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PUSHLOCADDR IDENTIFIER.stackframe_offset

or PUSHSTATADDR IDENTIFIER.static_address

Push ptr to IDENT's location

LOADFROMADDR Replace ptr to IDENT's location with ptr to IDENT[0]

code that leaves value of <expr> on top of EXPRSTACK

ADDTOPTR Replace ptr to IDENT[0] with ptr to IDENT[<expr>]

code that leaves value of <expr>$_R$ on top of EXPRSTACK

SAVETOADDR Pop value of <expr>$_R$; pop ptr to IDENT[<expr>]

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SAVETOADDR

Example Suppose a is a ***local*** **int**[] variable and the stackframe offset of a is 2.

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LOADFROMADDR

code that leaves value of <expr> on top of EXPRSTACK

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SAVETOADDR

Example Suppose a is a ***local*** **int**[] variable and the stackframe offset of a is 2.
What TinyJ VM instructions should be generated for the assignment a[23] = 17; assuming a will contain a reference to an array of size ≥ 24 when the instructions are executed?

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IDENTIFIER [<expr>] = <expr>$_R$;

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If variable a refers to an array, then a***'s location stores a pointer to*** a[0].

ANSWER:

PUSHLOCADDR IDENTIFIER.stackframe_offset

or PUSHSTATADDR IDENTIFIER.static_address

LOADFROMADDR

code that leaves value of <expr> on top of EXPRSTACK

ADDTOPTR

code that leaves value of <expr>$_R$ on top of EXPRSTACK

SAVETOADDR

Example Suppose a is a ***local*** **int**[] variable and the stackframe offset of a is 2.

What TinyJ VM instructions should be generated for the assignment a[23] = 17; assuming a will contain a reference to an array of size ≥ 24 when the instructions are executed?

ANSWER:

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e.g., a[9*x] = g(w) + y;

If variable a refers to an array, then a***'s location stores a pointer to*** a[0].

ANSWER:

PUSHLOCADDR IDENTIFIER.stackframe_offset
or PUSHSTATADDR IDENTIFIER.static_address

LOADFROMADDR

code that leaves value of <expr> on top of EXPRSTACK

ADDTOPTR

code that leaves value of <expr>$_R$ on top of EXPRSTACK

SAVETOADDR

Example Suppose a is a ***local*** **int**[] variable and the stackframe offset of a is 2. What TinyJ VM instructions should be generated for the assignment a[23] = 17; assuming a will contain a reference to an array of size ≥ 24 when the instructions are executed?

ANSWER:

```
PUSHLOCADDR 2
     ⋮
```

Q. What code should be generated for the following assignment statement?

IDENTIFIER [<expr>] = <expr>$_R$;

e.g., a[9*x] = g(w) + y;

If variable a refers to an array, then a***'s location stores a pointer to*** a[0].

ANSWER:

PUSHLOCADDR IDENTIFIER.stackframe_offset
or PUSHSTATADDR IDENTIFIER.static_address

LOADFROMADDR

code that leaves value of <expr> on top of EXPRSTACK

ADDTOPTR

code that leaves value of <expr>$_R$ on top of EXPRSTACK

SAVETOADDR

Example Suppose a is a ***local*** **int**[] variable and the stackframe offset of a is 2. What TinyJ VM instructions should be generated for the assignment a[23] = 17; assuming a will contain a reference to an array of size ≥ 24 when the instructions are executed?

ANSWER:

```
PUSHLOCADDR 2
LOADFROMADDR
PUSHNUM 23
ADDTOPTR
    :
```

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e.g., a[9*x] = g(w) + y;

If variable a refers to an array, then a***'s location stores a pointer to*** a[0].

ANSWER:

PUSHLOCADDR IDENTIFIER.stackframe_offset
or PUSHSTATADDR IDENTIFIER.static_address

LOADFROMADDR
code that leaves value of <expr> on top of EXPRSTACK
ADDTOPTR

code that leaves value of <expr>$_R$ on top of EXPRSTACK
SAVETOADDR

Example Suppose a is a ***local*** **int**[] variable and the stackframe offset of a is 2. What TinyJ VM instructions should be generated for the assignment a[23] = 17; assuming a will contain a reference to an array of size ≥ 24 when the instructions are executed?

