Passing Parameters Through the Stack

D. Thiebaut — CSC231

Pass *a* & *b* via Registers

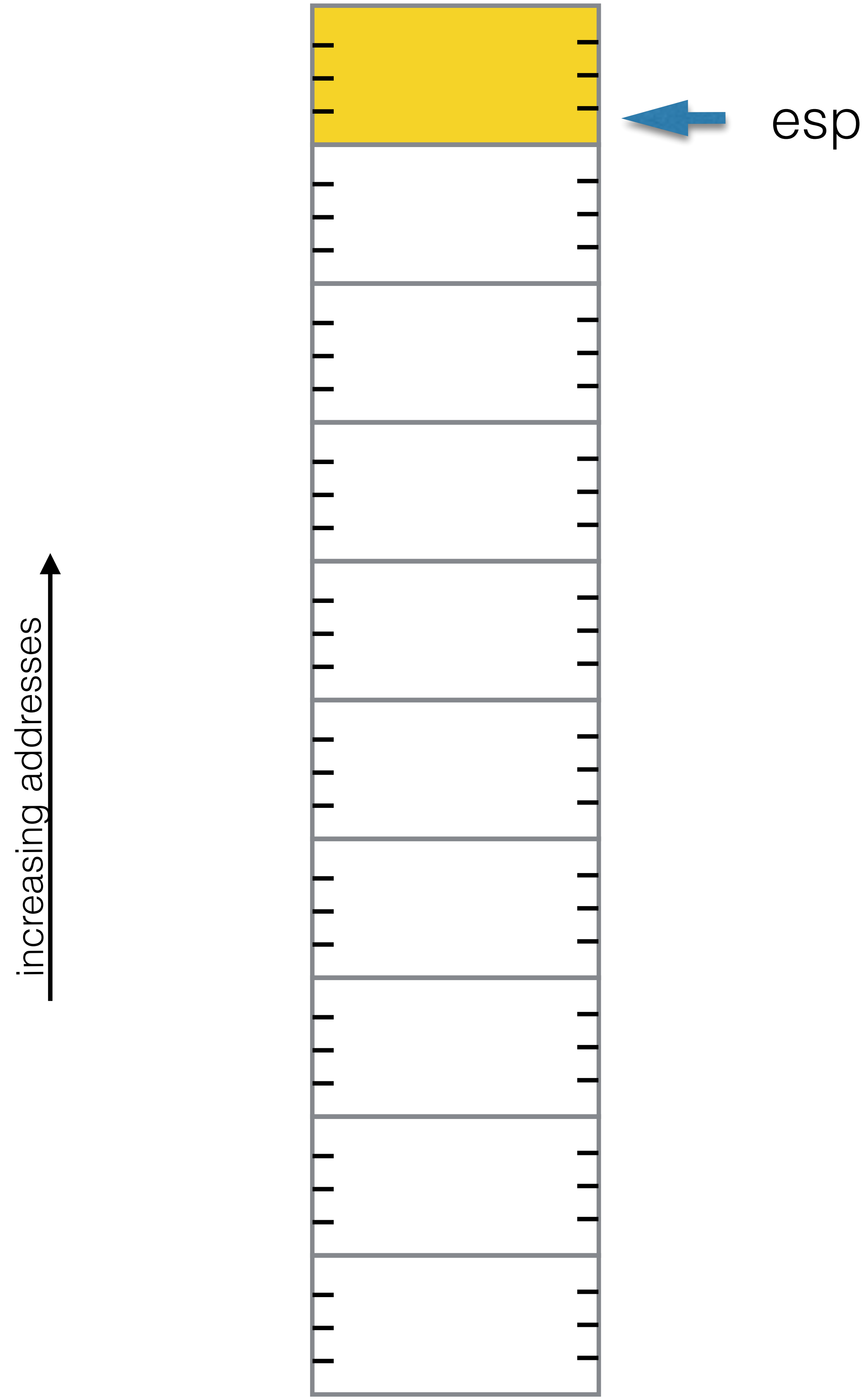
```
        section .data
a       dd      1234
b       dd      5555
result  dd      0

        section .text

        mov     eax,dword [a]
        mov     ebx,dword [b]
        call    sum
*       mov     dword [result], eax


        mov     eax,SYS_EXIT
        mov     ebx,0
        int     0x80

;;; ----------------------------
;;; sum function
;;; adds eax+ebx and return in eax
;;; registers modified:  ax
;;; ----------------------------
sum:    add     eax,ebx
        ret
```



