The TinyJ Virtual Machine’s Memory (VM Registers are Not Shown)

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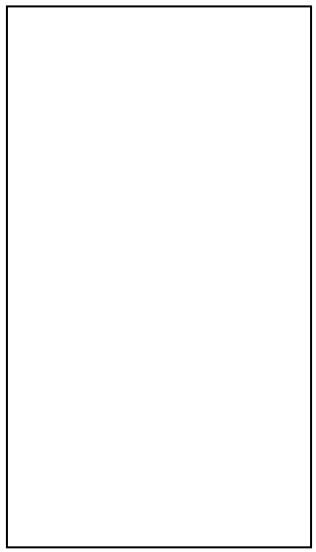
STATICALLY ALLOCATED DATA MEMORY



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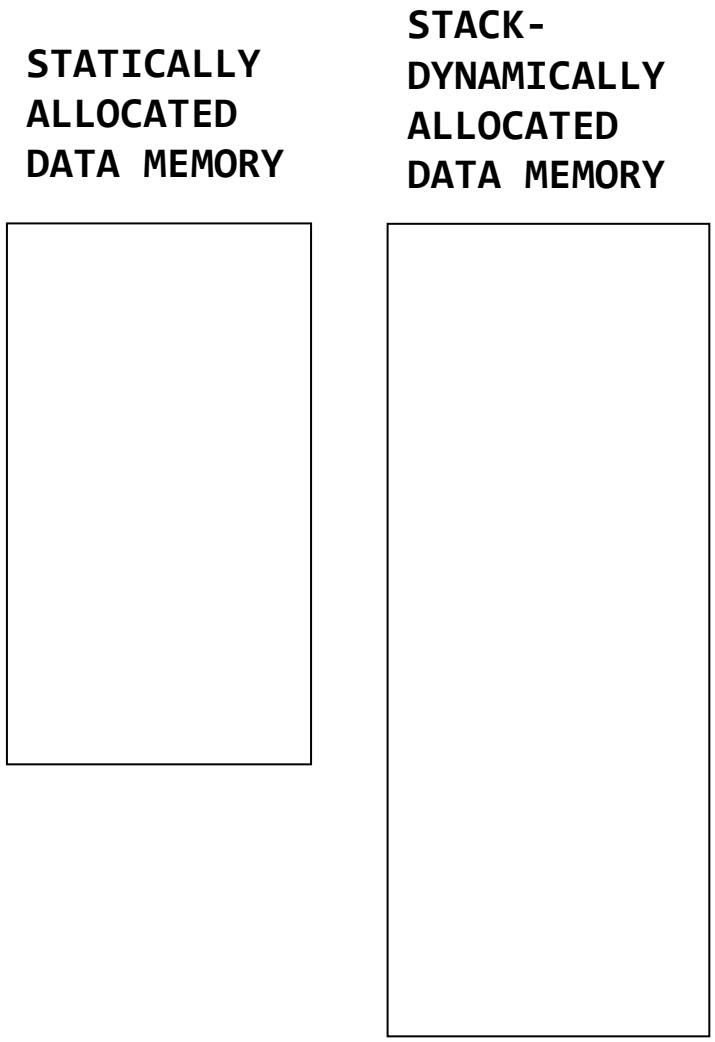

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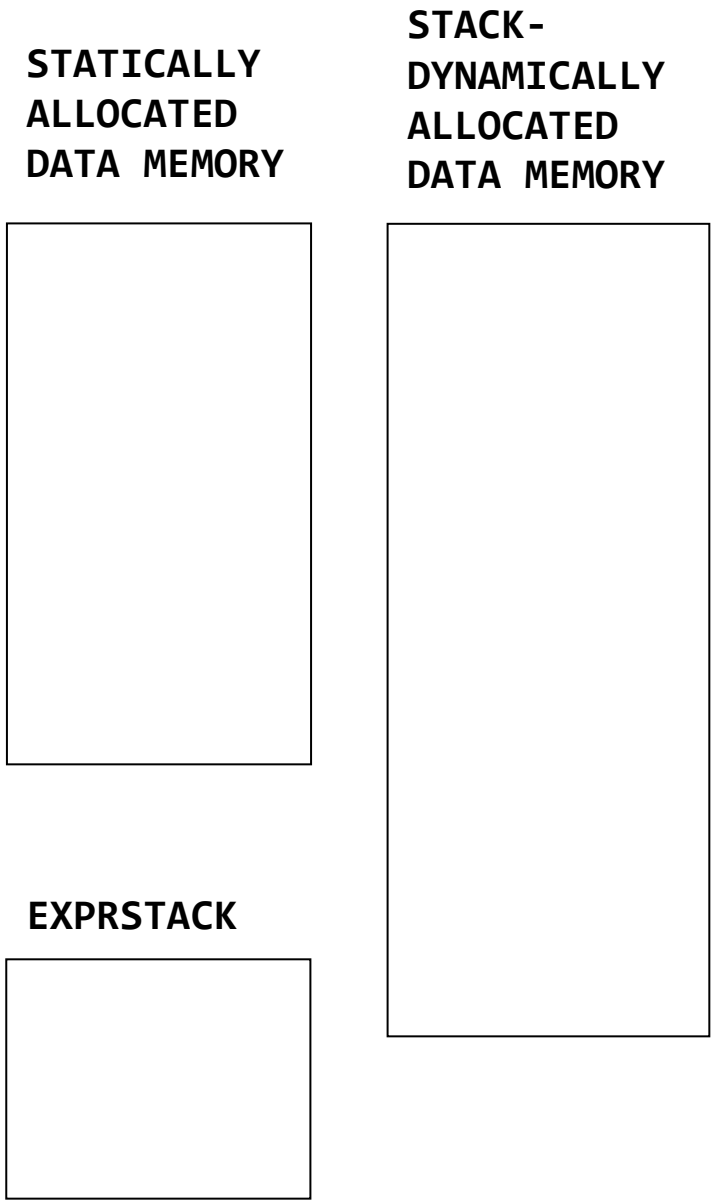

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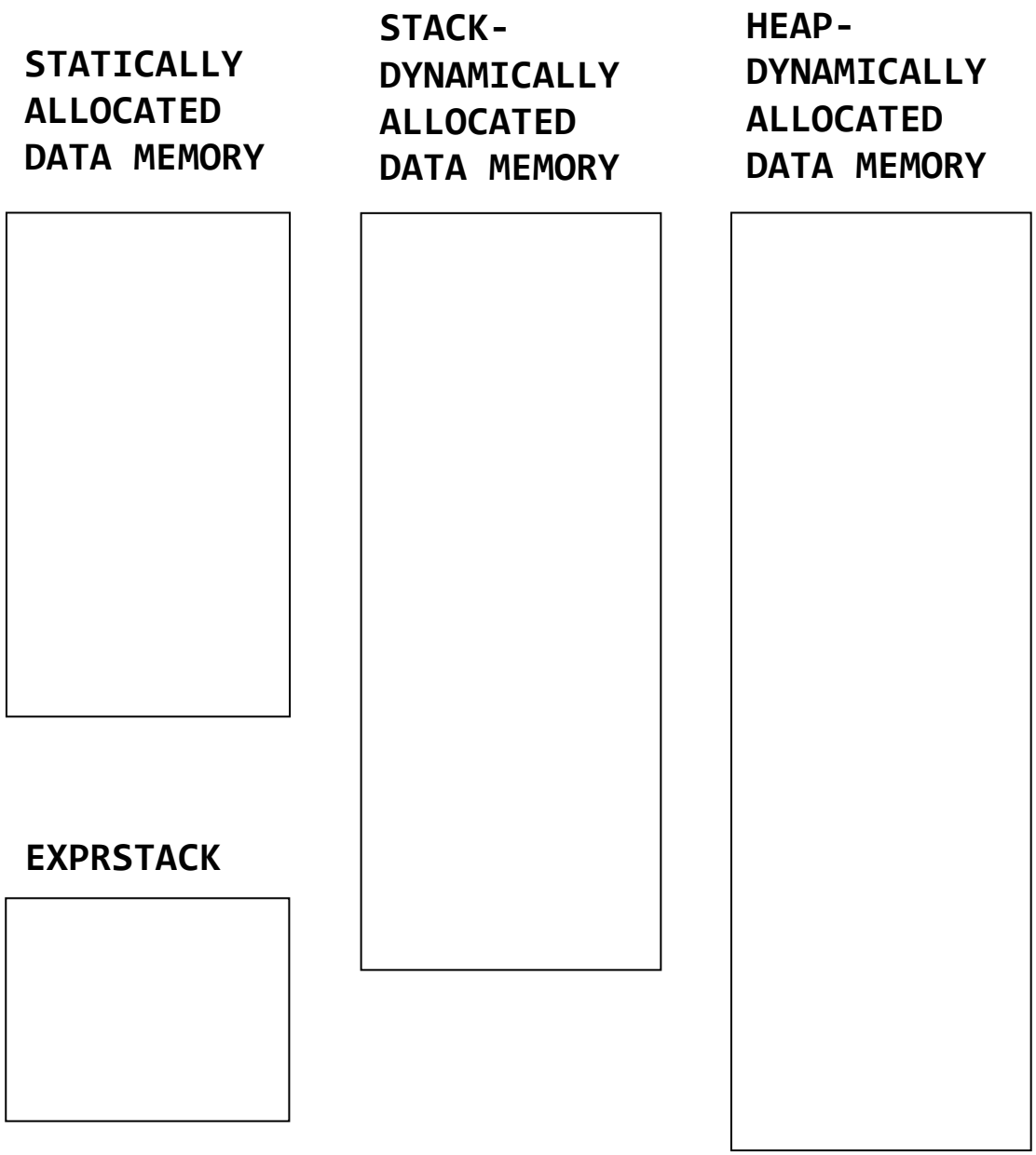

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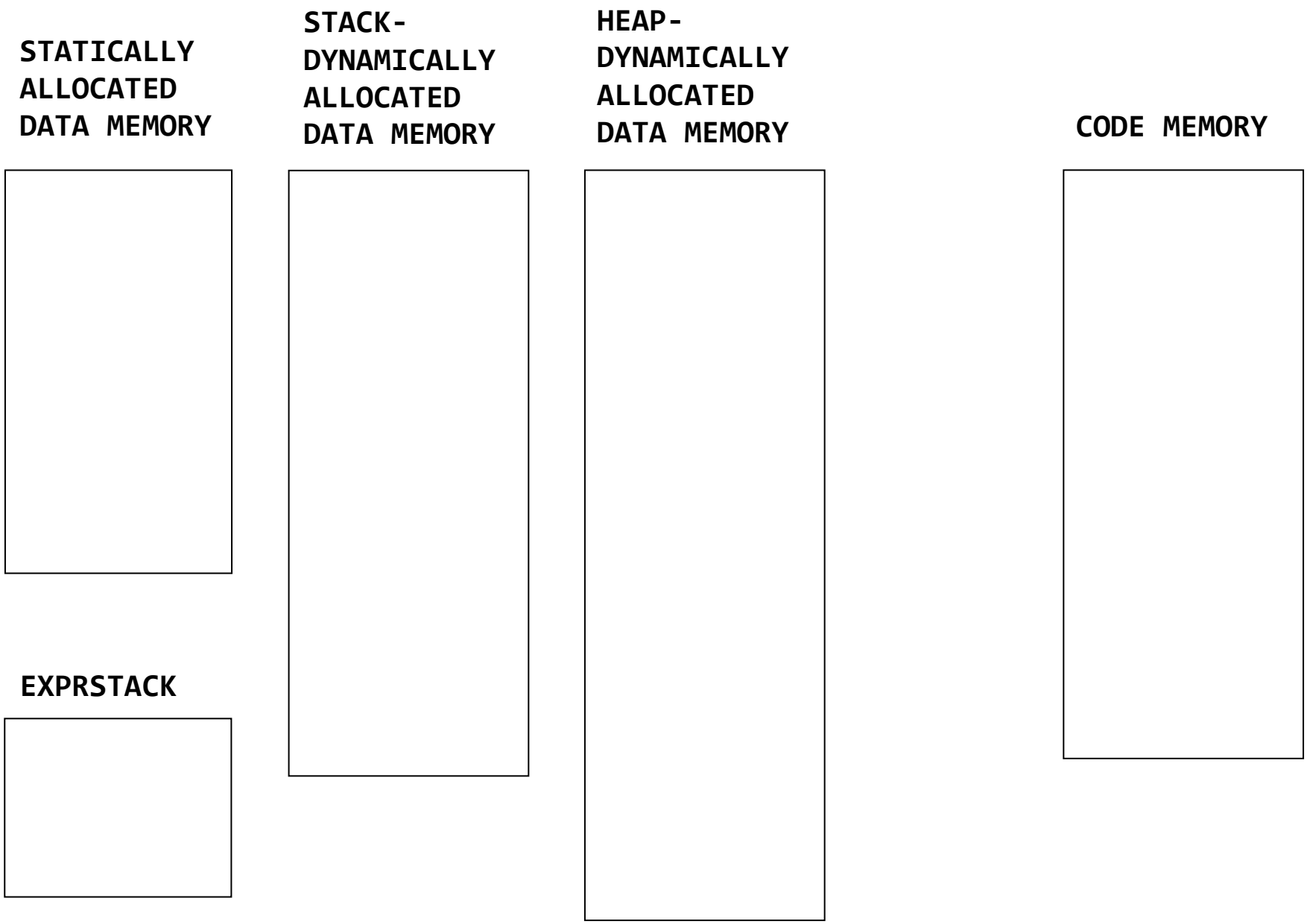