ANSWER:

```
PUSHLOCADDR 2
LOADFROMADDR
PUSHNUM 23
ADDTOPTR
PUSHNUM 17
SAVETOADDR
```

BEFORE execution of: PUSHLOCADDR 2

offset from stkfrm	Stackframe of Currently Executing Method Activation
-3	
-2	
-1	
0	
1	
a 2	
3	
⋮	

EXPRSTACK

???
⋮
???

address	HEAP (Part of Data memory)
⋮	allocated for other purposes
13212	PTR TO ADDR 13313
13213	array of size ≥ 24 (size is 100 in this example)
⋮	
13236	
⋮	
13312	
13313	

address	CODE MEMORY
0	
1	
⋮	
	PUSHLOCADDR 2
	LOADFROMADDR
	PUSHNUM 23
	ADDTOPTR
	PUSHNUM 17
	SAVETOADDR

These instructions execute:
a[23] = 17;

BEFORE execution of: PUSHLOCADDR 2

offset from stkfrm	Stackframe of Currently Executing Method Activation
-3	
-2	
-1	
0	
1	
a 2	
3	
⋮	

EXPRSTACK

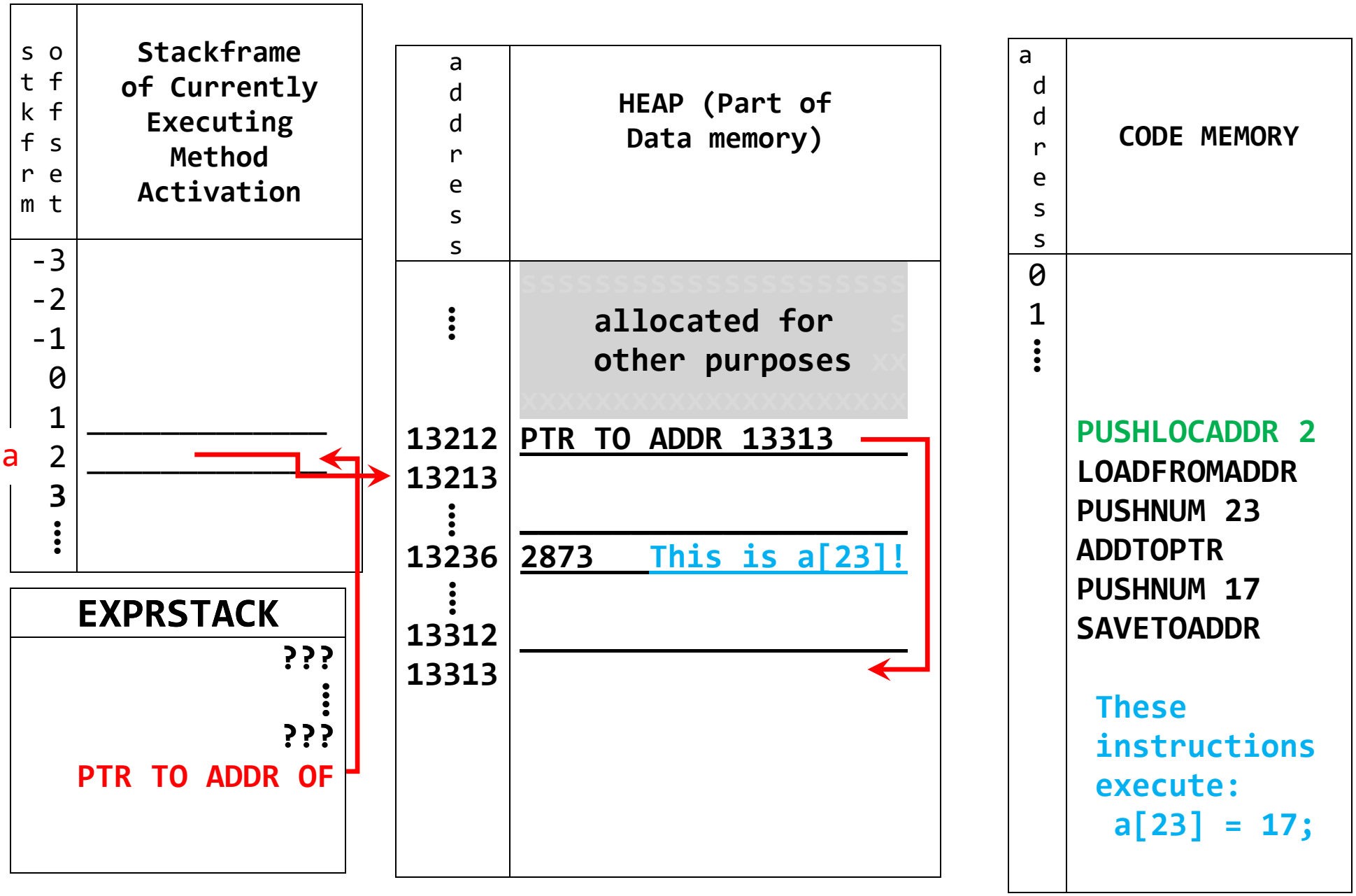
???
⋮
???

