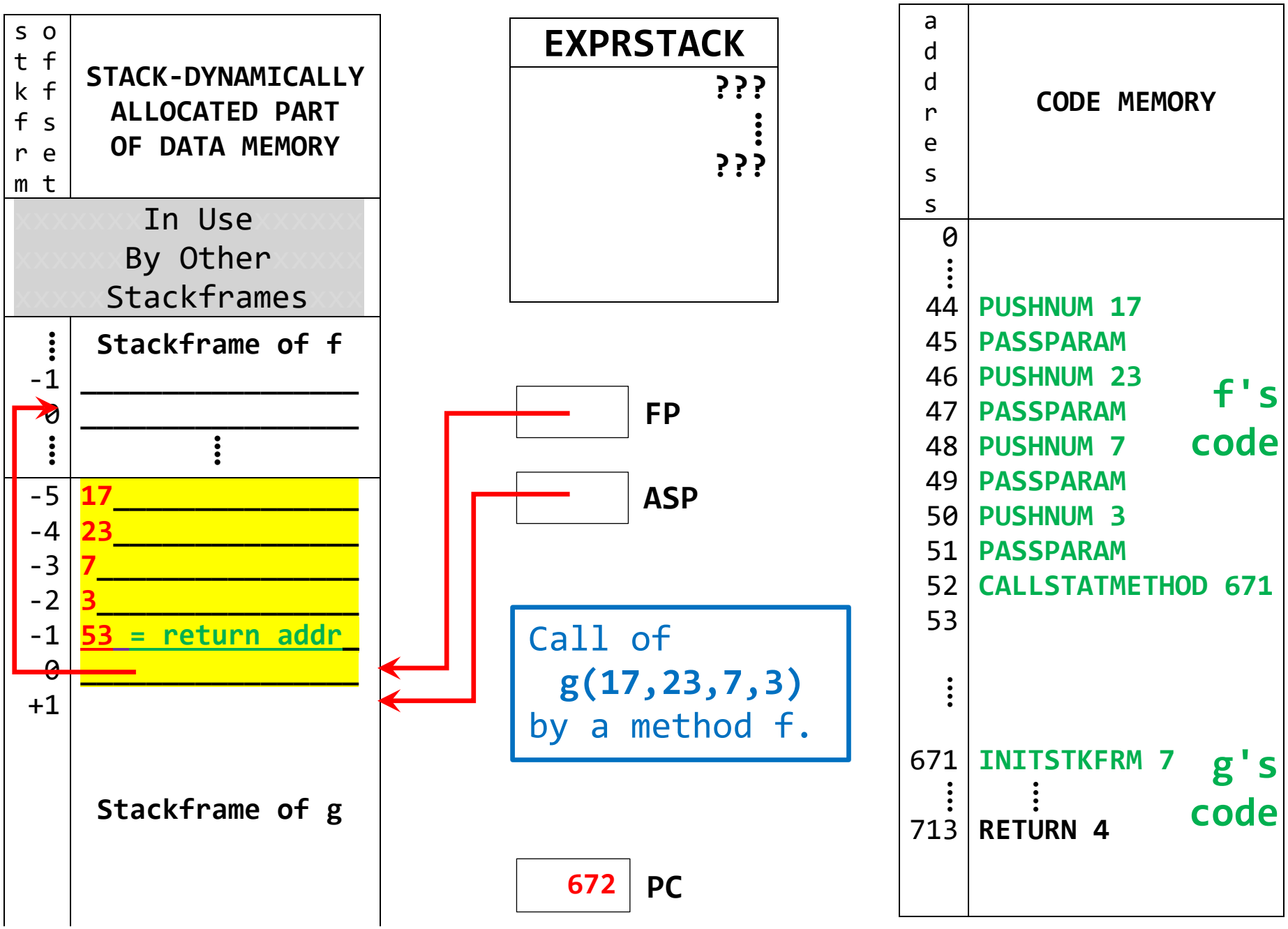
AFTER Execution of 52: CALLSTATMETHOD 671