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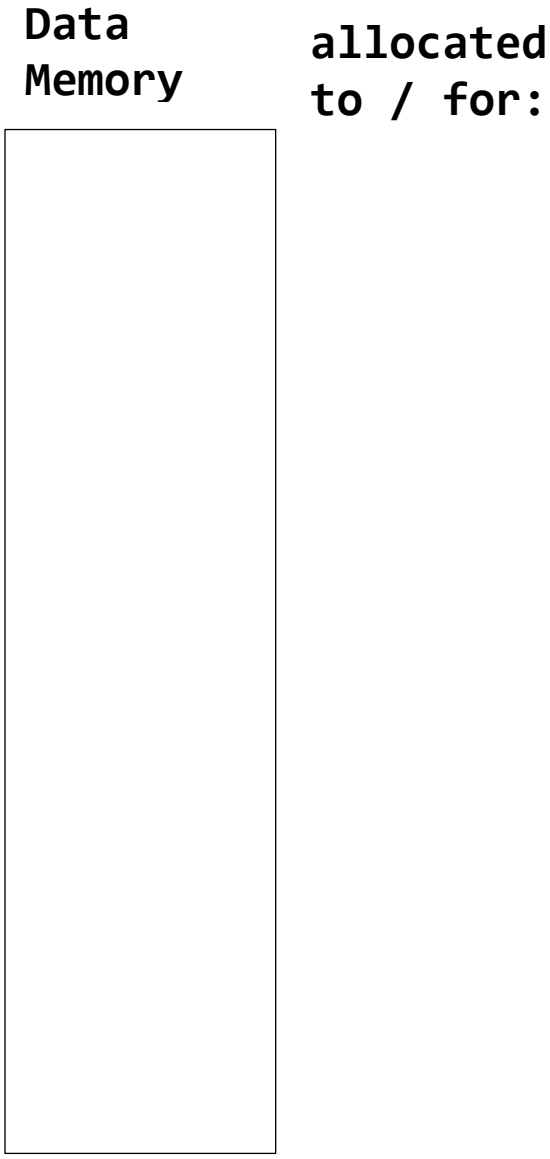

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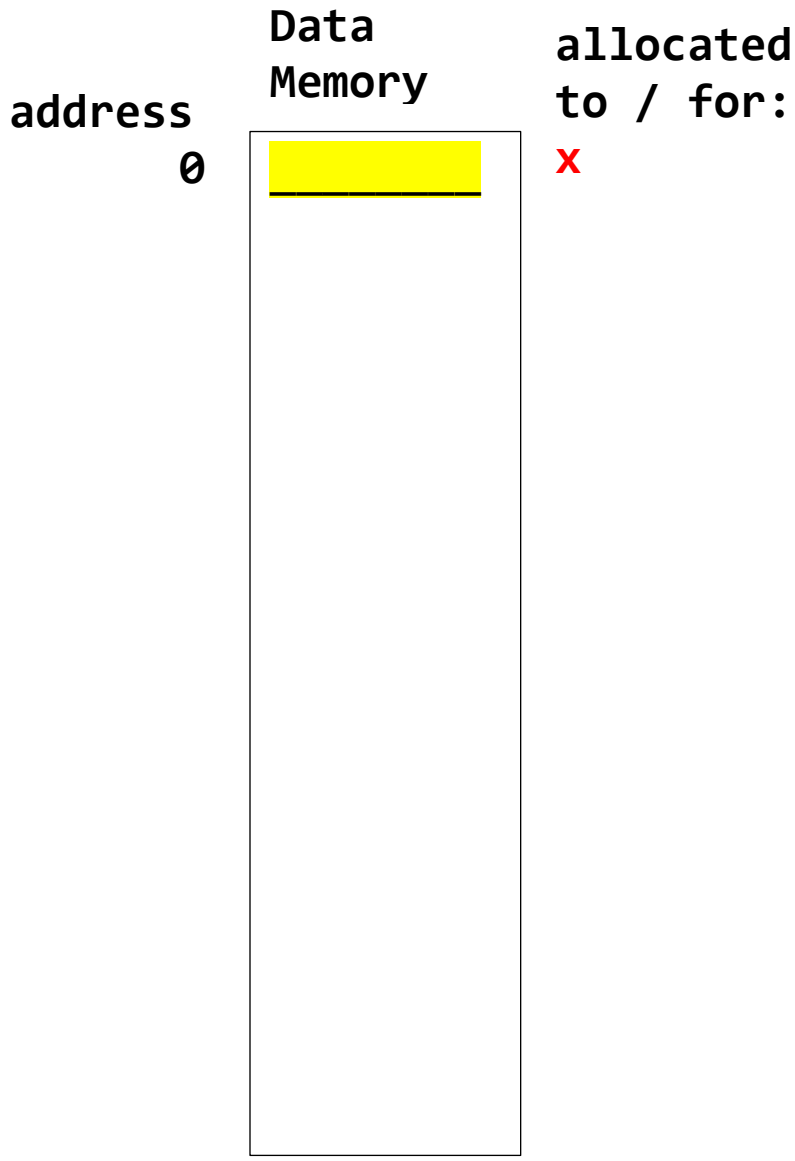

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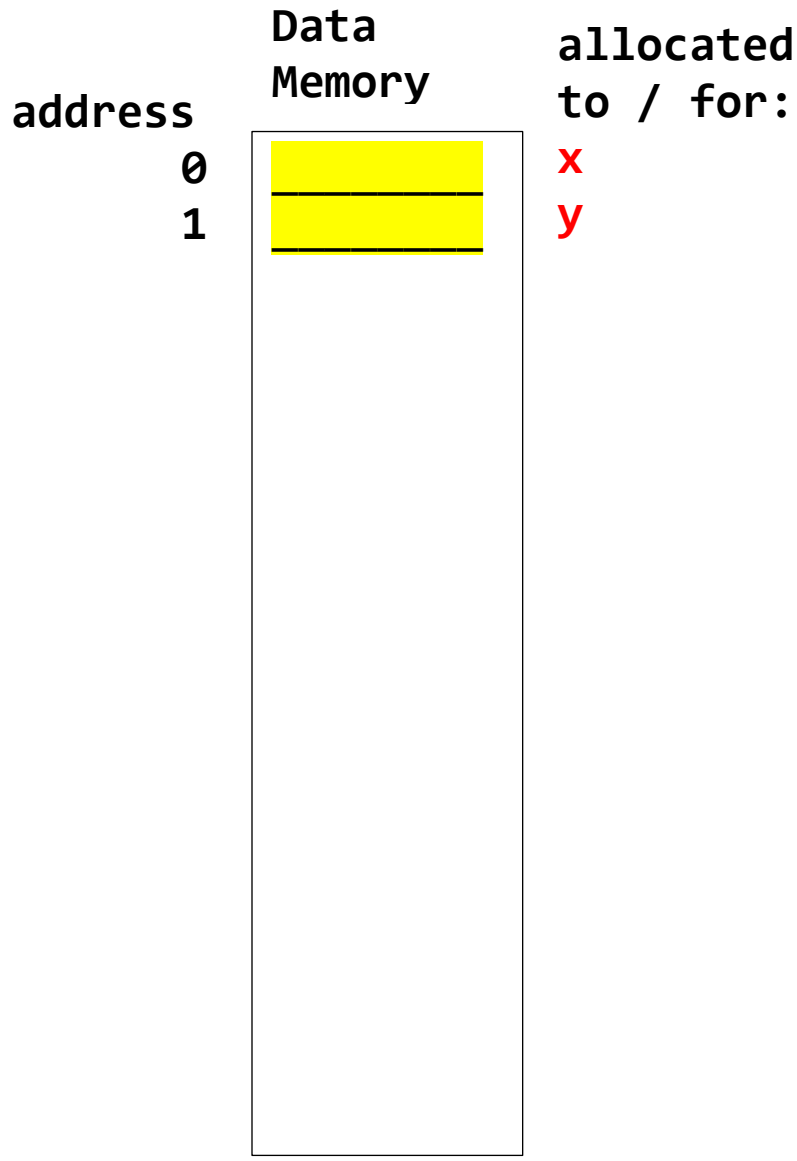

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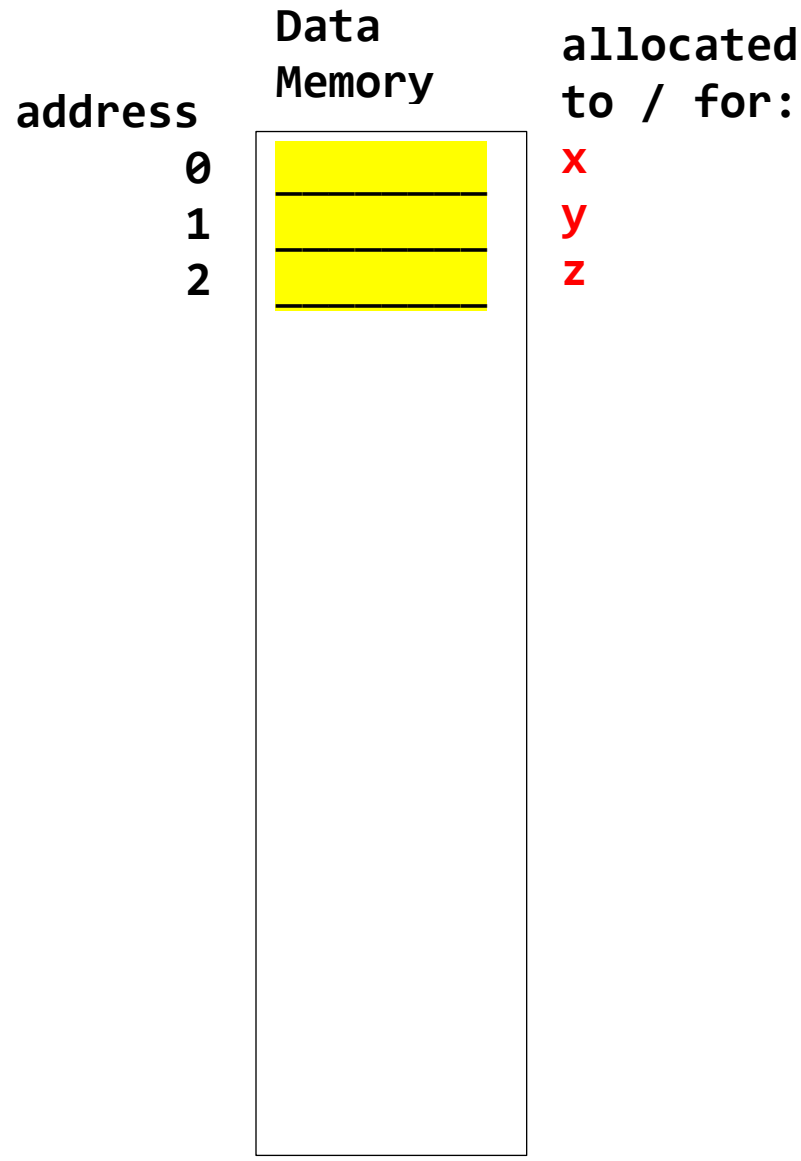