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        section .text

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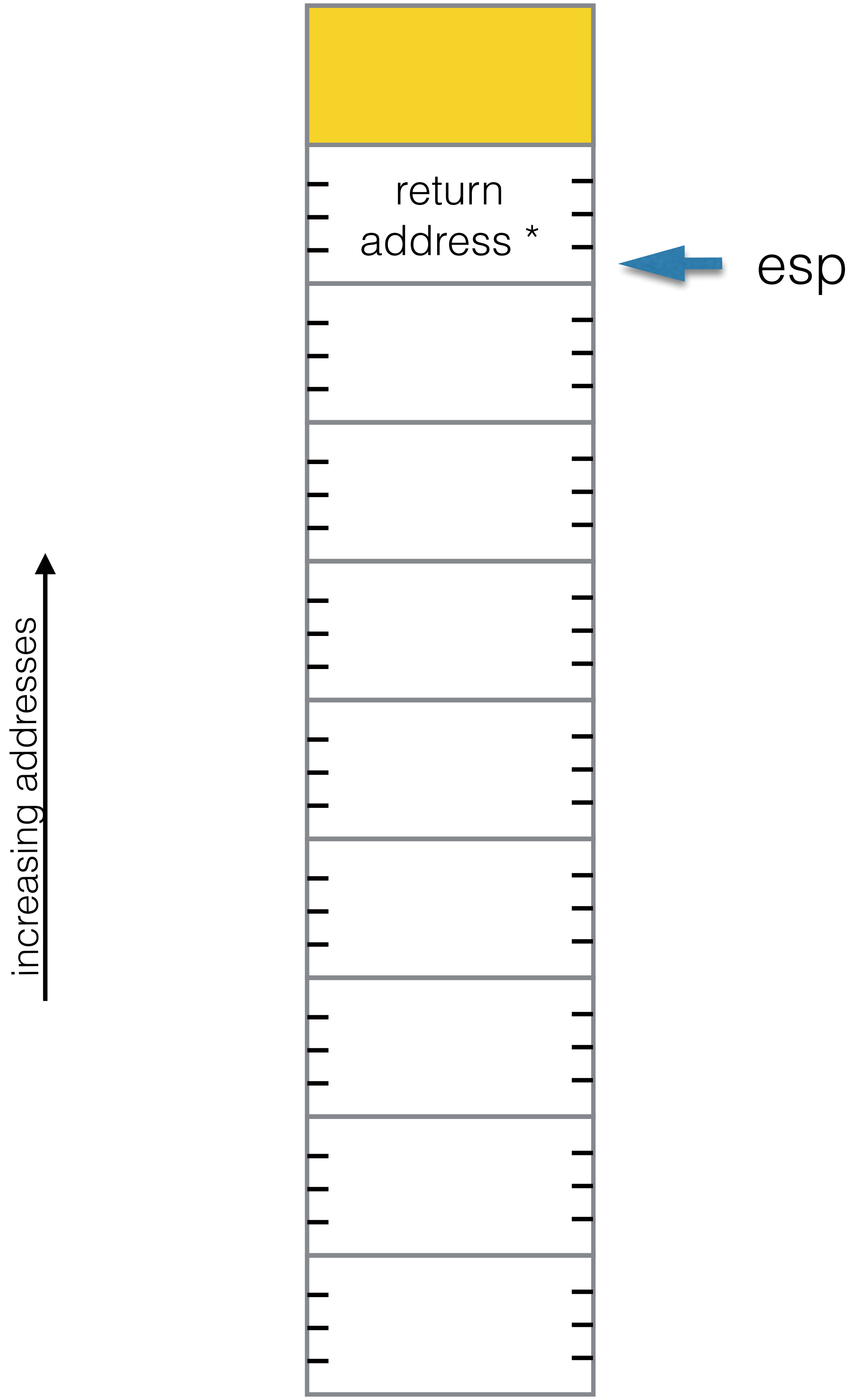

```
        section .data
a       dd      1234
b       dd      5555
result  dd      0

        section .text

        mov     eax,dword [a]
        mov     ebx,dword [b]
        call    sum
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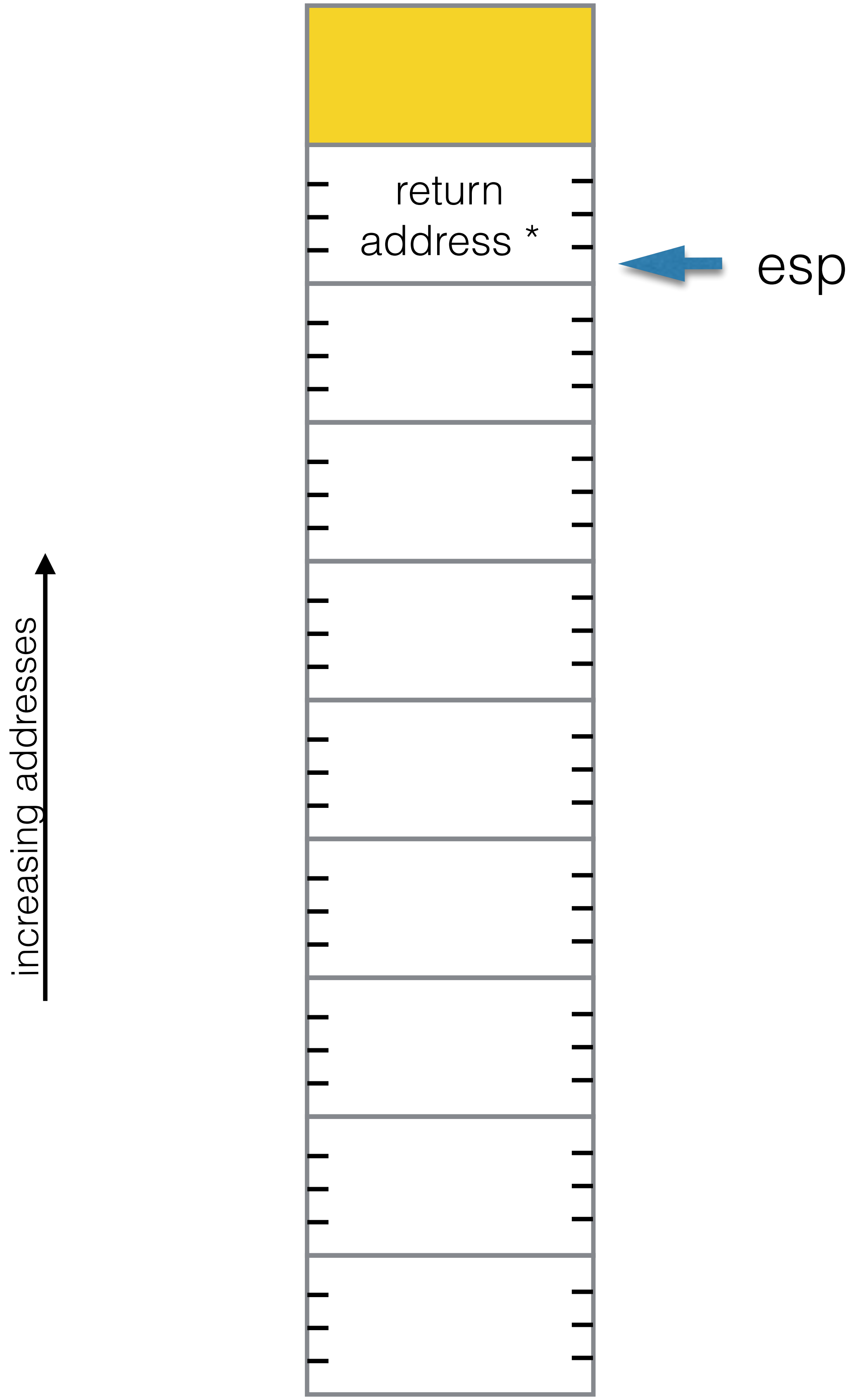