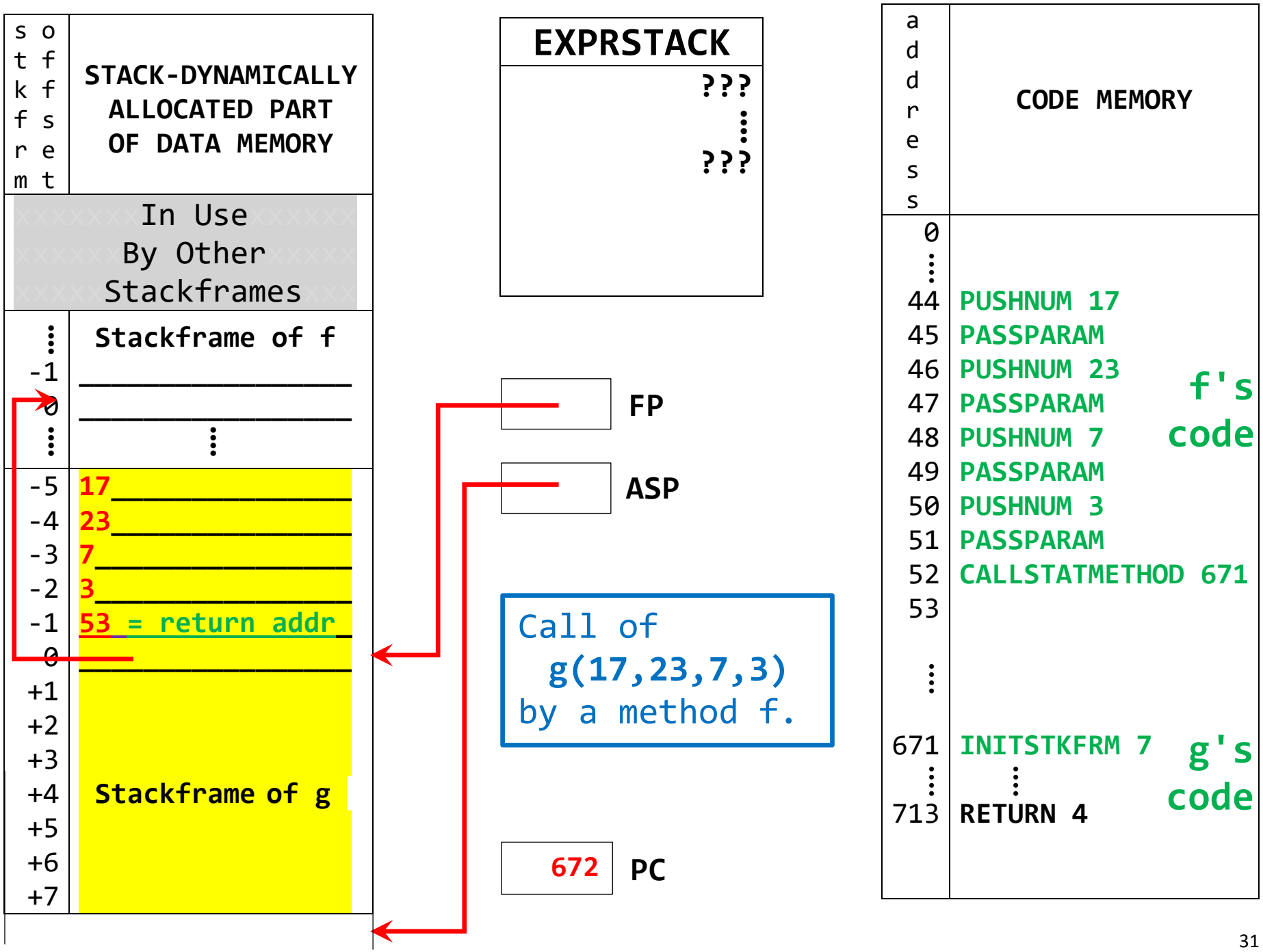
After S-PUSH FP *during Execution of* 671: INITSTKFRM 7