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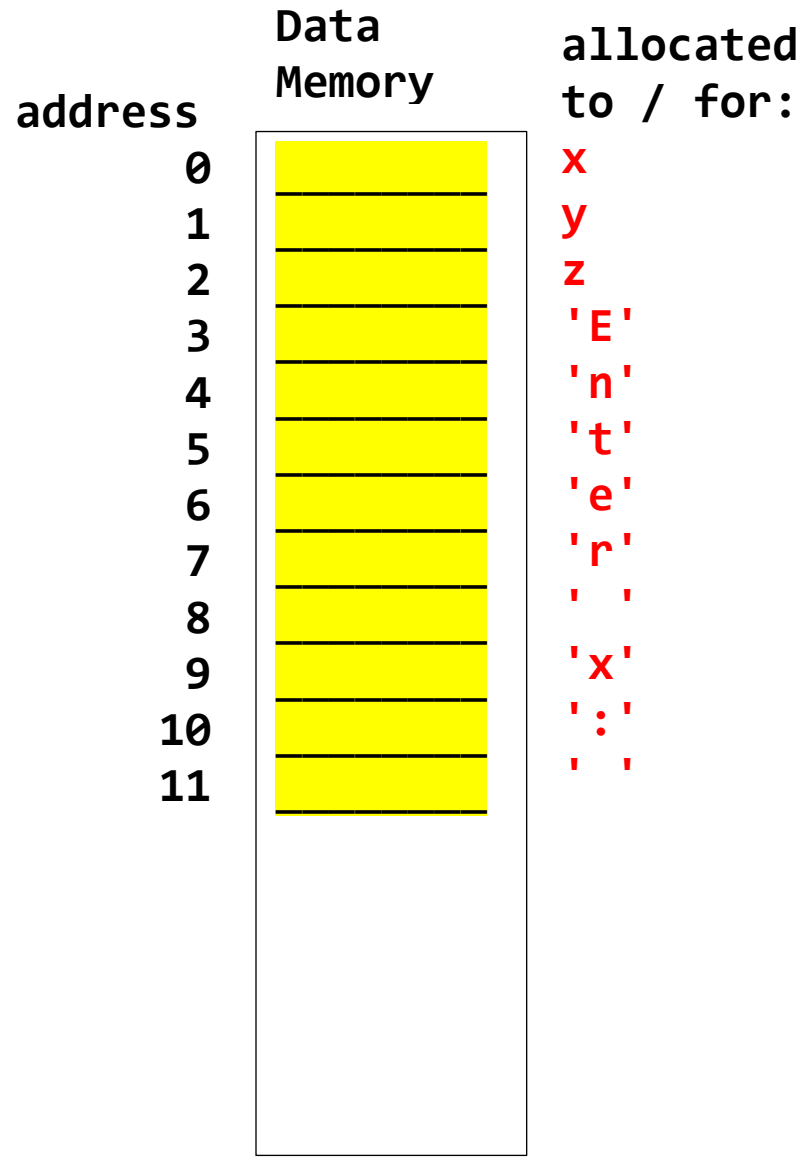

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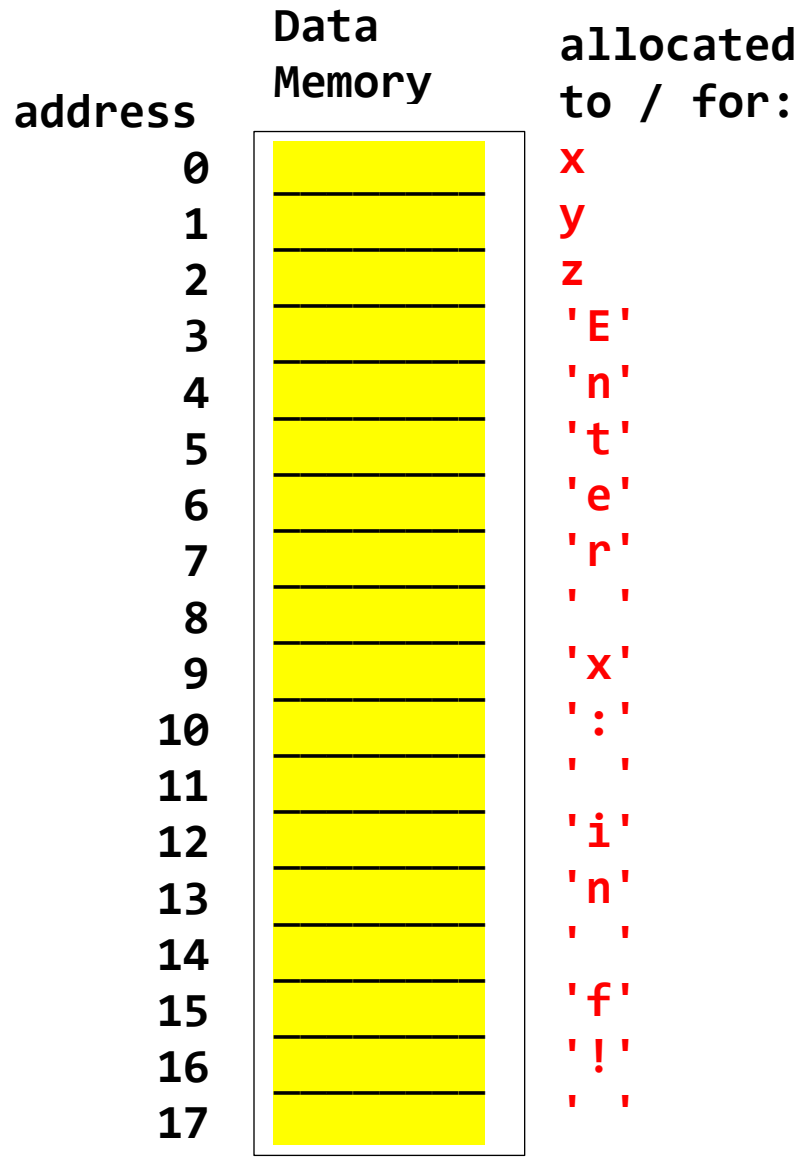

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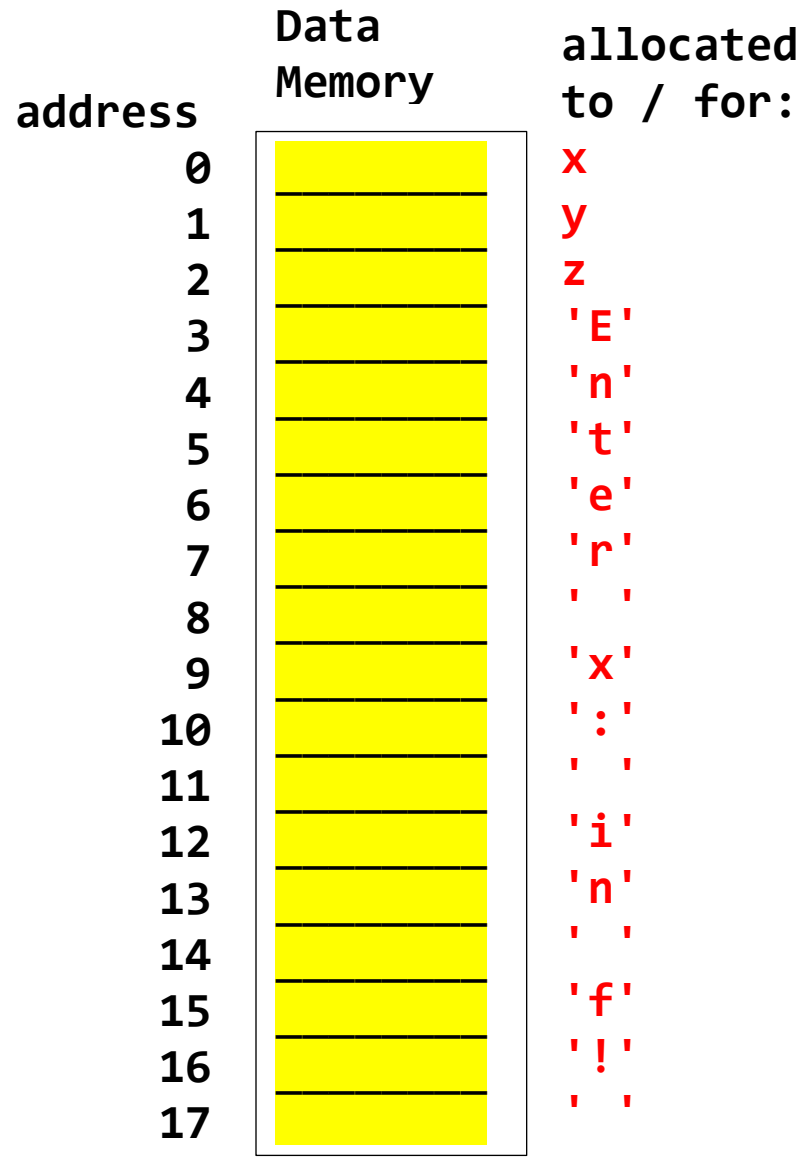

Answer: 18 locations are statically allocated as shown above.

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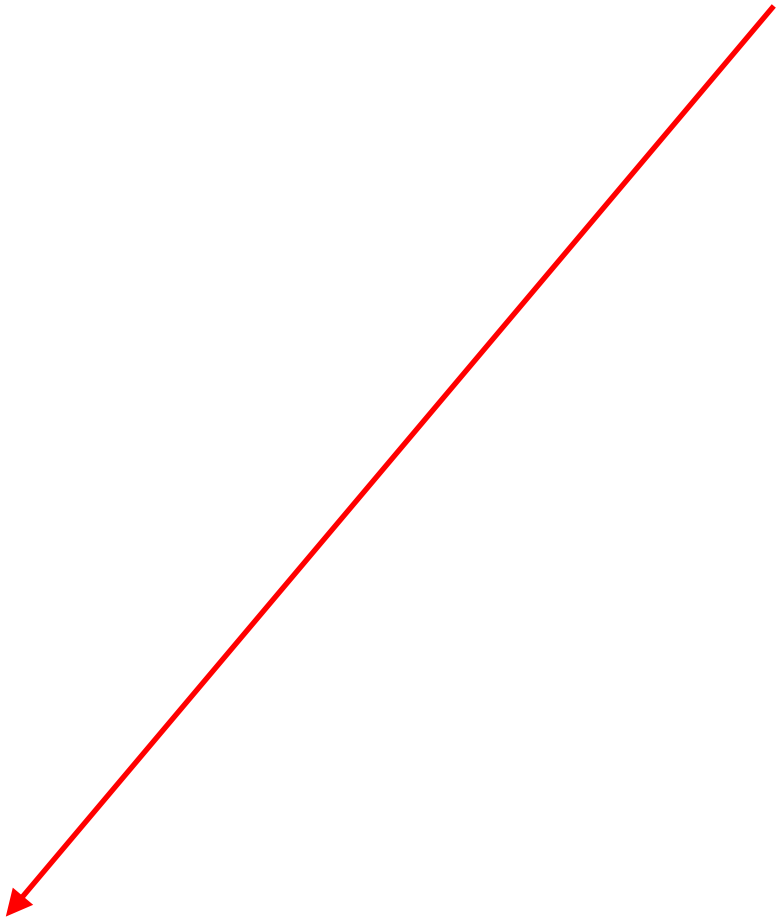
ANSWER: 11



See pp. 3-4 of:
https://euclid.cs.qc.cuny.edu/316/Memory-allocation-VM-instruction-set-and-hints-for-asn-2.pdf

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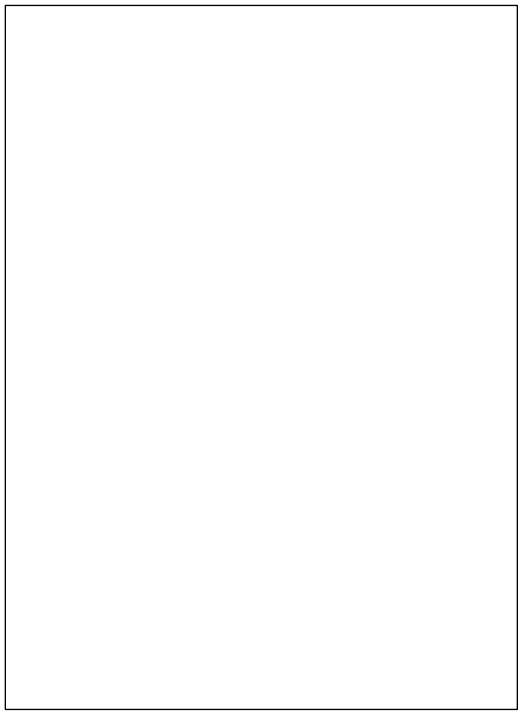
ANSWER: 11