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        section .text

        mov     eax,dword [a]
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        call    sum
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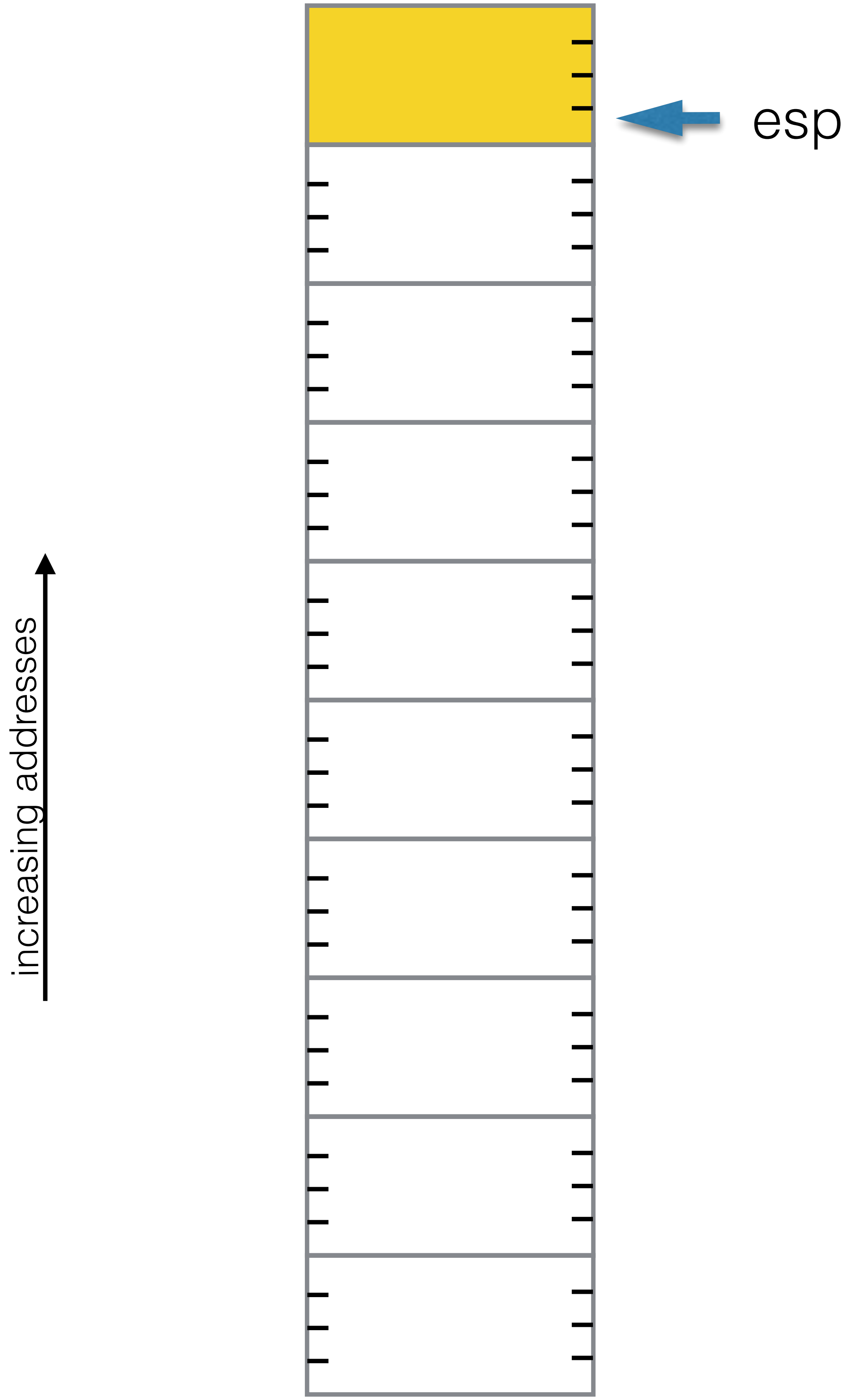


Pass *a* & *b* Through The Stack

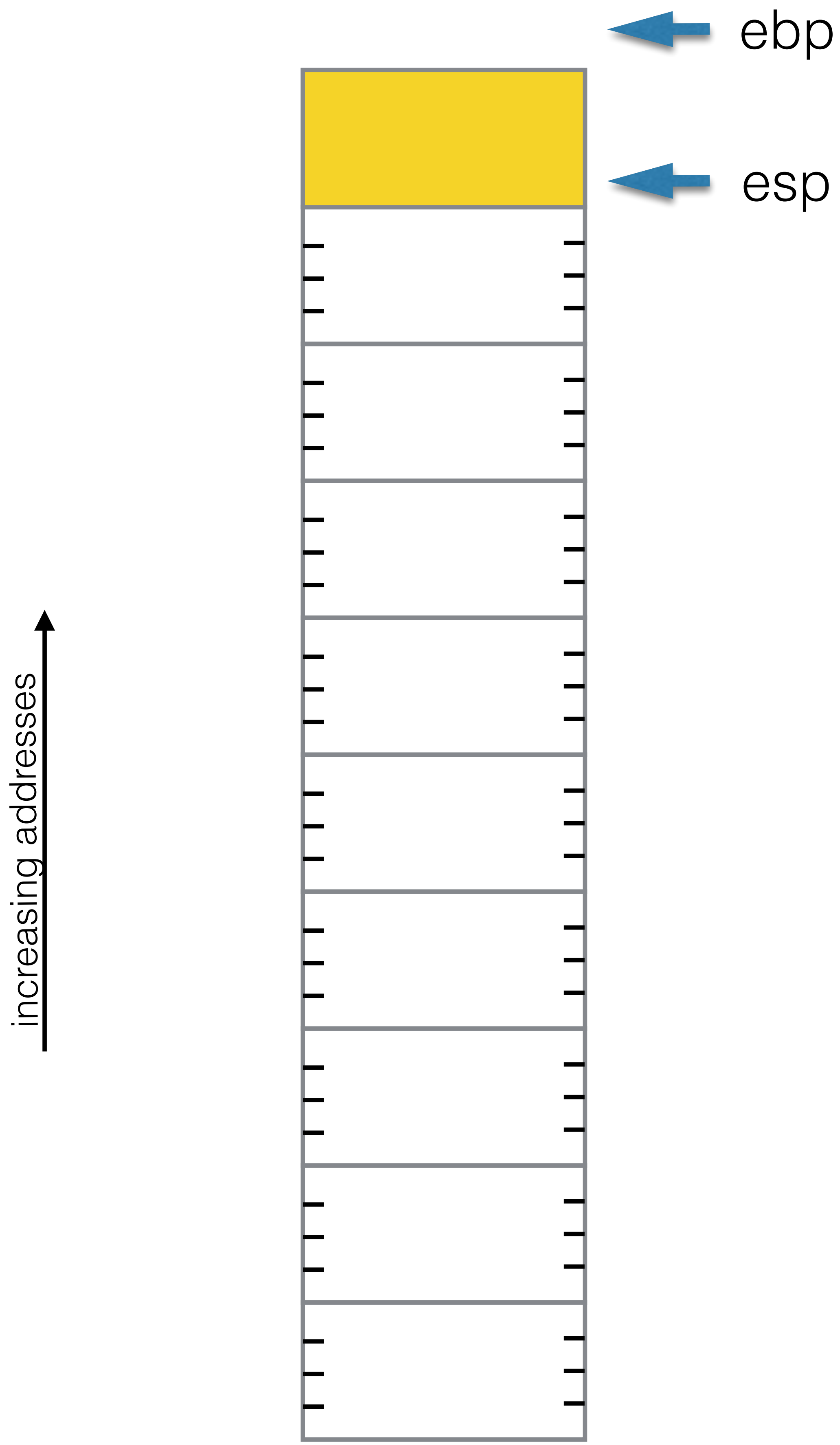
```
        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
  ➡     push    dword [a]
        push    dword [b]
        call    sum
        mov     dword[result], eax