After Step 2 of *Execution of* 671: INITSTKFRM 7



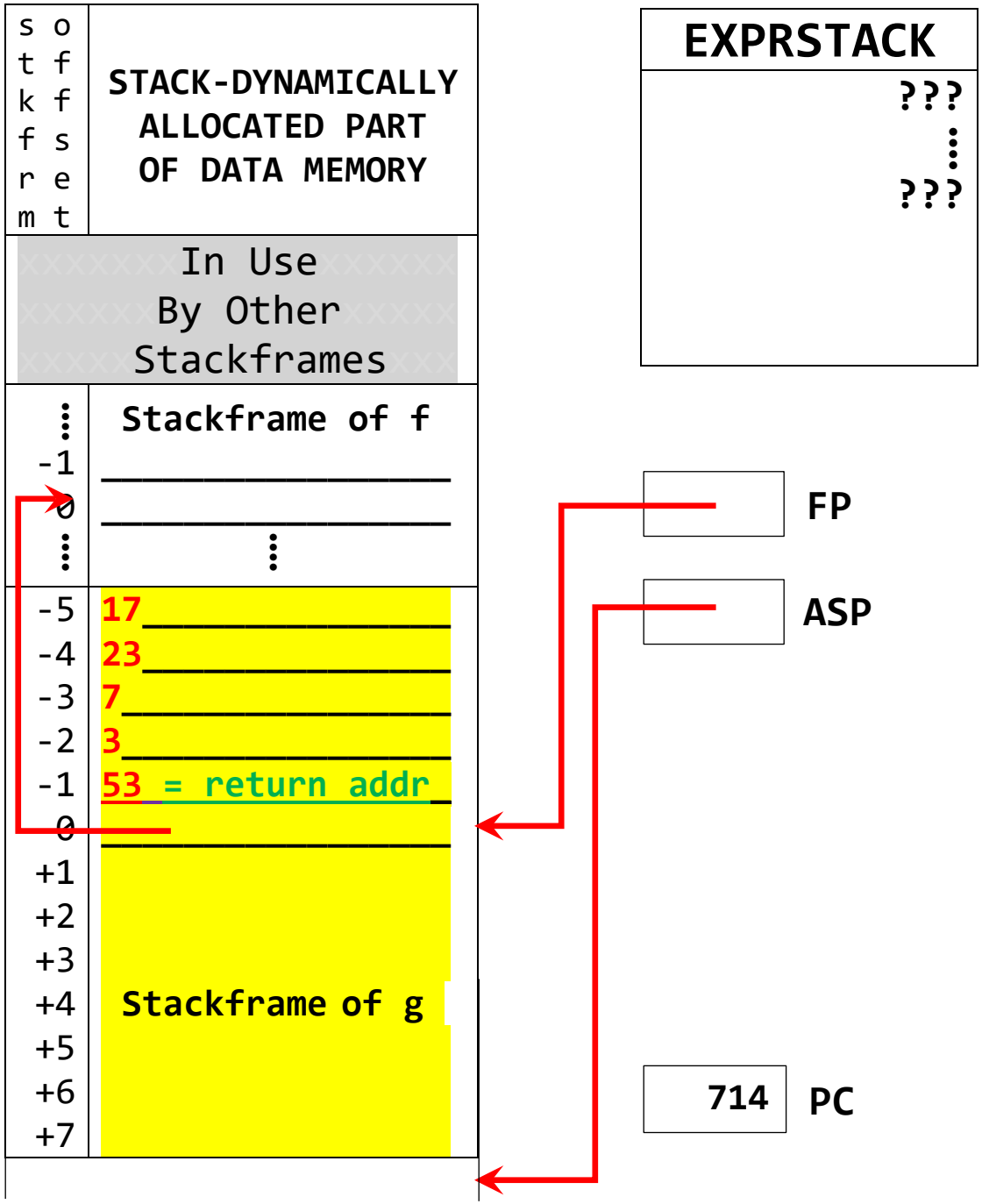
After Final Step of *Execution of* 671: INITSTKFRM 7