address	HEAP (Part of Data memory)
⋮	allocated for other purposes
13212	PTR TO ADDR 13313
13213	
⋮	
13236	2873 This is a[23]!
⋮	
13312	
13313	

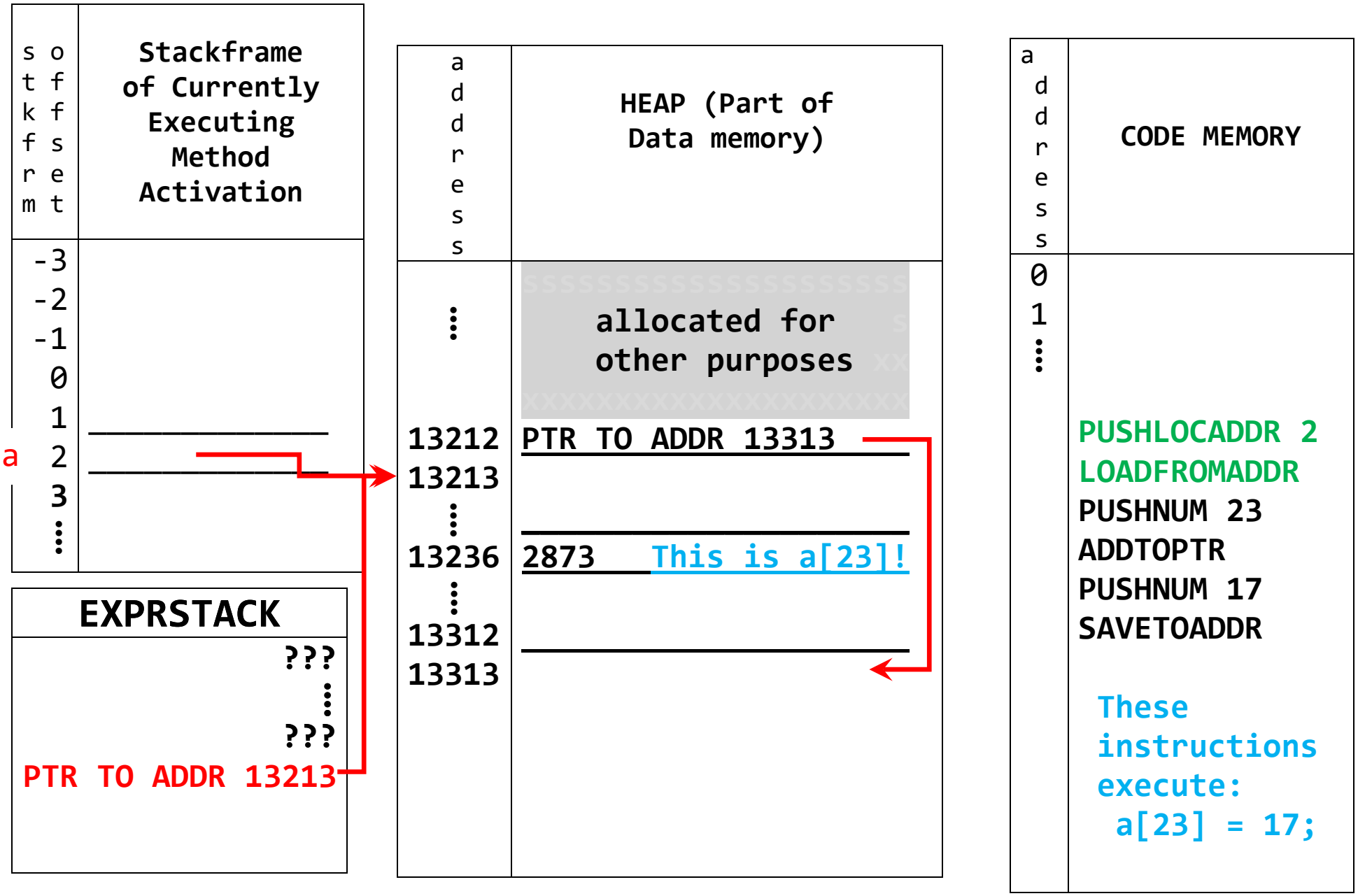
address	CODE MEMORY
0	PUSHLOCADDR 2
1	LOADFROMADDR
⋮	PUSHNUM 23
	ADDTOPTR
	PUSHNUM 17
	SAVETOADDR