         …
;;; sum function
sum:    push    ebp
        mov     ebp,esp

        mov     eax,dword [ebp+8]
        add     eax,dword [ebp+12]


        pop     ebp
        ret     8
```



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        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        push    dword [a]
        push    dword [b]
        call    sum
        mov     dword[result], eax

         …
;;; sum function
sum:    push    ebp
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        pop     ebp
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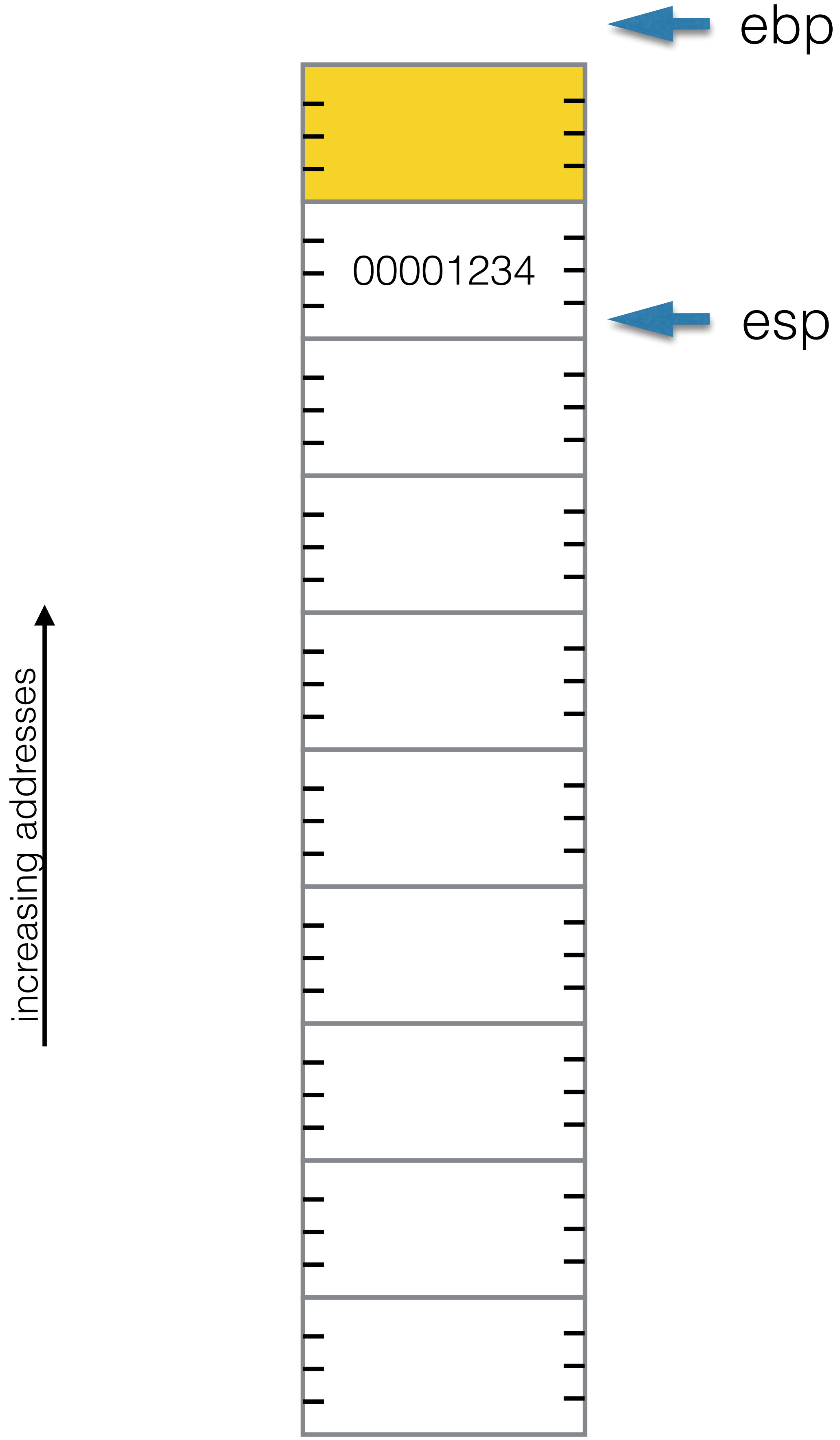

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a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
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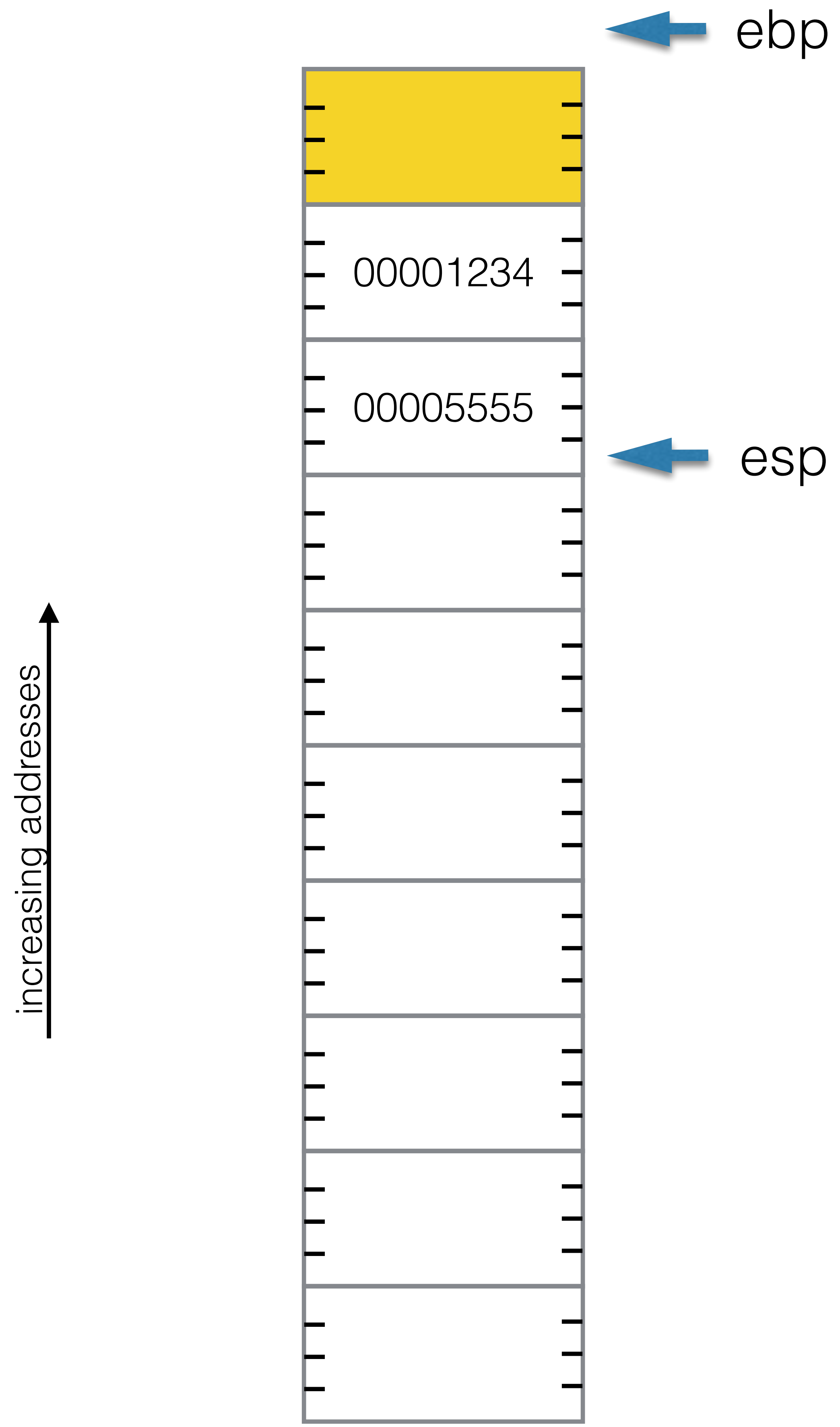

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a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        push    dword [a]