offset **Stackframe of any call of my_func** allocated to



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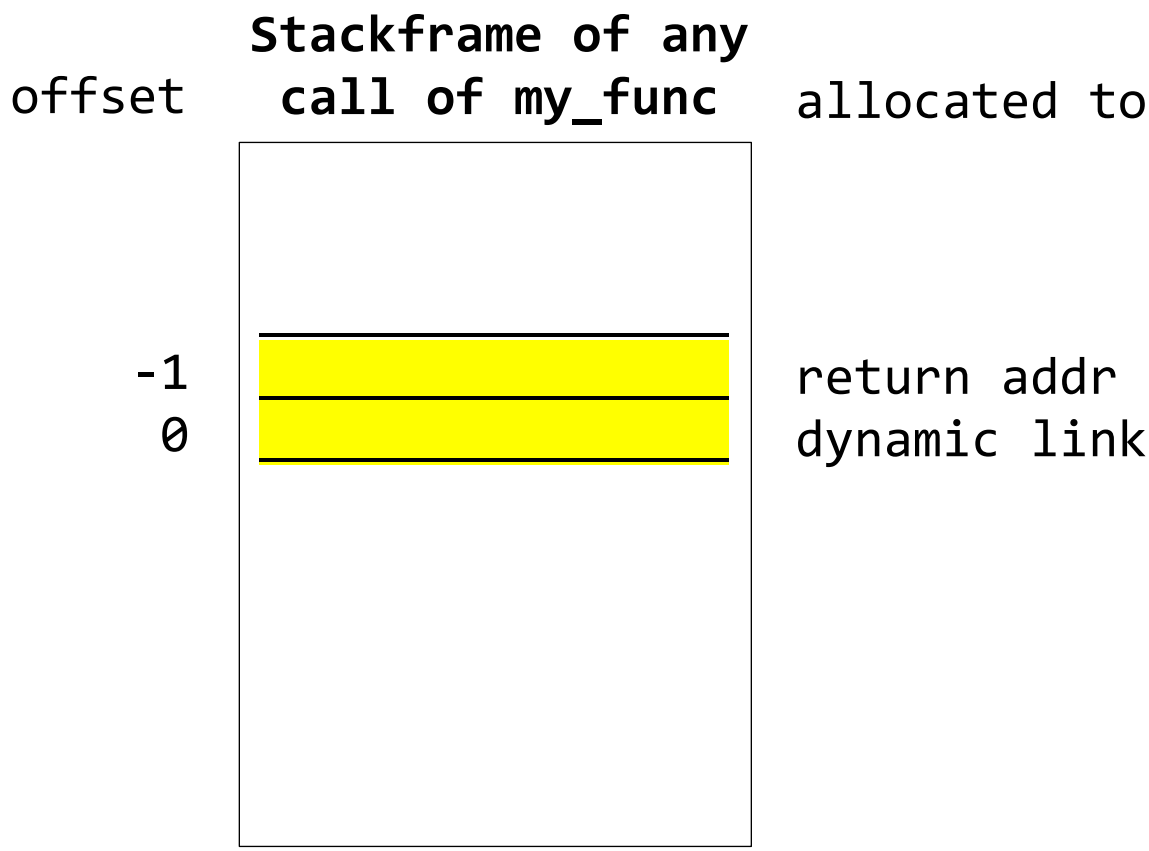
ANSWER: 11



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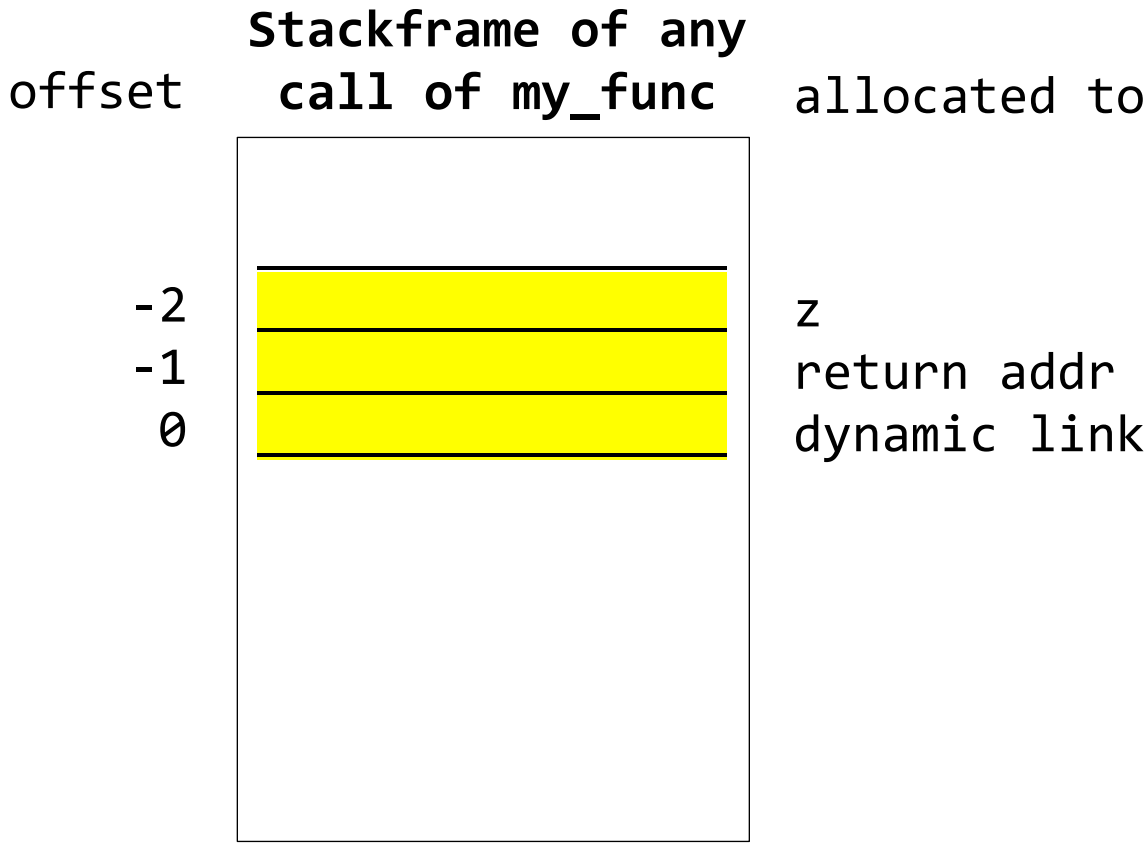
ANSWER: 11



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ANSWER: 11

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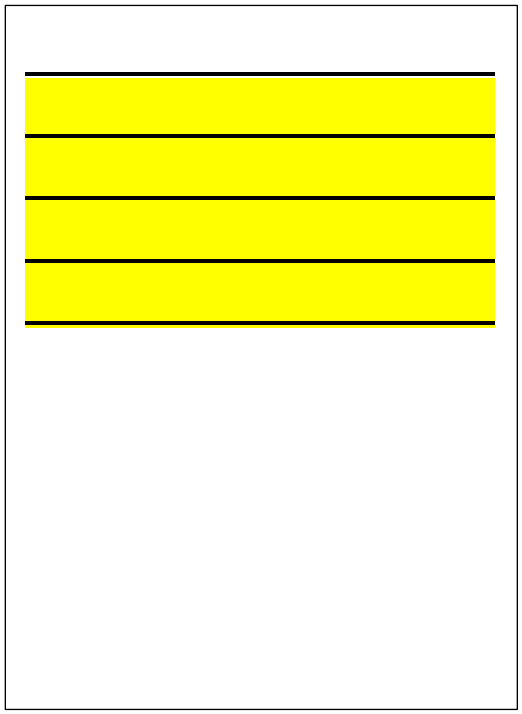

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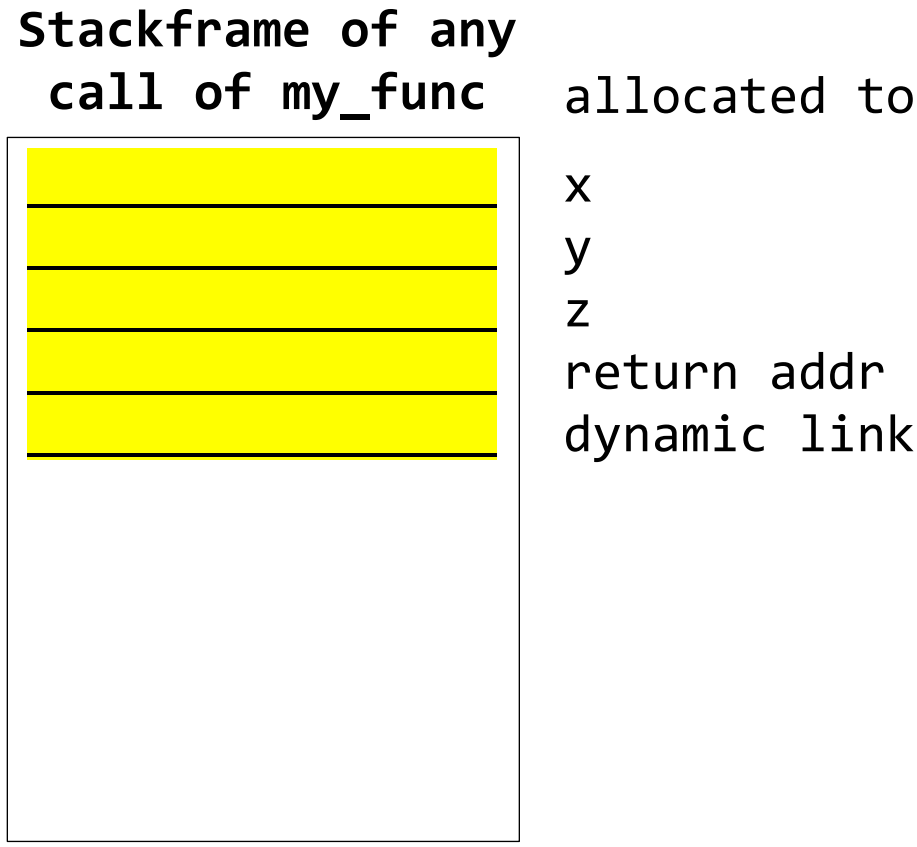

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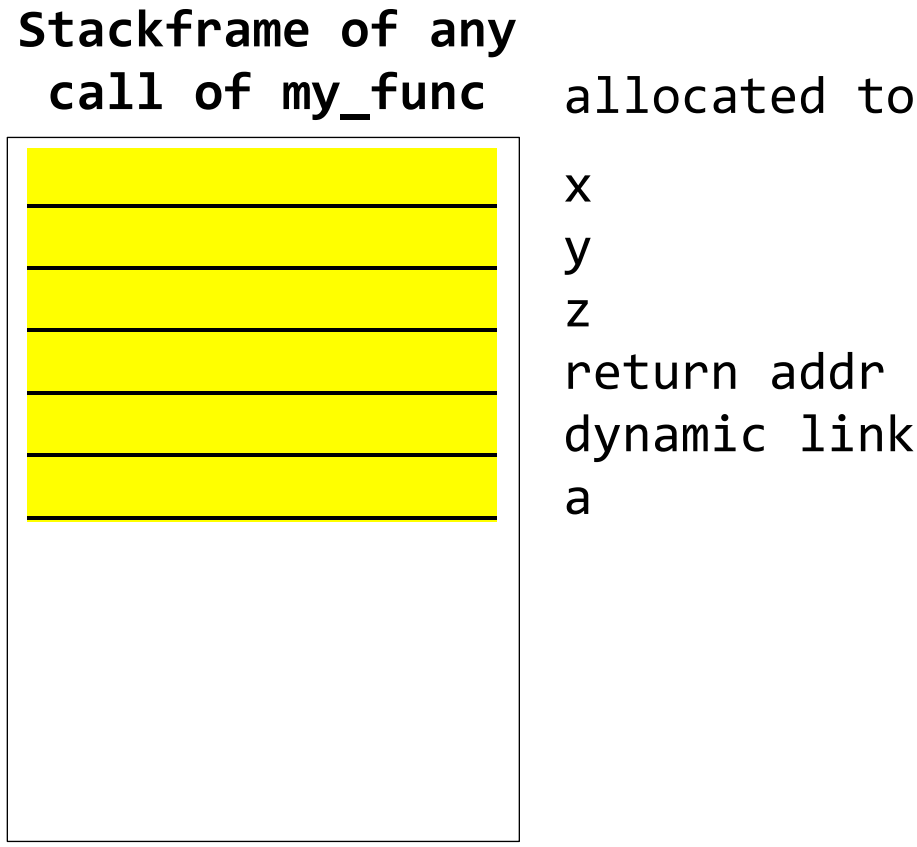