These instructions execute:
a[23] = 17;

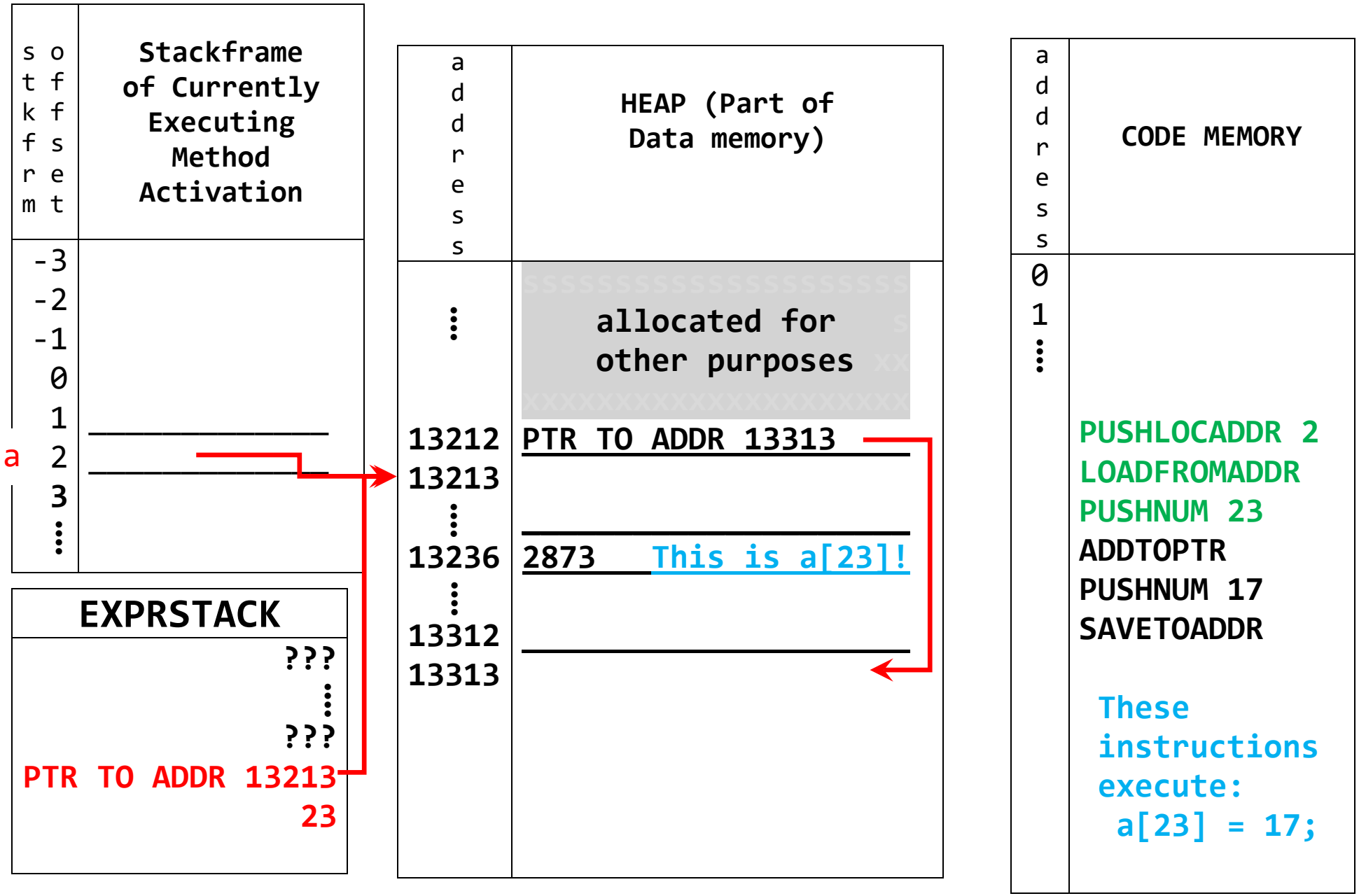
AFTER *execution of*: PUSHLOCADDR 2



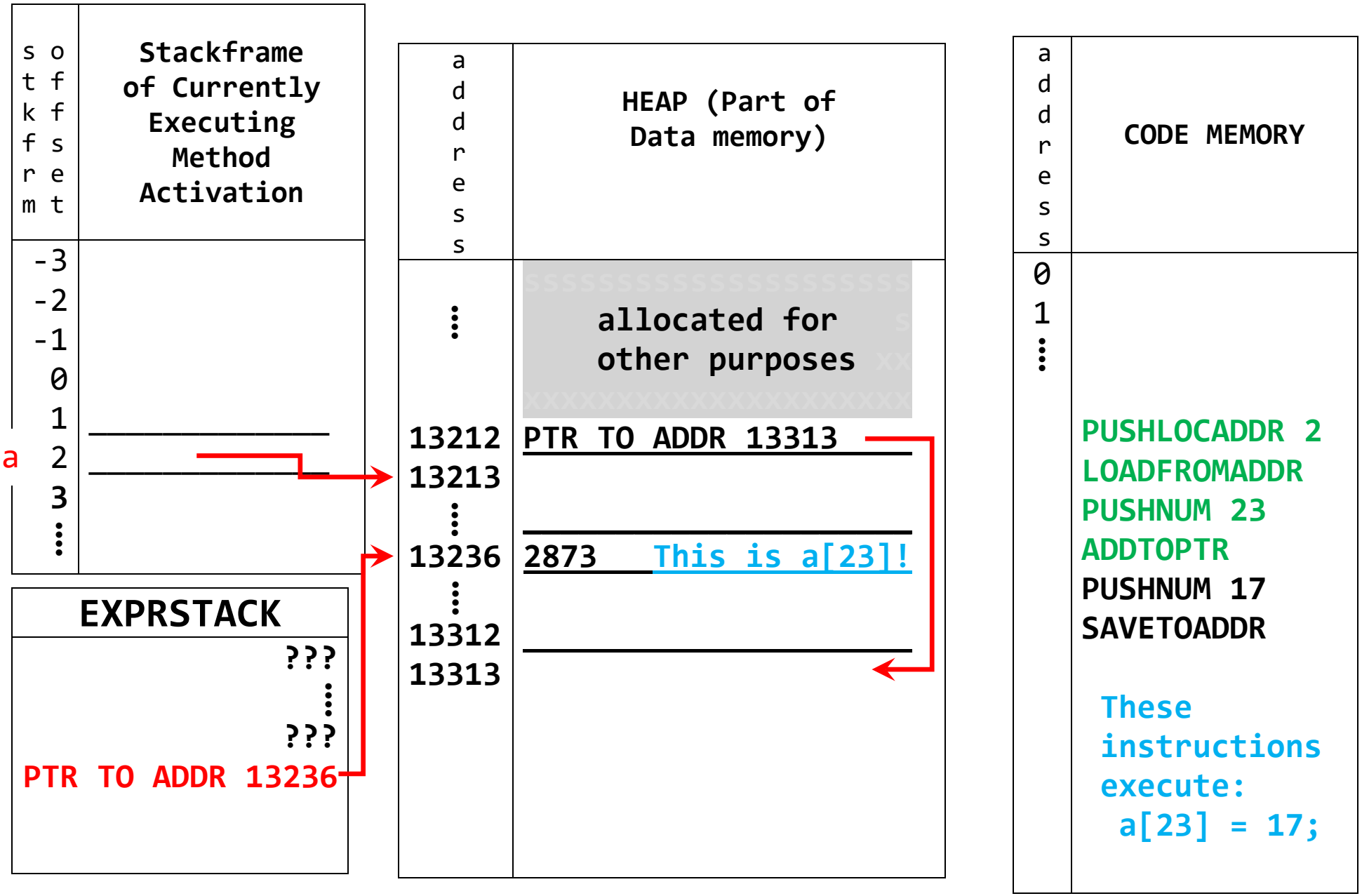
AFTER execution of: LOADFROMADDR



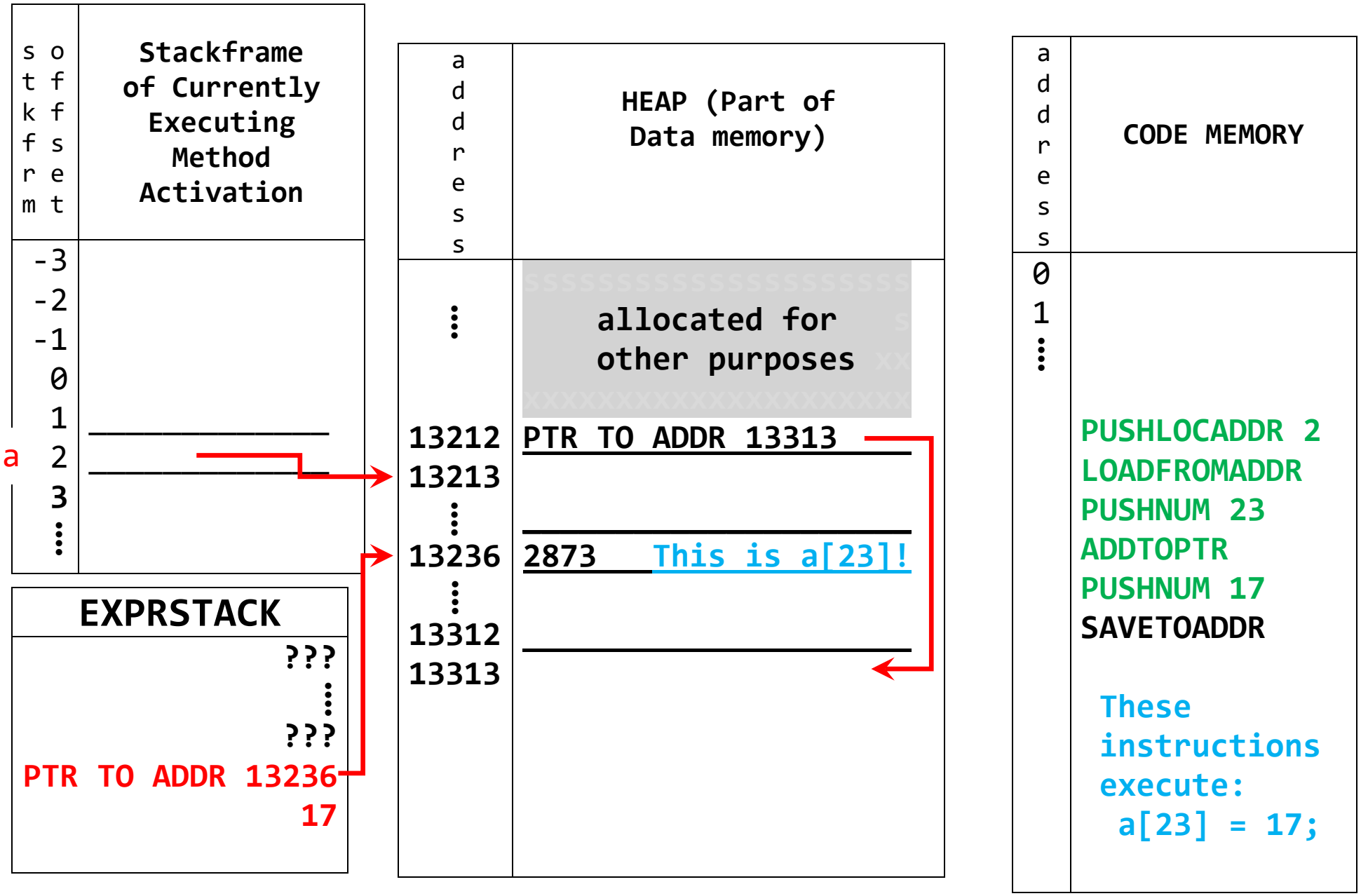
AFTER execution of: PUSHNUM 23



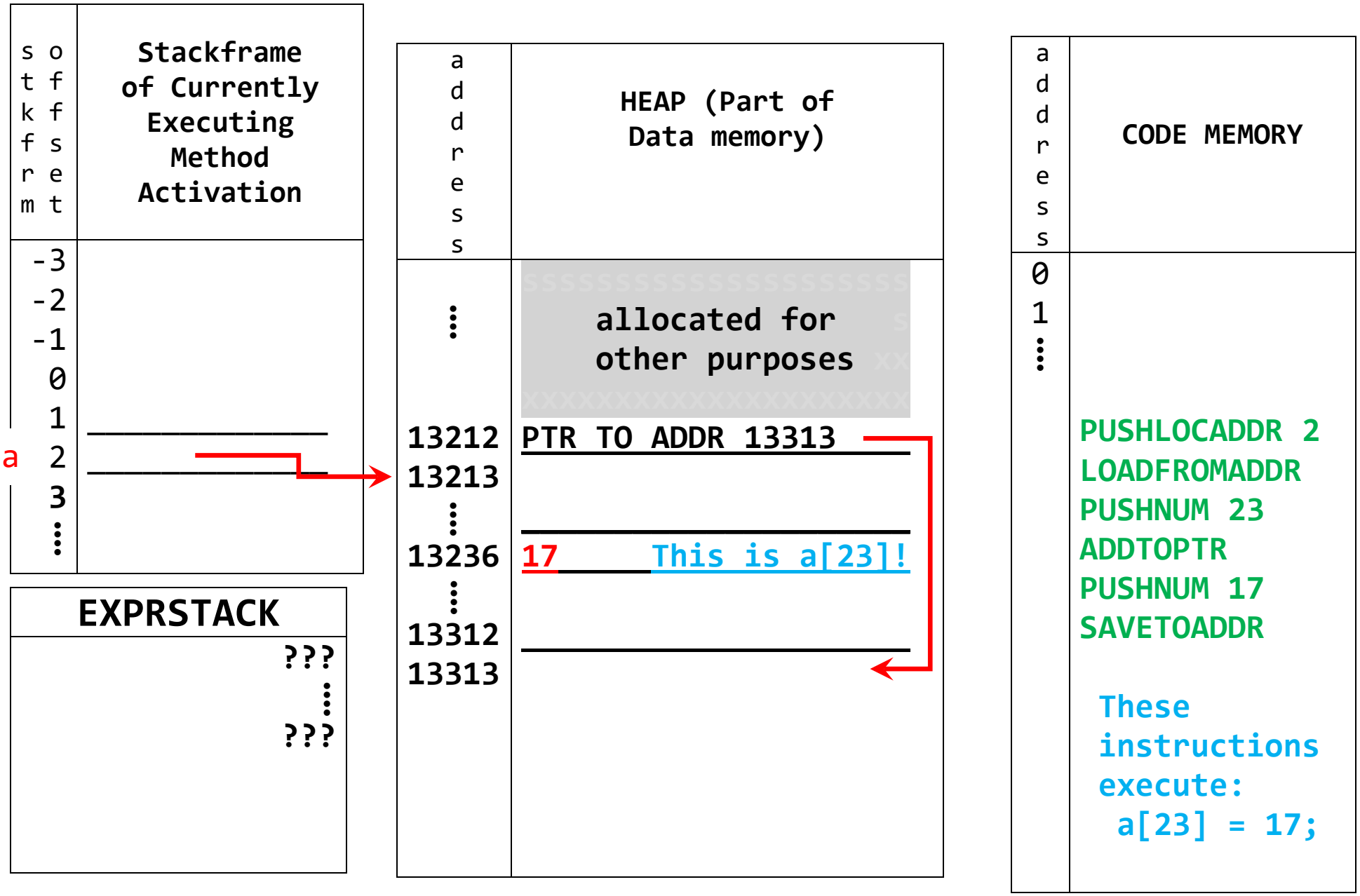
AFTER execution of: ADDTOPTR



AFTER *execution of*: PUSHNUM 17



AFTER execution of: SAVETOADDR



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e.g., a[2*x][9][y-x] = u + g(w);

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code that leaves value of <expr>$_1$ on top of EXPRSTACK

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code that leaves value of <expr>$_2$ on top of EXPRSTACK