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sum:    push    ebp
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        pop     ebp
        ret     8
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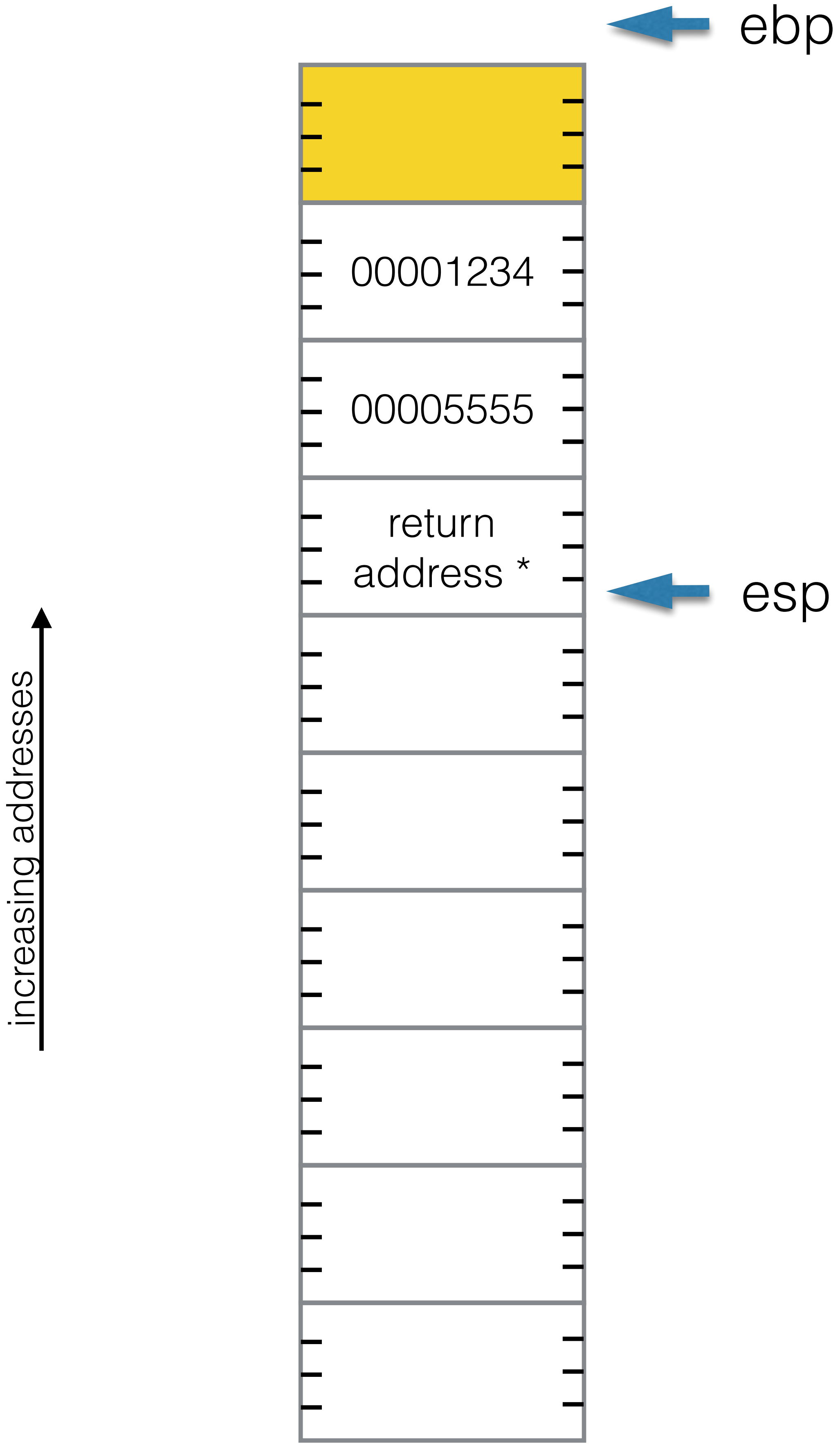

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a       dd      0x1234
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result  dd      0

        section .text
        push    dword [a]
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sum:    push    ebp
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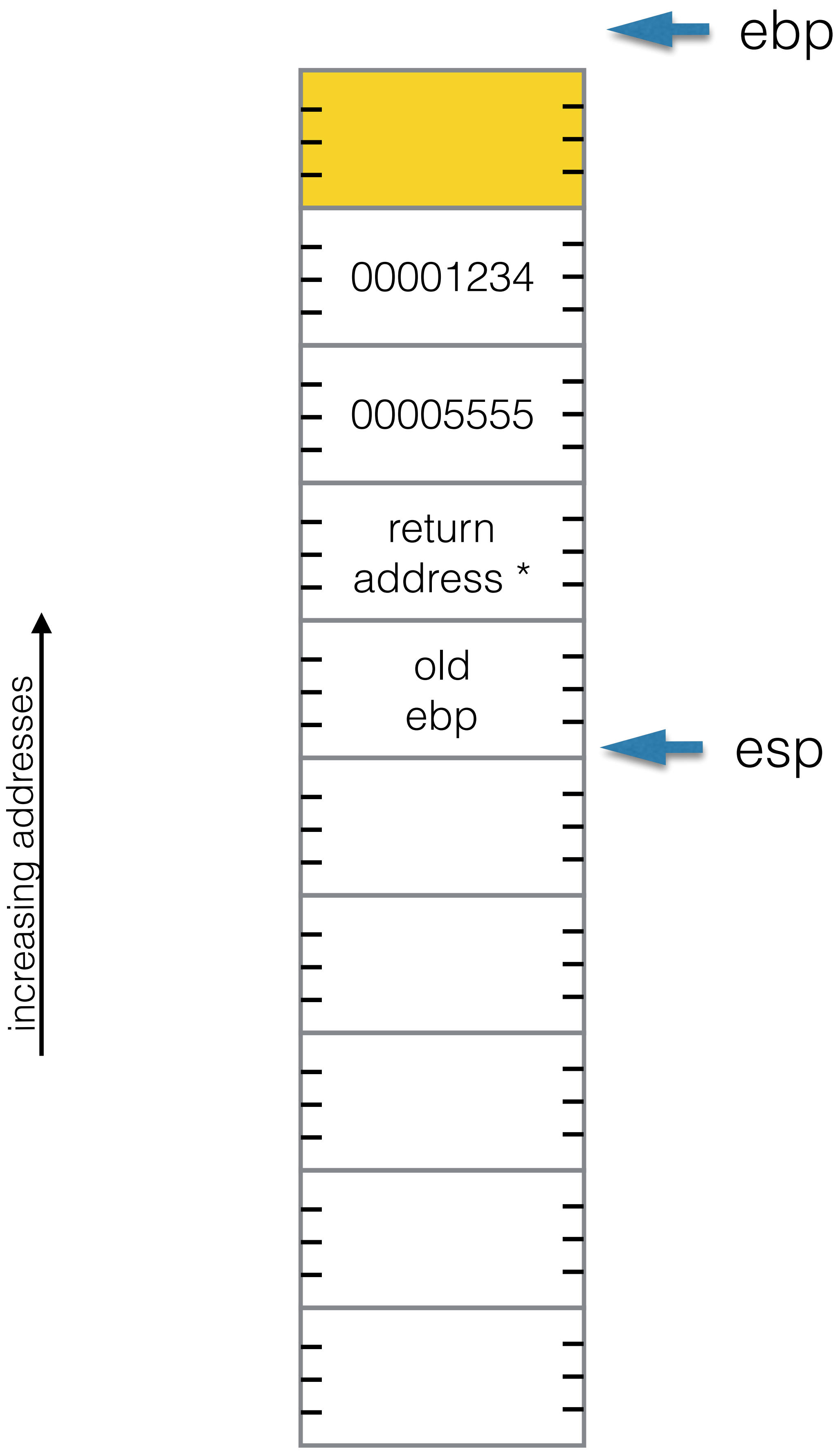

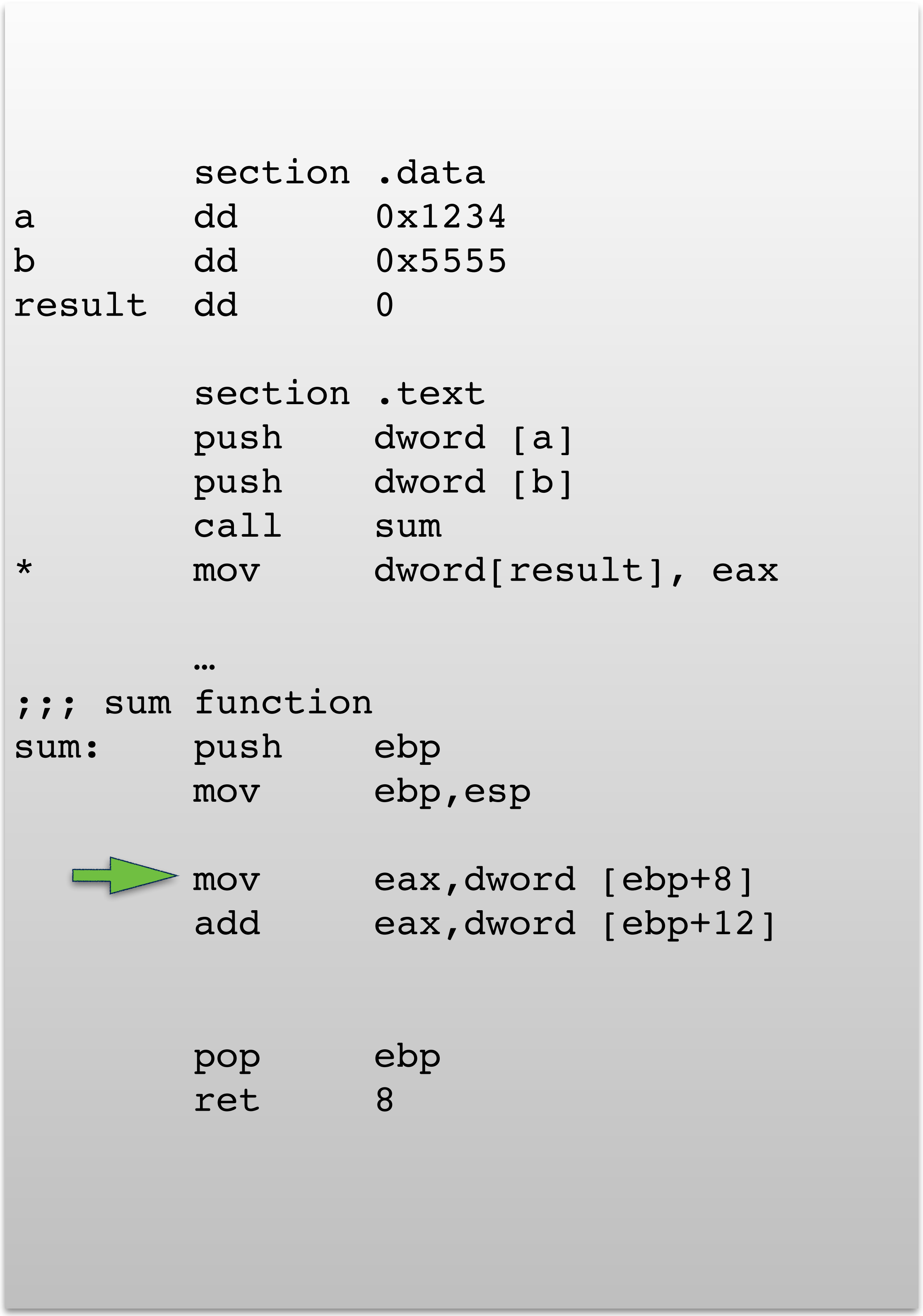

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result  dd      0

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sum:    push    ebp
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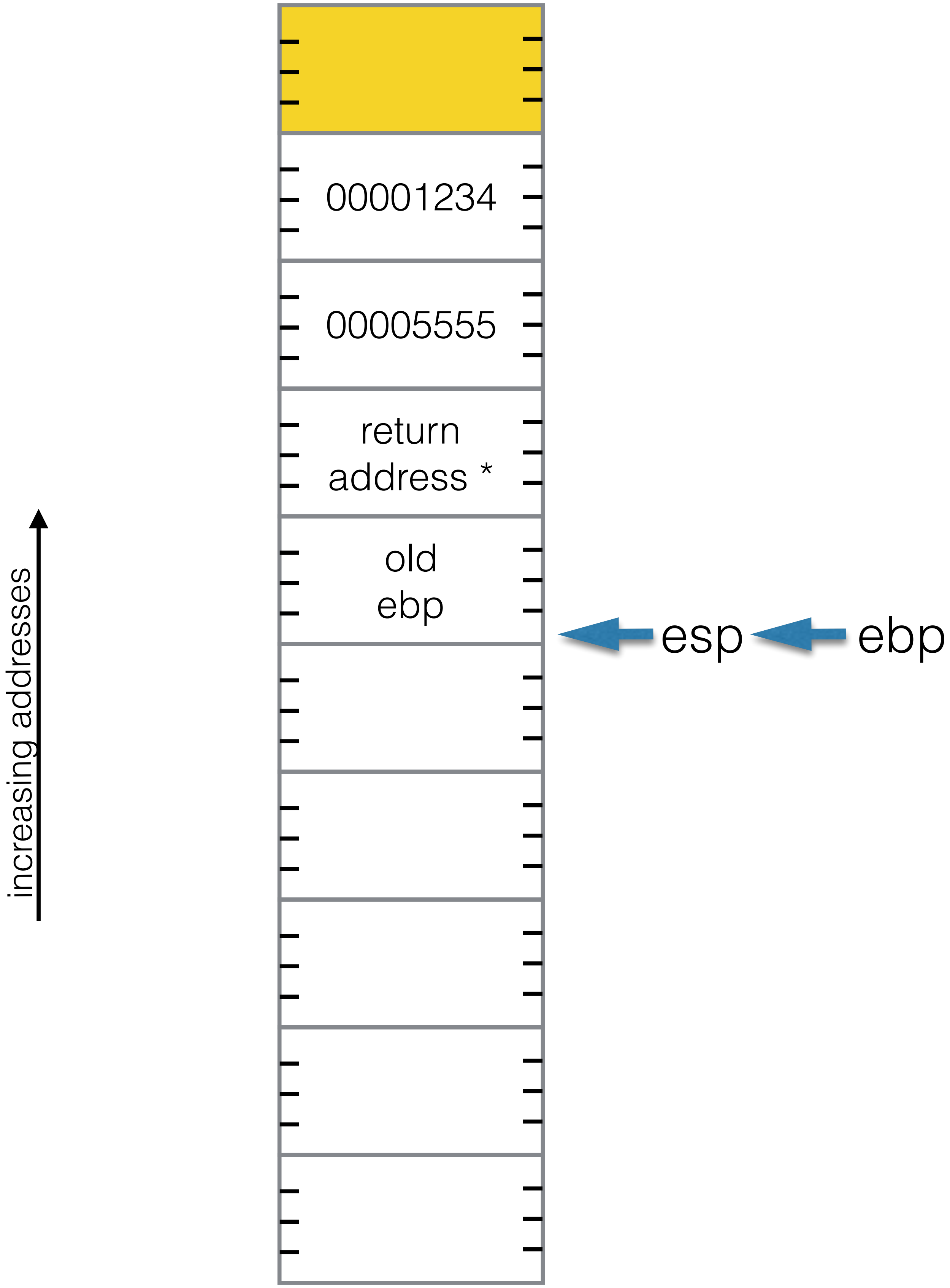

increasing addresses

00001234

00005555

return address *

old ebp

esp

ebp