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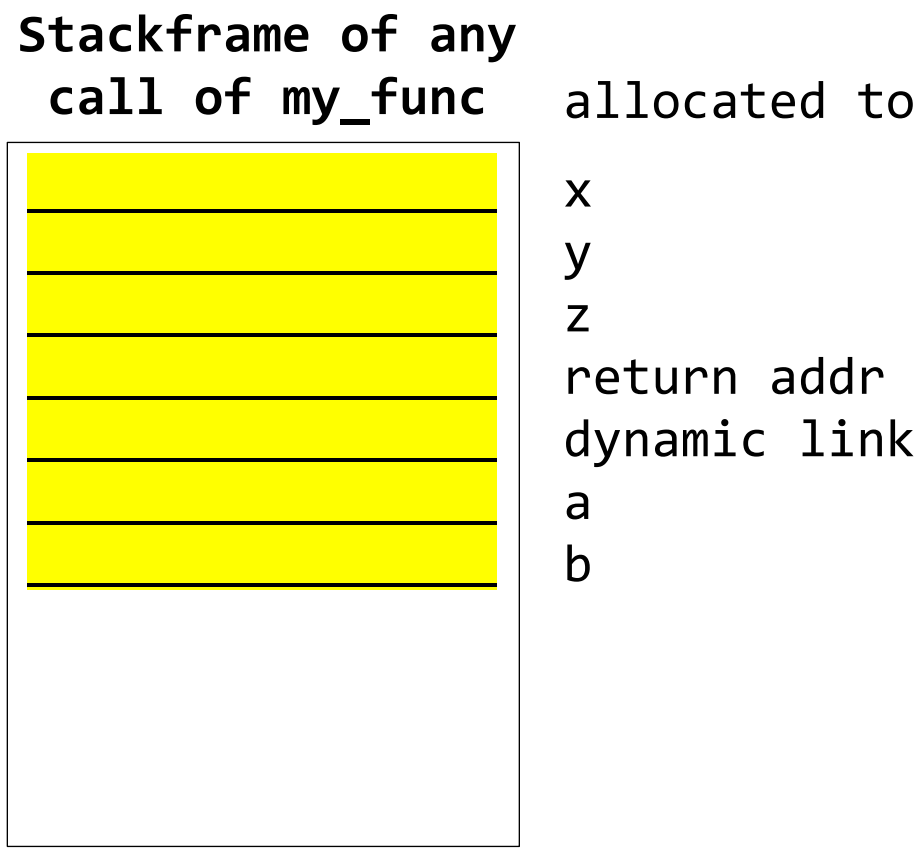

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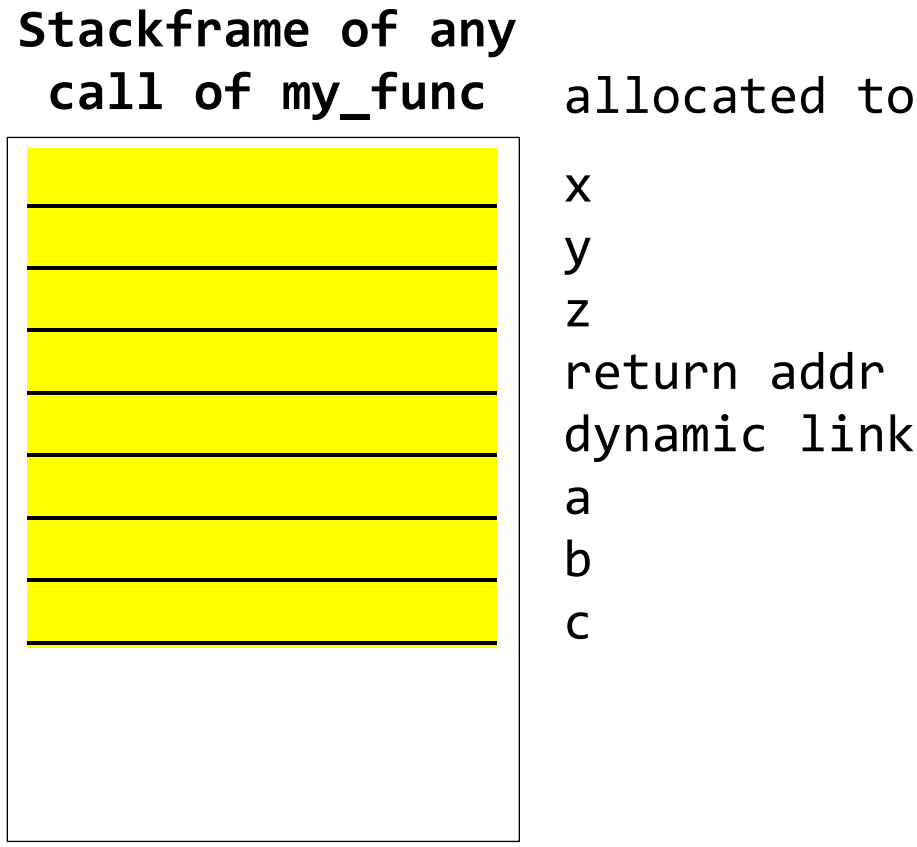

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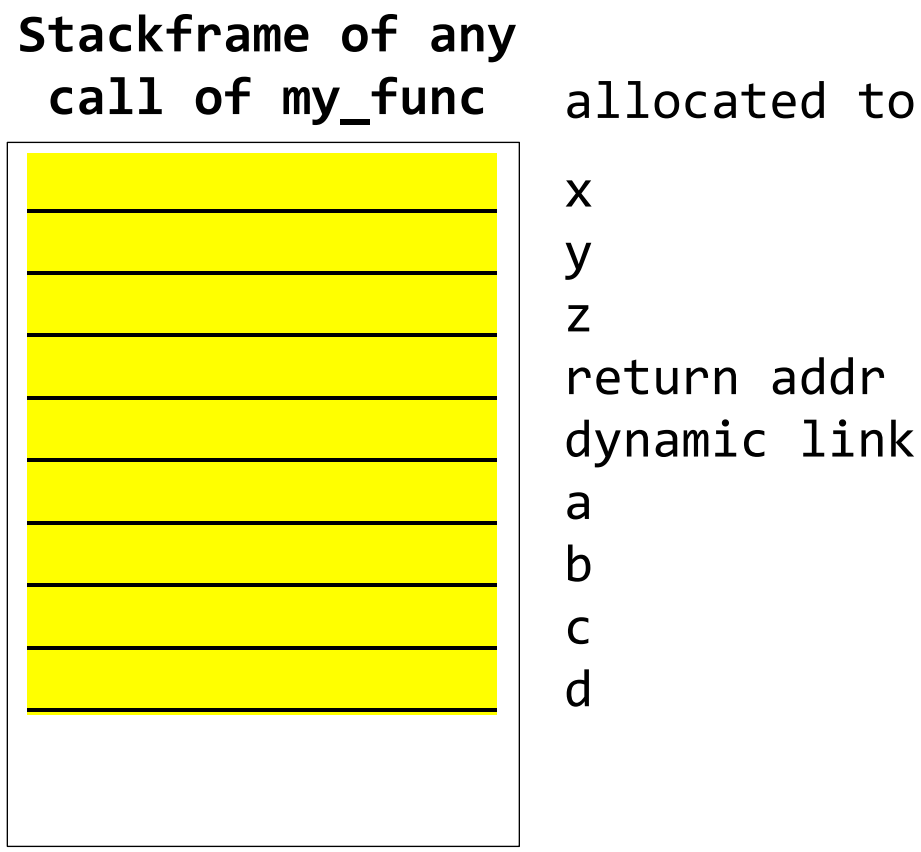

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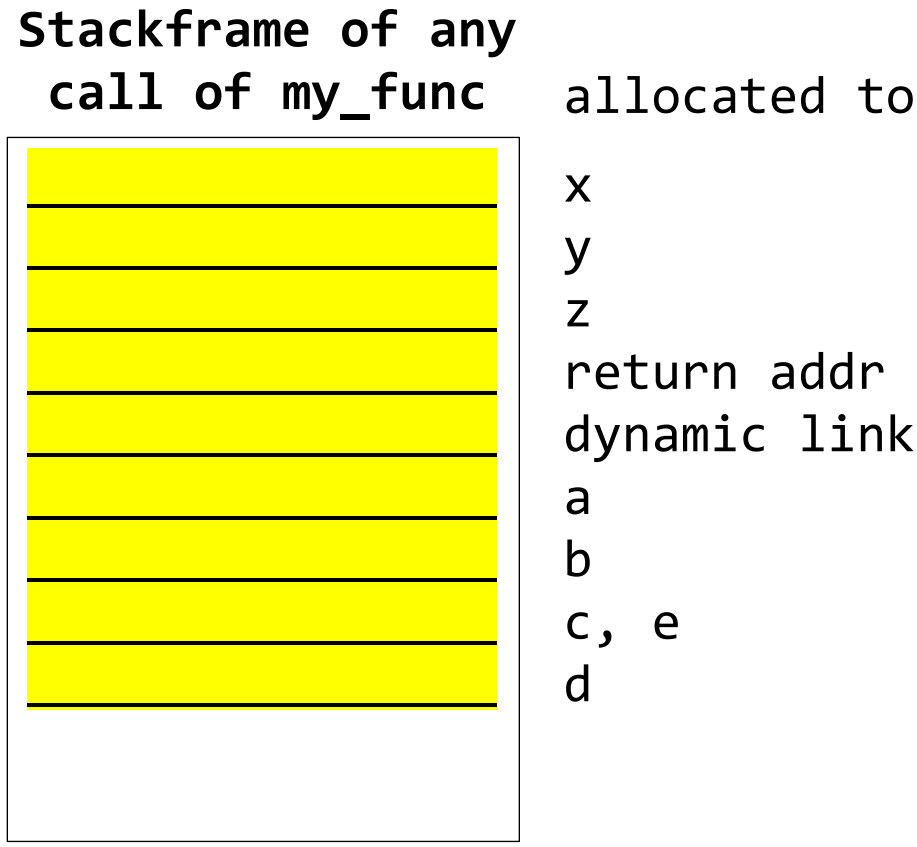

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ANSWER: 11

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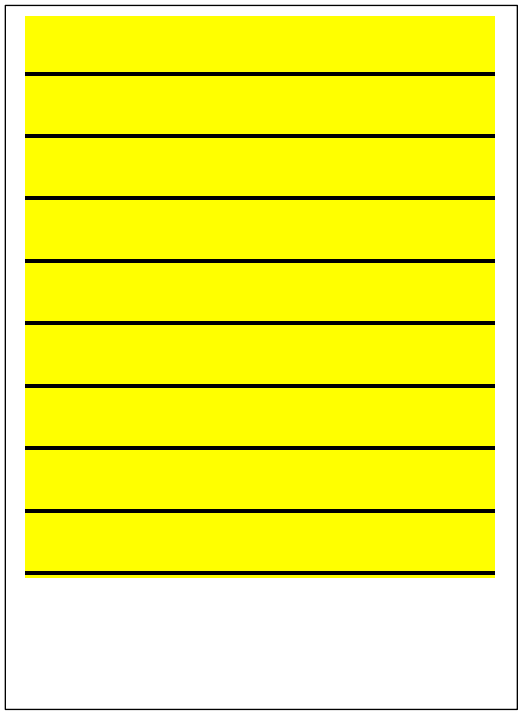

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-1	return addr
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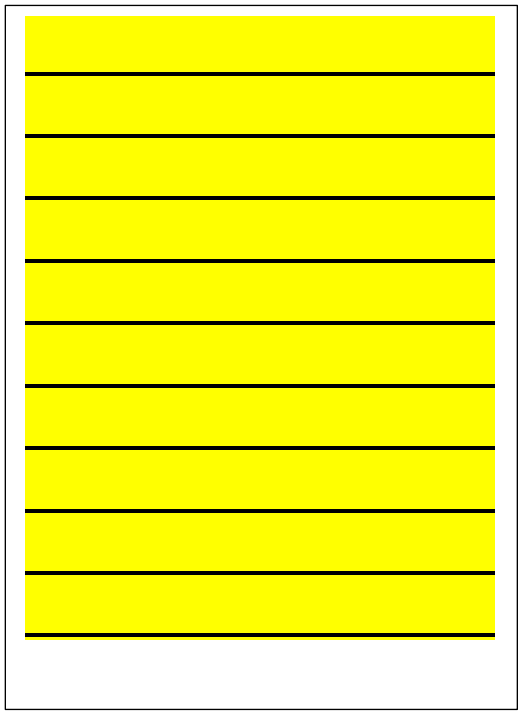