713: RETURN 4

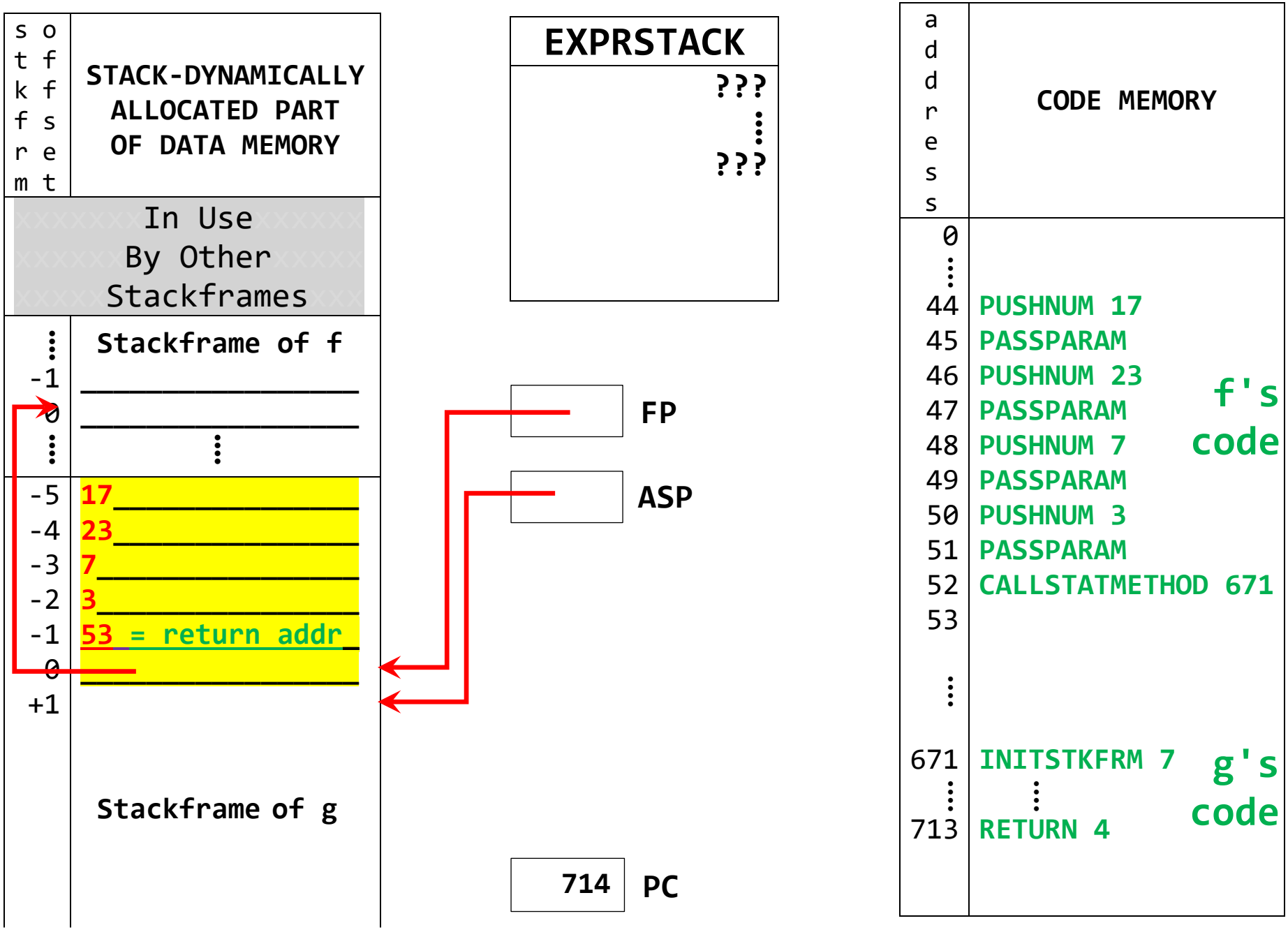
should	set ASP to FP+1	[deallocates space used by callee's variables]
and then	**S-POP** FP	[restores caller's FP]
and then	**S-POP** PC	[puts the saved return address into PC]
and then	decrease ASP by 4	[deallocates space used by formal parameters]