```
        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        push    dword [a]
        push    dword [b]
        call    sum
*       mov     dword[result], eax

        …
;;; sum function
sum:    push    ebp
        mov     ebp,esp

        mov     eax,dword [ebp+8]
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        pop     ebp
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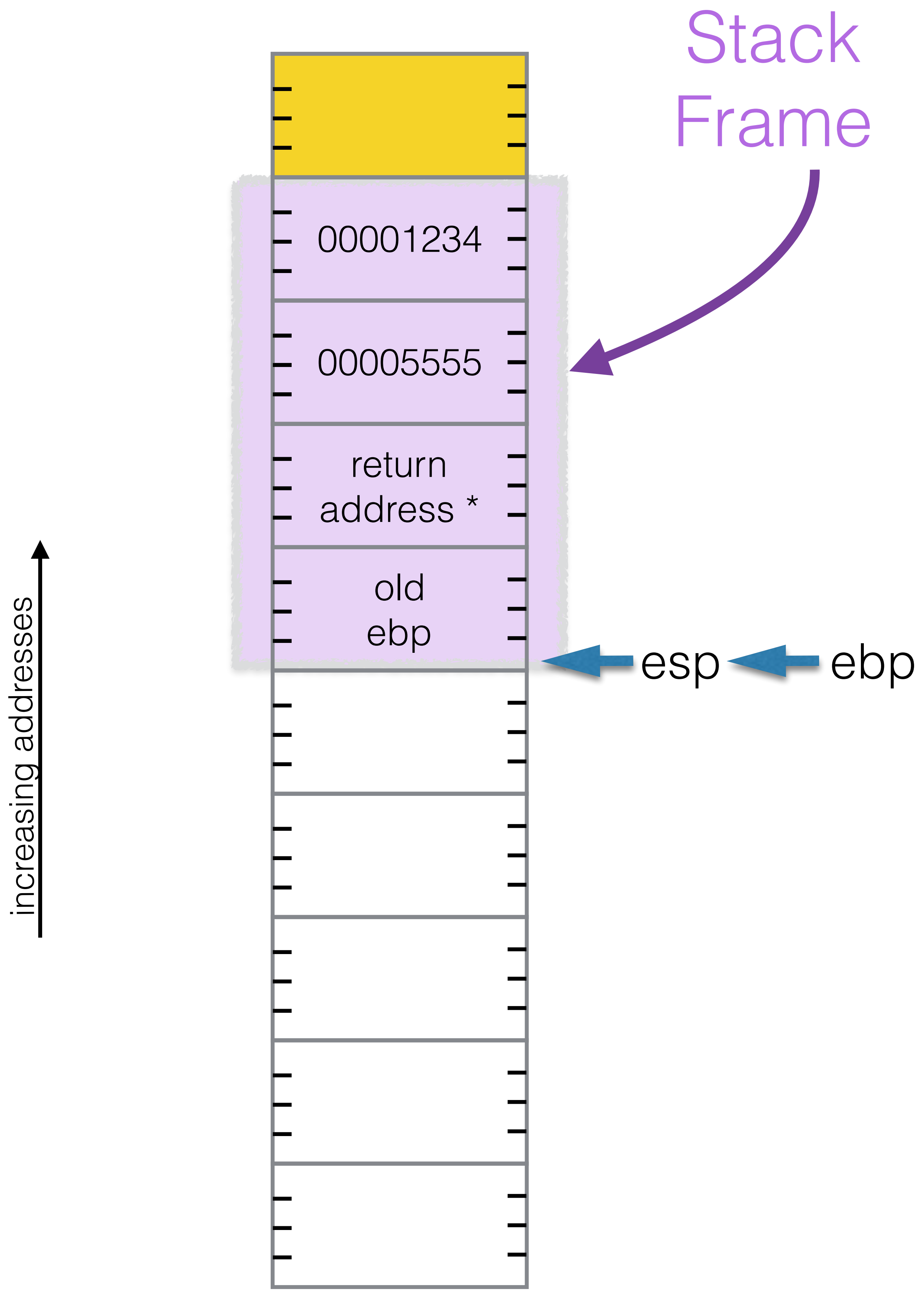

```
        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        push    dword [a]
        push    dword [b]
        call    sum
*       mov     dword[result], eax

        …
;;; sum function
sum:    push    ebp
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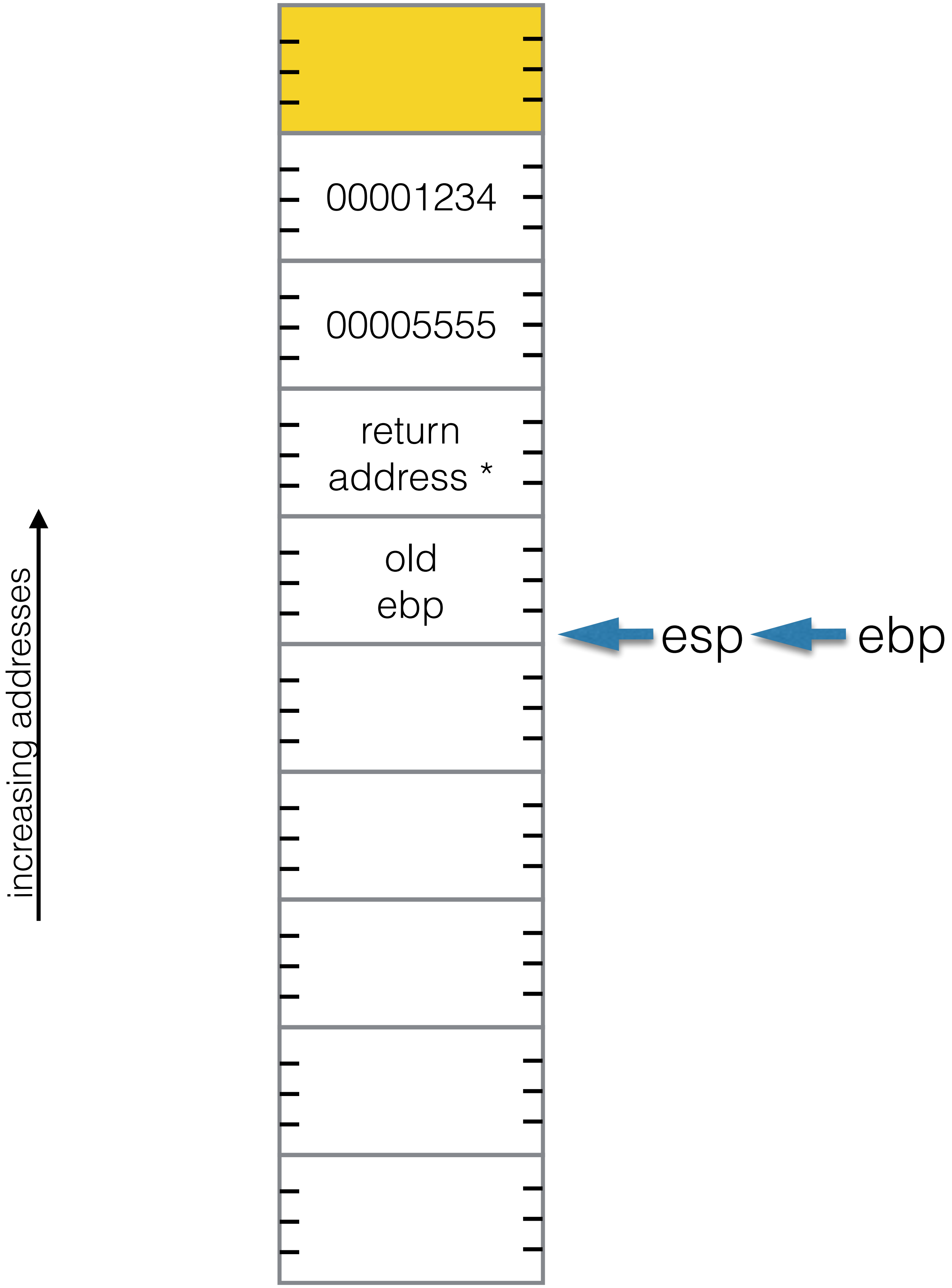
   ➡    pop     ebp
        ret     8
```