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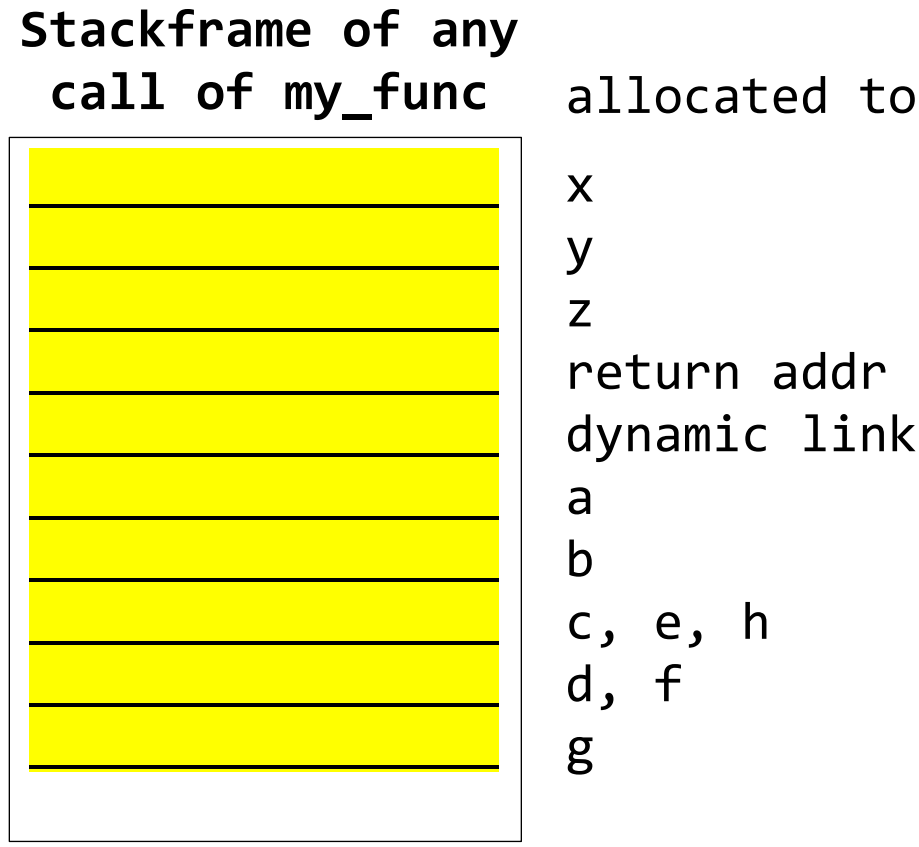

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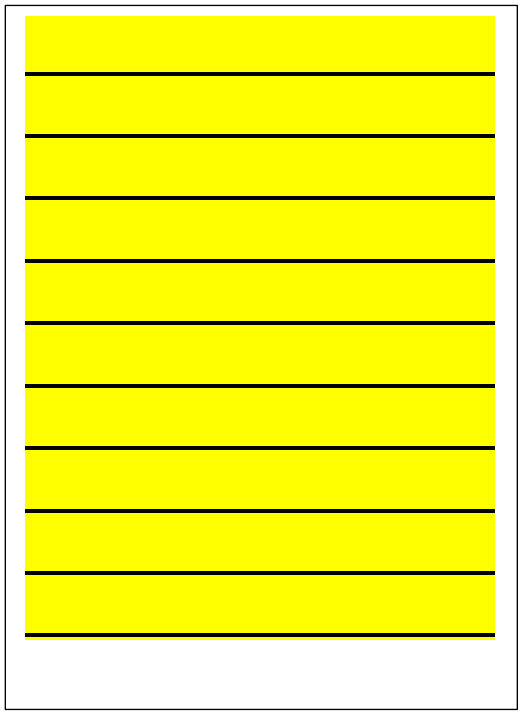
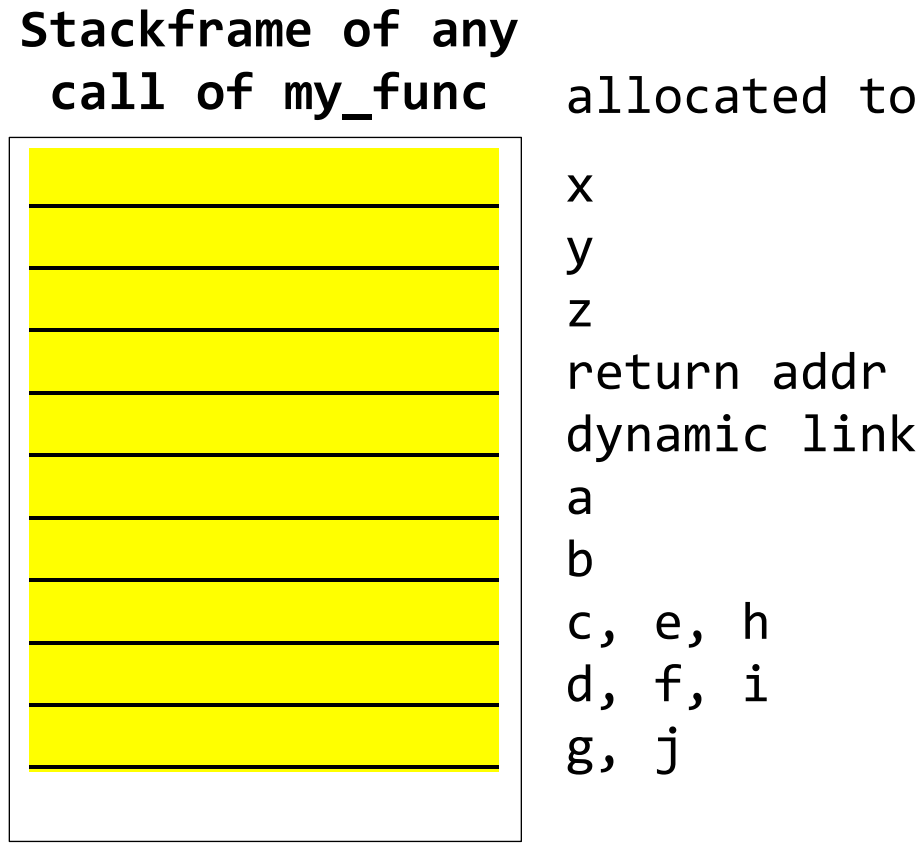


offset	allocated to
-4	x
-3	y
-2	z
-1	return addr
0	dynamic link
+1	a
+2	b
+3	c, e, h
+4	d, f, i
+5	g

An Example: How many locations are allocated for each stackframe of the following function, and what stackframe offset is given to each formal parameter and each local variable declared in the body?

```
int my_func(int x, int[] y, int z)
{
  int a, b[];
  if ( ... ) {
    int c, d[];
       ...
  }
  else {
    int e, f;
       ...
    int g;
       ...
  }
   ...
  int h, i, j, k;
   ...
}
```

ANSWER: 11



An Example: How many locations are allocated for each stackframe of the following function, and what stackframe offset is given to each formal parameter and each local variable declared in the body?

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  if ( ... ) {
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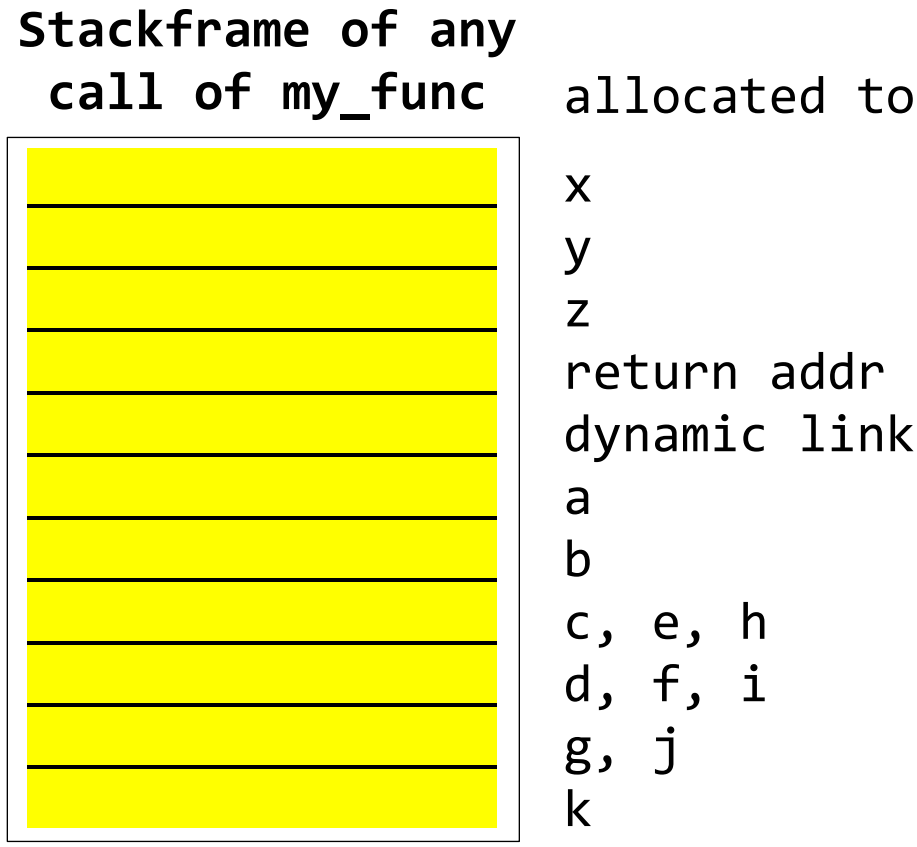
       ...
  }
  else {
    int e, f;
       ...
    int g;
       ...
  }
   ...
  int h, i, j, k;
   ...
}
```

ANSWER: 11



Example of Stack-Dynamic Allocation

See p. 4 of: https://euclid.cs.qc.cuny.edu/316/Memory-allocation-VM-instruction-set-and-hints-for-asn-2.pdf

How are stackframes allocated and deallocated during execution of the following sequence of calls and returns?

Example of Stack-Dynamic Allocation

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How are stackframes allocated and deallocated during execution of the following sequence of calls and returns?