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LOADFROMADDR

code that leaves value of <expr>$_3$ on top of EXPRSTACK

ADDTOPTR Replace ptr to IDENT[<expr>$_1$][<expr>$_2$] with ptr to IDENT[<expr>$_1$][<expr>$_2$][<expr>$_3$]

code that leaves value of <expr>$_R$ on top of EXPRSTACK

Push value of <expr>$_R$

SAVETOADDR Pop value of <expr>$_R$; pop ptr to IDENT[<expr>$_1$][<expr>$_2$][<expr>$_3$]

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code that leaves value of <expr>$_2$ on top of EXPRSTACK

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LOADFROMADDR

code that leaves value of <expr>$_3$ on top of EXPRSTACK

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code that leaves value of <expr>$_2$ on top of EXPRSTACK

ADDTOPTR **Replace ptr to IDENT[<expr>$_1$][0] with ptr to IDENT[<expr>$_1$][<expr>$_2$]**

LOADFROMADDR

code that leaves value of <expr>$_3$ on top of EXPRSTACK

ADDTOPTR **Replace ptr to IDENT[<expr>$_1$][<expr>$_2$] with ptr to IDENT[<expr>$_1$][<expr>$_2$][<expr>$_3$]**

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code that leaves value of <expr>$_2$ on top of EXPRSTACK

ADDTOPTR Replace ptr to IDENT[<expr>$_1$][0] with ptr to IDENT[<expr>$_1$][<expr>$_2$]

LOADFROMADDR

code that leaves value of <expr>$_3$ on top of EXPRSTACK