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        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        push    dword [a]
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        call    sum
*       mov     dword[result], eax

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;;; sum function
sum:    push    ebp
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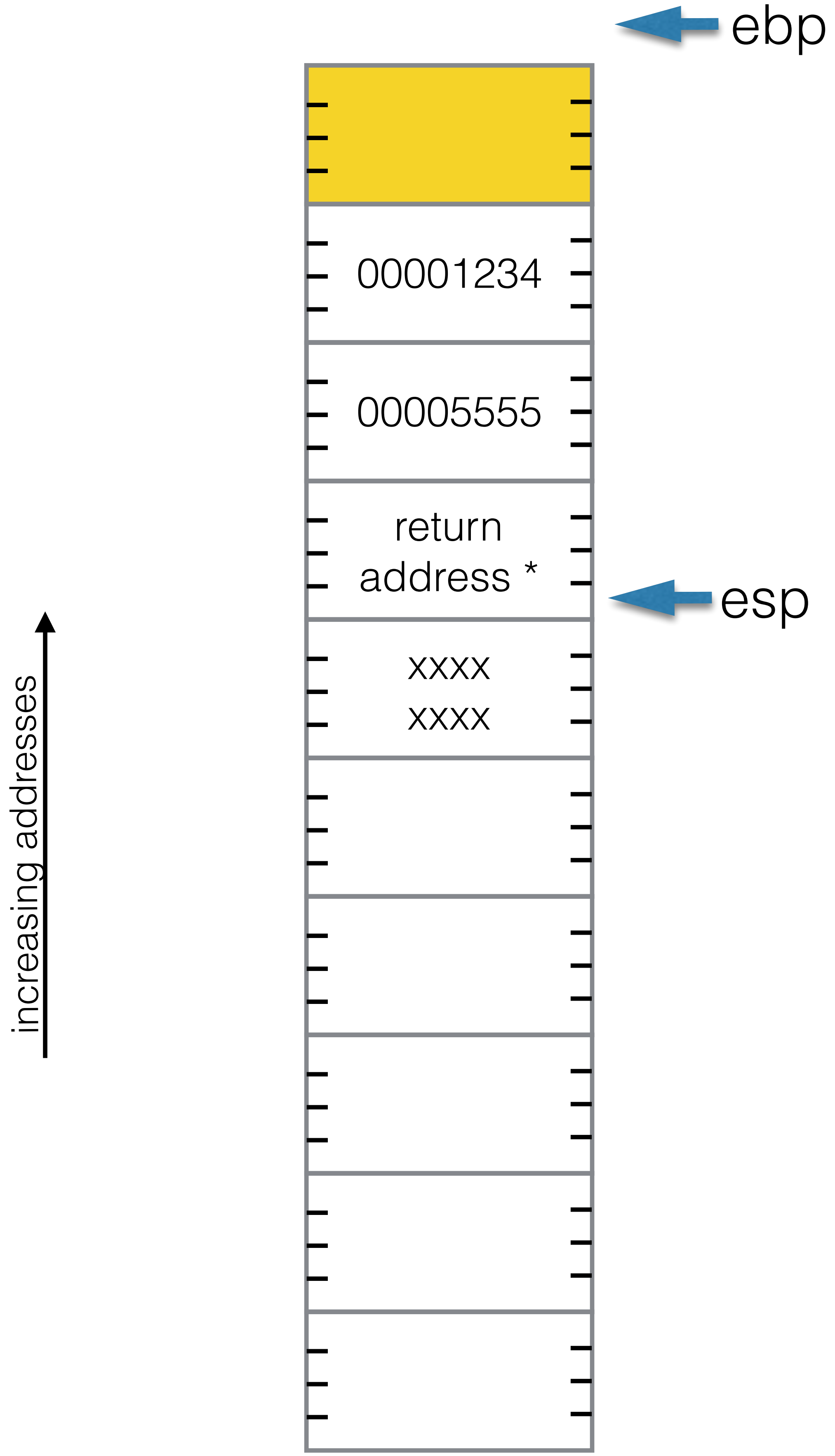
        mov     eax,dword [ebp+8]
        add     eax,dword [ebp+12]