BEFORE Execution of 713: RETURN 4

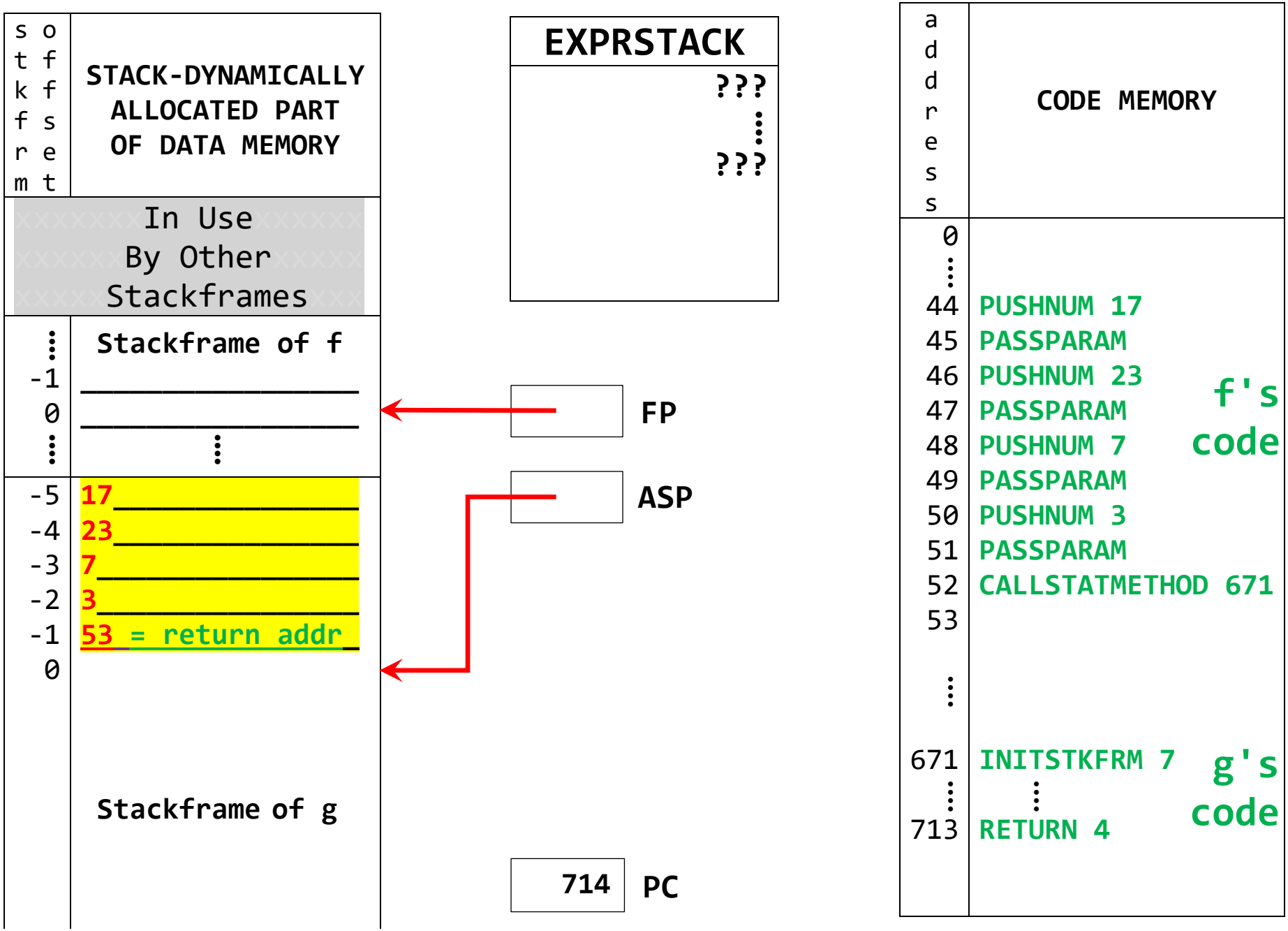


address	CODE MEMORY	
0 ⋮		
44	PUSHNUM 17	f's code
45	PASSPARAM	
46	PUSHNUM 23	
47	PASSPARAM	
48	PUSHNUM 7	
49	PASSPARAM	
50	PUSHNUM 3	
51	PASSPARAM	
52	CALLSTATMETHOD 671	
53		
⋮		
671	INITSTKFRM 7	g's code
⋮	⋮	
713	RETURN 4	