ADDTOPTR Replace ptr to IDENT[<expr>$_1$][<expr>$_2$] with ptr to IDENT[<expr>$_1$][<expr>$_2$][<expr>$_3$]

code that leaves value of <expr>$_R$ on top of EXPRSTACK

Push value of <expr>$_R$

SAVETOADDR Pop value of <expr>$_R$; pop ptr to IDENT[<expr>$_1$][<expr>$_2$][<expr>$_3$] Save value of <expr>$_R$ into IDENT[<expr>$_1$][<expr>$_2$][<expr>$_3$]'s loc.

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ANSWER:

PUSHLOCADDR IDENTIFIER.stackframe_offset
or PUSHSTATADDR IDENTIFIER.static_address

LOADFROMADDR
code that leaves value of <expr>$_1$ on top of EXPRSTACK
ADDTOPTR

⋮

LOADFROMADDR
code that leaves value of <expr>$_n$ on top of EXPRSTACK
ADDTOPTR

code that leaves value of <expr>$_R$ on top of EXPRSTACK
SAVETOADDR

Q. What code should be generated to ***<u>Leave the value of</u>*** the following indexed variable on top of EXPRSTACK?

IDENTIFIER [<expr>$_1$] ... [<expr>$_k$]

e.g., a[2*x][9][y-x]

ANSWER:

This is ***part*** of the code that should be generated for a statement that prints the value of IDENTIFIER [<expr>$_1$] ... [<expr>$_k$] or a statement that assigns the value of IDENTIFIER [<expr>$_1$] ... [<expr>$_k$] to another variable.

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code that leaves value of <expr>$_k$ on top of EXPRSTACK
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