```
(1) main() is called
(2)  main() calls f()
(3)   f() calls g()
(4)    g() calls h()
(5)     h() calls f()
(6)      f() returns control to h()
(7)     h() returns control to g()
(8)    g() calls f()
```

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```
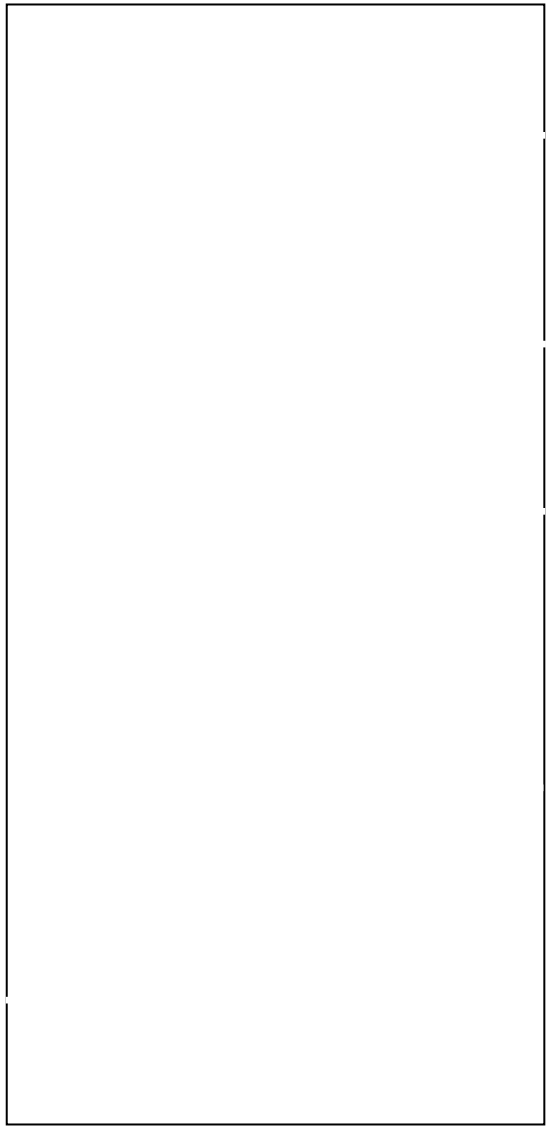

Stack-Dynamically Allocated Data Memory



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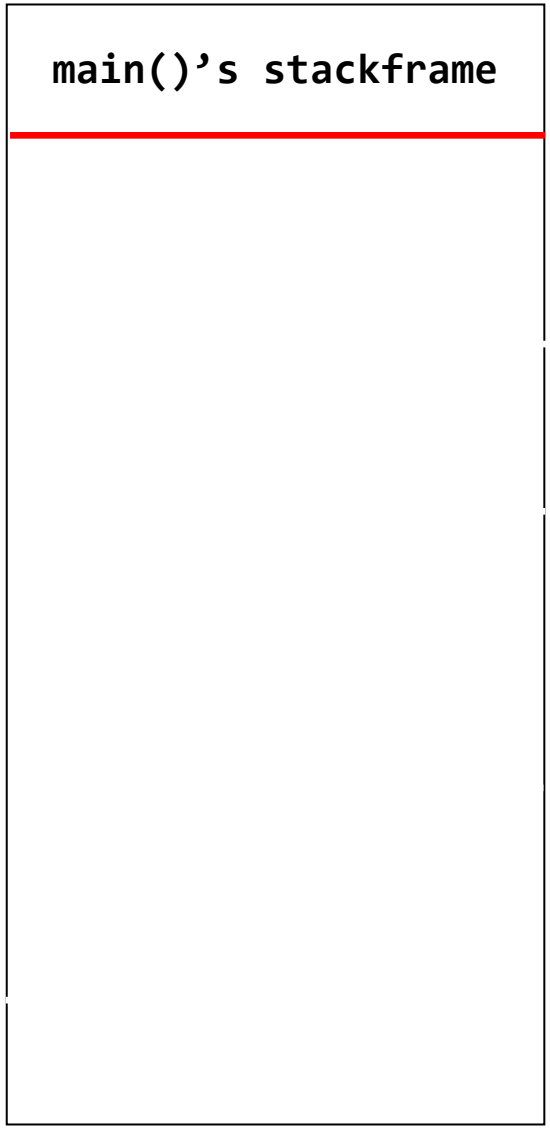
Stack-Dynamically Allocated Data Memory



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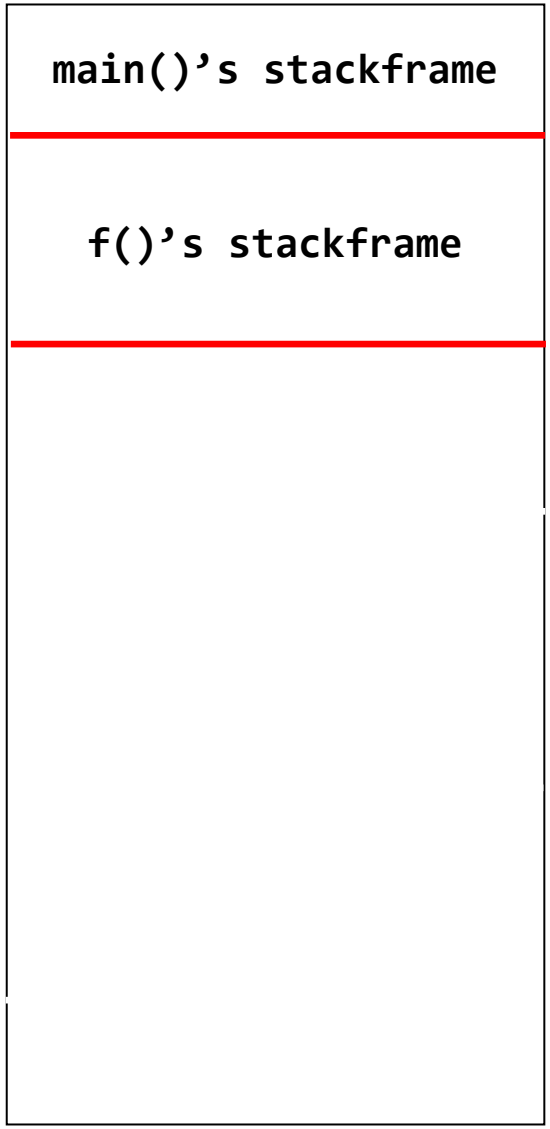
Stack-Dynamically Allocated Data Memory



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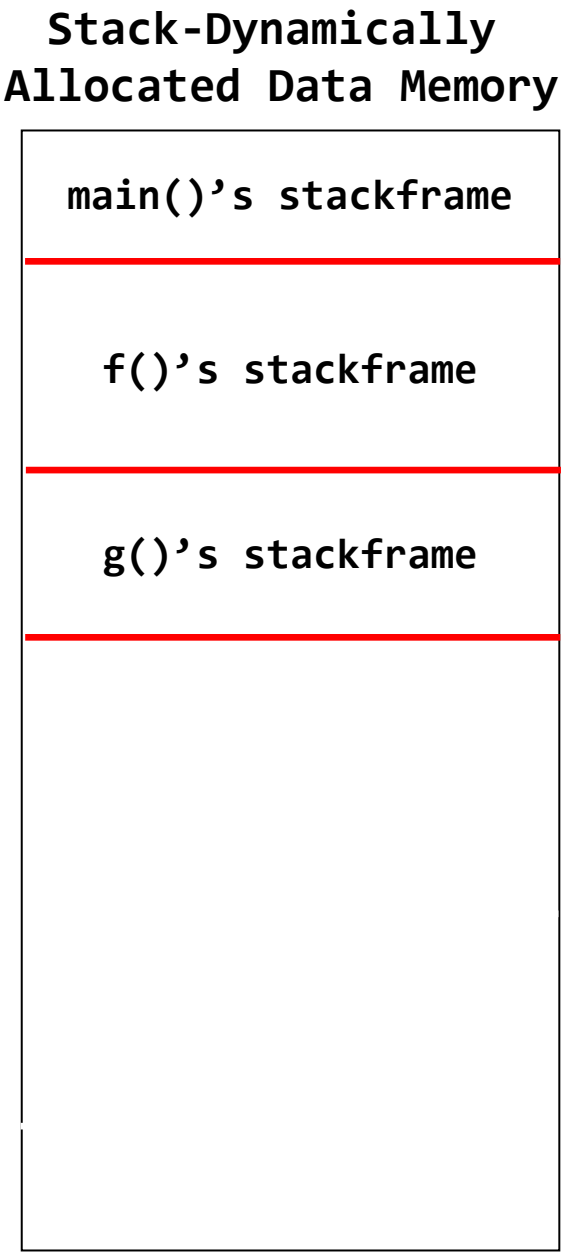

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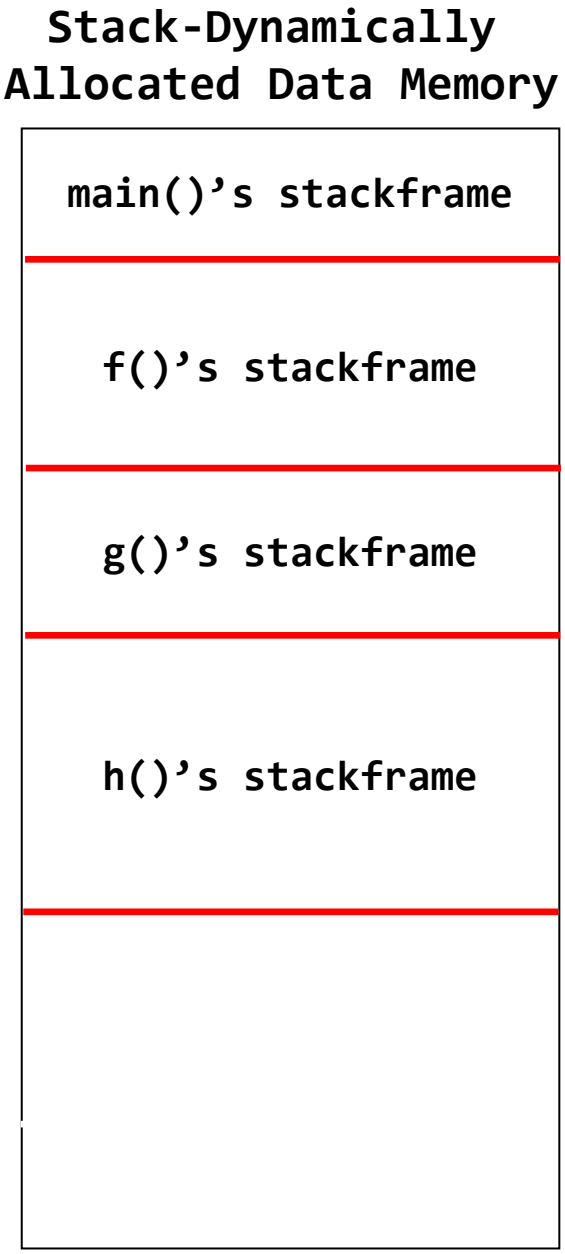

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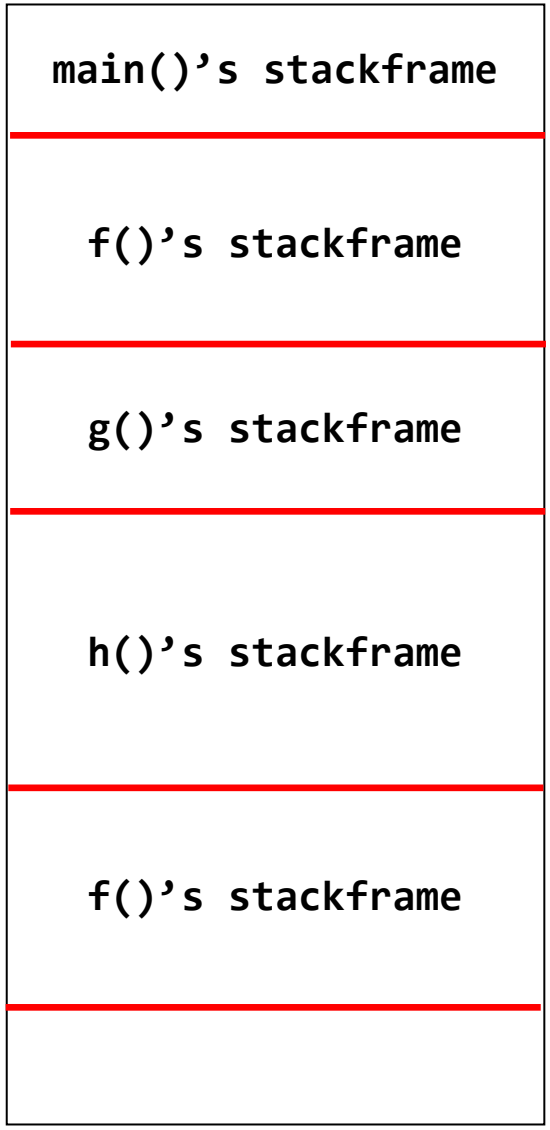
Stack-Dynamically Allocated Data Memory



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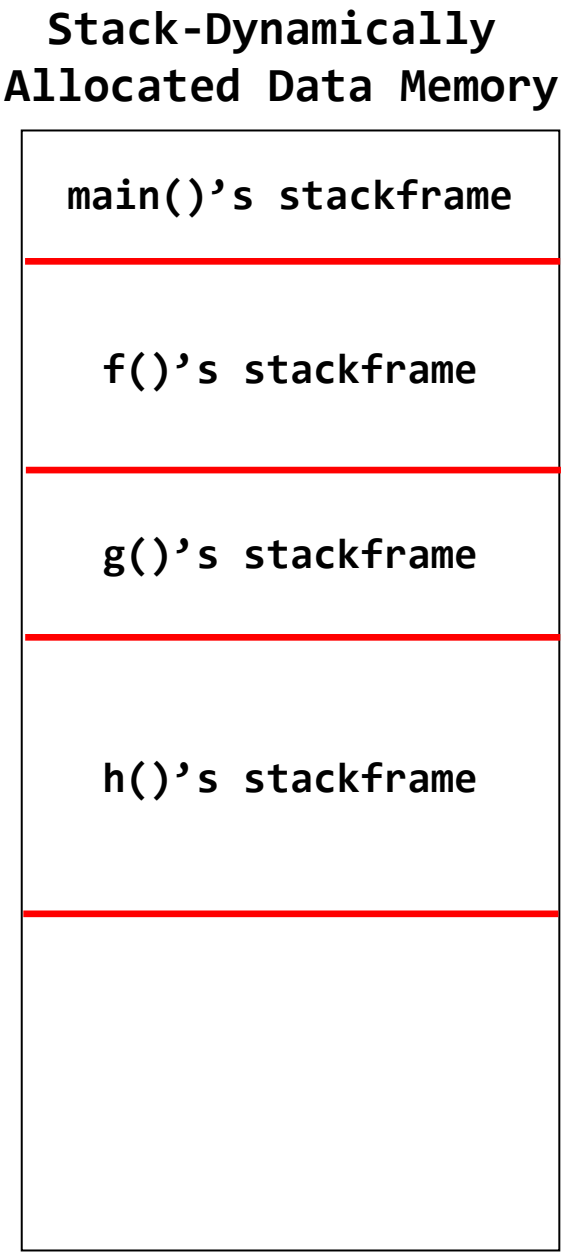

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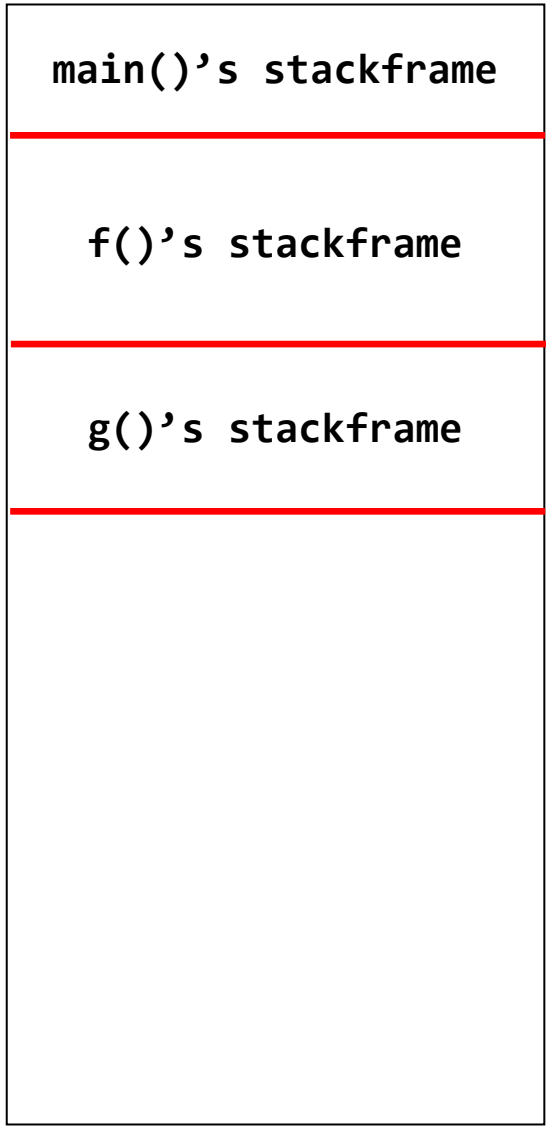
Stack-Dynamically Allocated Data Memory



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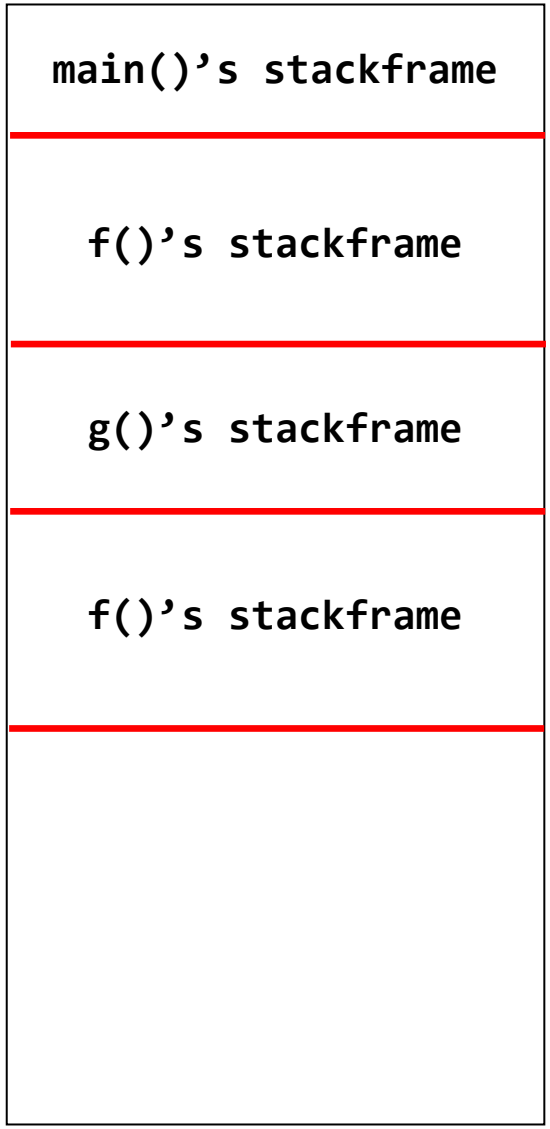