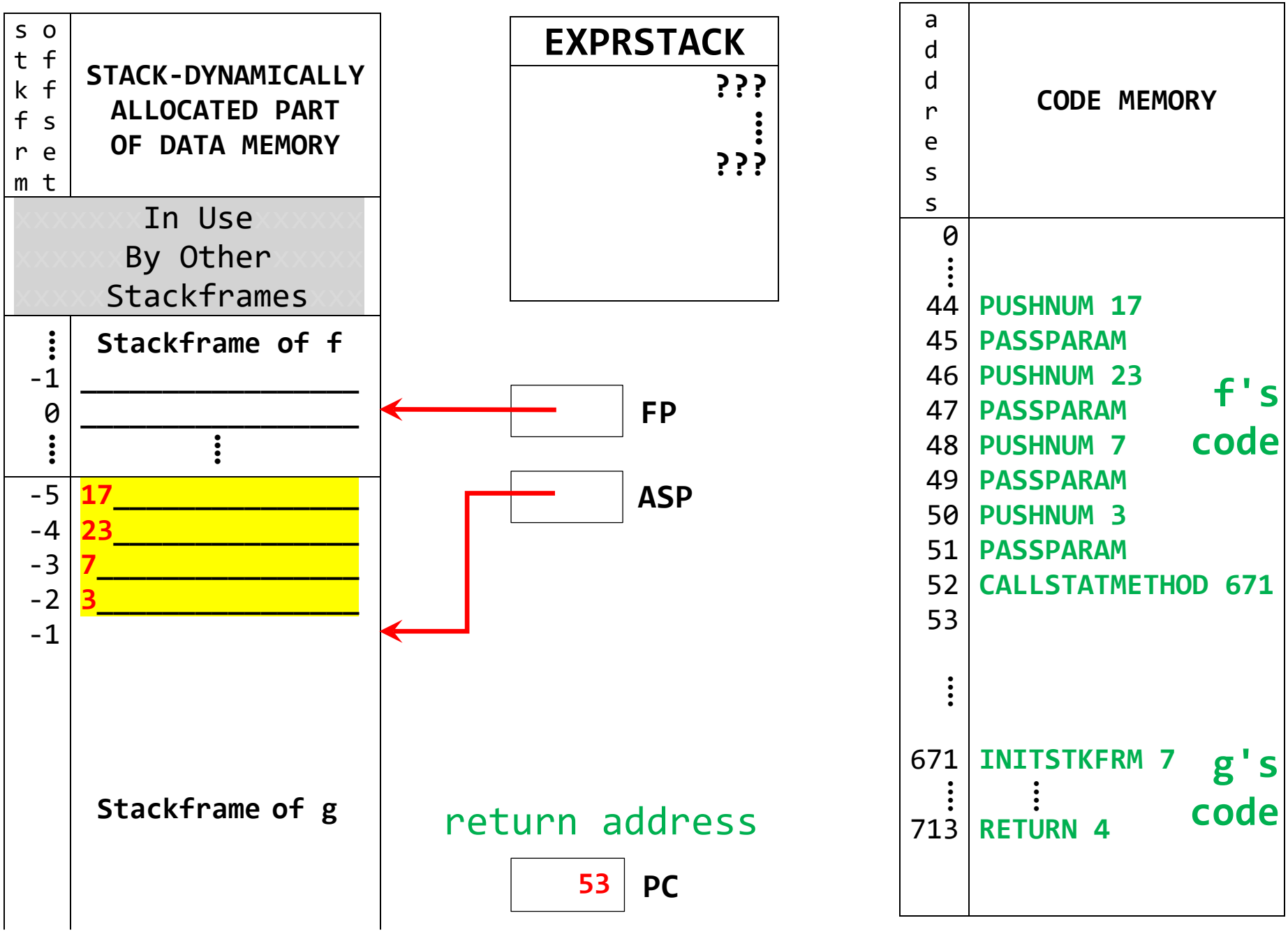
After Step 1 of *Execution of* 713: RETURN 4



After S-POP FP *during Execution of* 713: RETURN 4



After S-POP PC *during of Execution of* 713: RETURN 4



After Final Step of *Execution of* 713: RETURN 4