Stack-Dynamically Allocated Data Memory



EXECUTION OF VARIOUS TINYJ VM INSTRUCTIONS

BEFORE execution of: PUSHNUM 23

stkframe offset	CURRENTLY EXECUTING METHOD ACTIVATION'S STACKFRAME (Part of Data memory)

address	DATA MEMORY

address	HEAP (Part of Data memory)

address	CODE MEMORY
	PUSHNUM 23

EXPRSTACK
???
⋮
???

AFTER *execution of*: **PUSHNUM 23**

stkframe offset	CURRENTLY EXECUTING METHOD ACTIVATION'S STACKFRAME (Part of Data memory)

address	DATA MEMORY

address	HEAP (Part of Data memory)

address	CODE MEMORY
	PUSHNUM 23

EXPRSTACK
???
⋮
???
23

BEFORE execution of: PUSHSTATADDR 17

stkframeoffset	CURRENTLY EXECUTING METHOD ACTIVATION'S STACKFRAME (Part of Data memory)

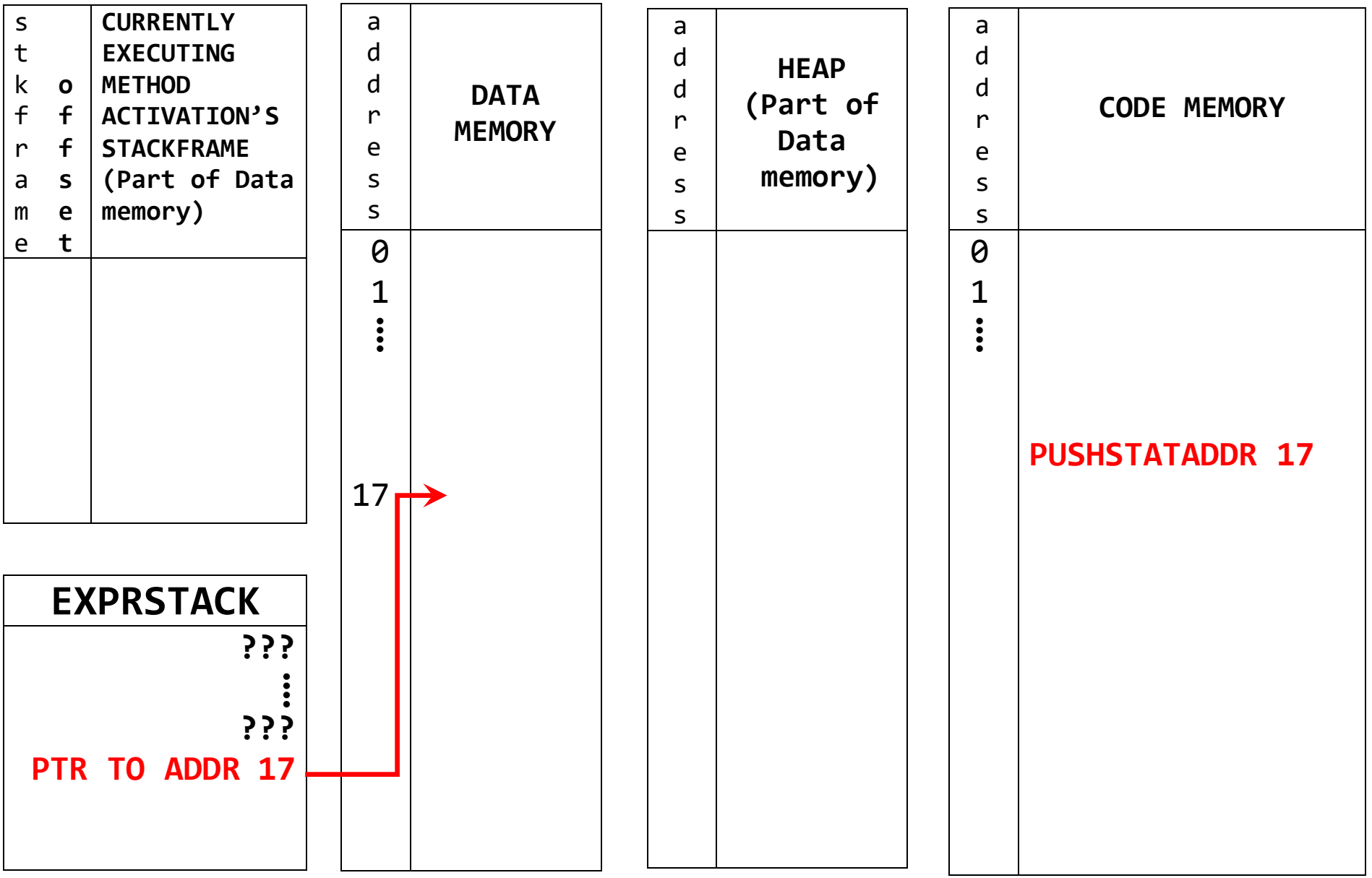
address	DATA MEMORY
0	
1	
⋮	
17	

address	HEAP (Part of Data memory)

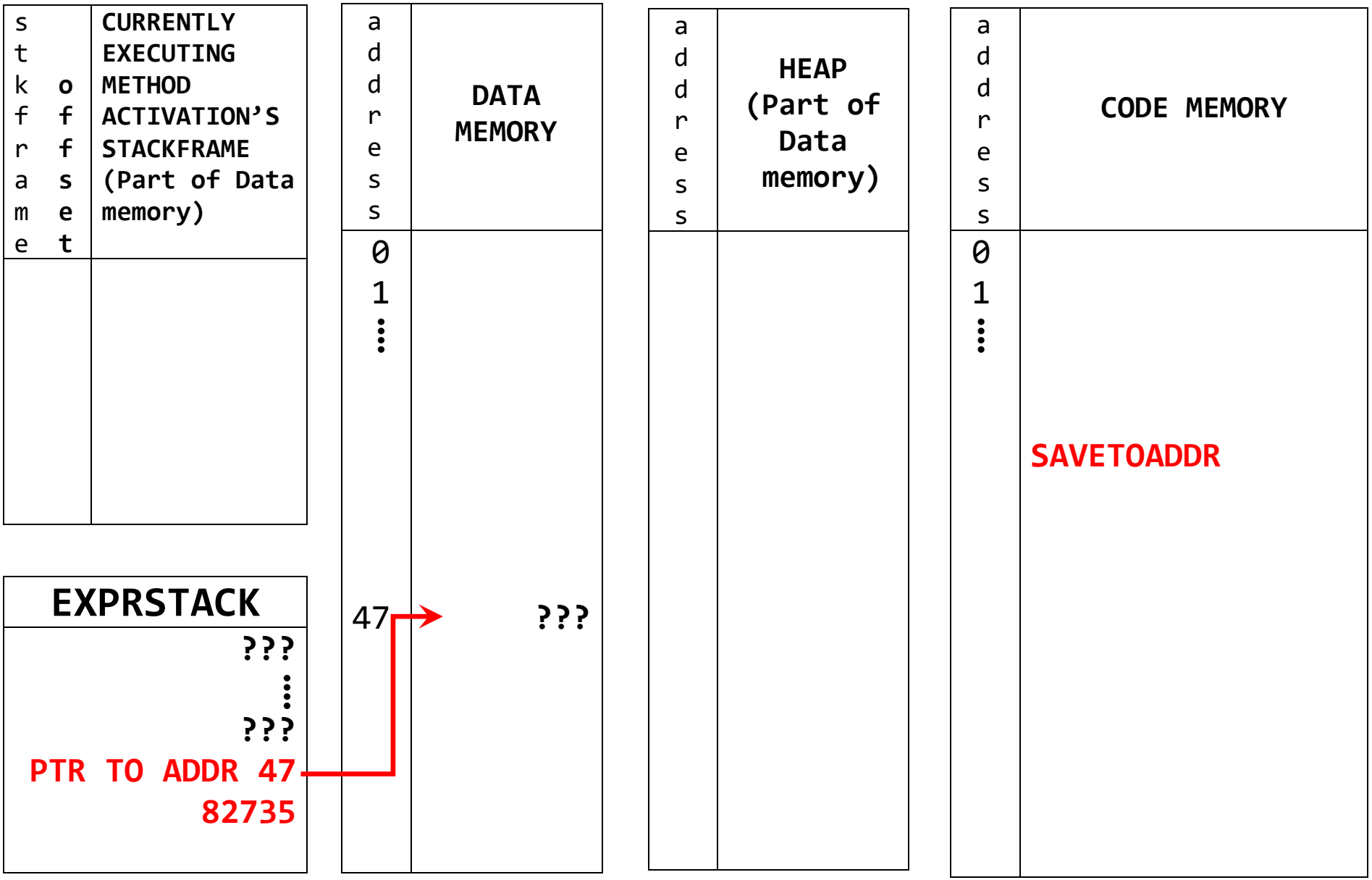
address	CODE MEMORY
0	
1	
⋮	
	PUSHSTATADDR 17

EXPRSTACK
???
⋮
???

AFTER *execution of*: **PUSHSTATADDR 17**



BEFORE execution of **SAVETOADDR**



AFTER *execution of* **SAVETOADDR**

stkframeoffset	CURRENTLY EXECUTING METHOD ACTIVATION'S STACKFRAME (Part of Data memory)

EXPRSTACK
???
⋮
???

address	DATA MEMORY
0	
1	
⋮	
47	82735

address	HEAP (Part of Data memory)

address	CODE MEMORY
0	
1	
⋮	
	SAVETOADDR