        pop     ebp
   ➡    ret     8
```



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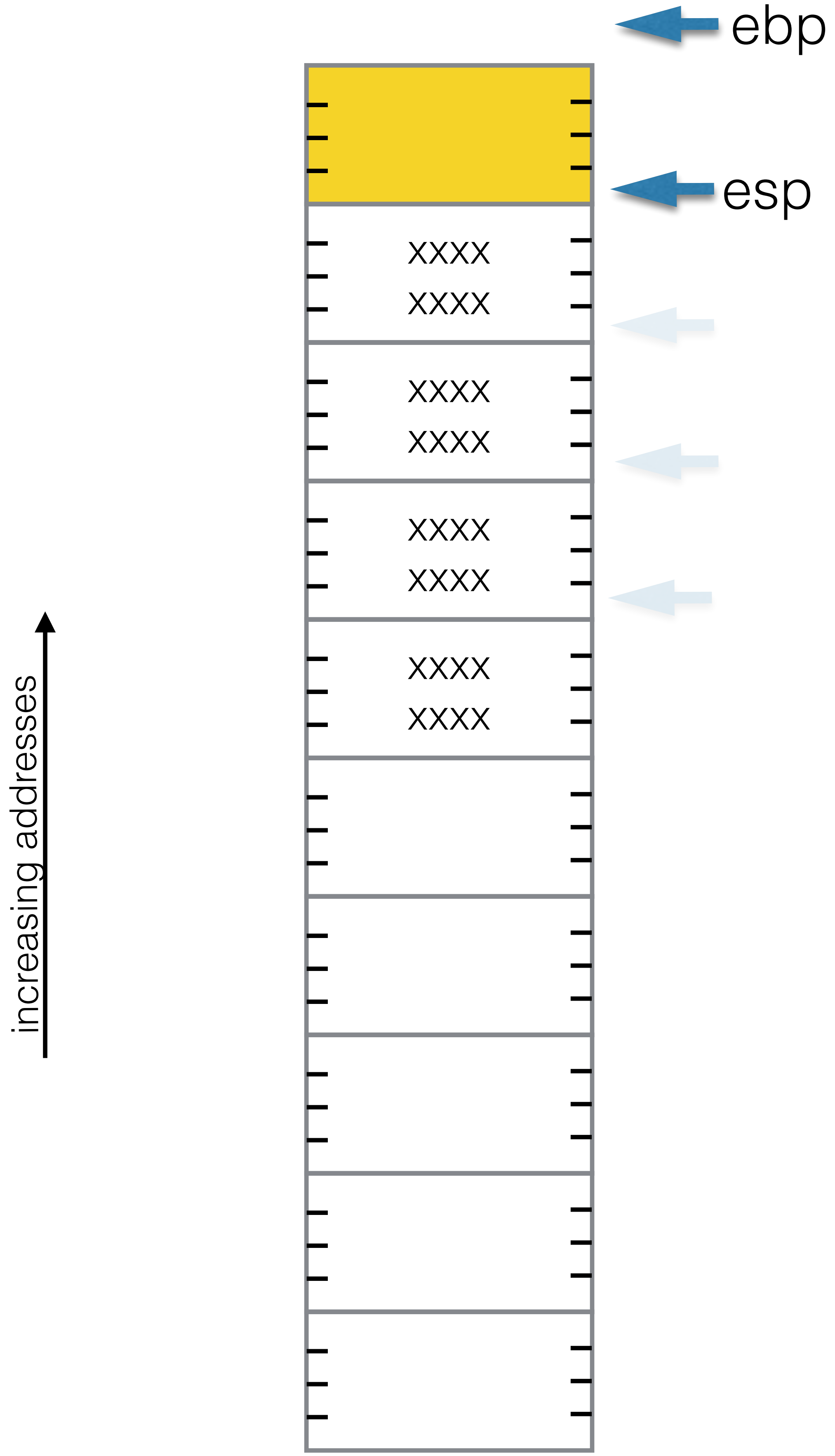
        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        push    dword [a]
        push    dword [b]
        call    sum
*       mov     dword[result], eax

        …
;;; sum function
sum:    push    ebp
        mov     ebp,esp

        mov     eax,dword [ebp+8]
        add     eax,dword [ebp+12]


        pop     ebp
        ret     8
```



Question:

- Why do we bother pushing **ebp** when the function starts?

Exercises

Exercises 1 & 2

- Write a new **printDec()** function that gets the number to print through the stack. The function should not modify any register upon its return.

- Write a new **printString()** function that prints a string, and that gets the string address and length through the stack. The function should not modify any register upon its return.

Exercise 3

- The sum function illustrated above modifies **eax** when it performs the addition. If **eax** had contained an important piece of information in the main program, the function would have overwritten it.

    - Modify the function so that it **saves** eax before using it.

    - Show the **behavior of the stack** as the function executes.

Exercise 4

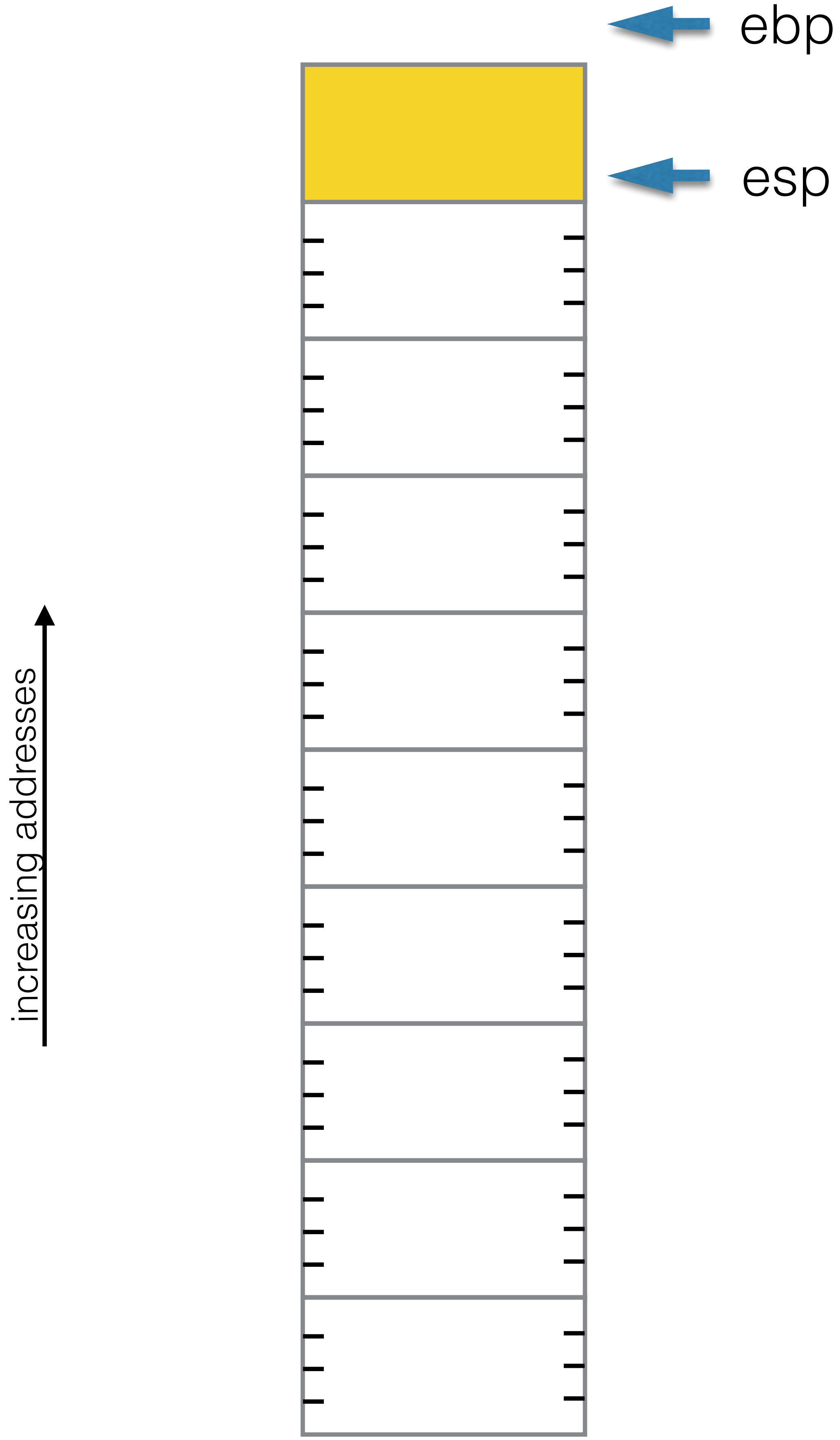
- Make the **sum** function *call* your new **printString** function to make it print the sum of the two parameters before it (sum) returns to the main program.   Show the stack behavior as the program executes.

Pass *a* & *b* by value, and pass *result* by reference

```
        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        mov     eax, result
        push    eax
        push    dword [a]
        push    dword [b]
        call    sum

         …
;;; sum function
sum:    push    ebp
        mov     ebp,esp
        push    eax
        push    ebx
        mov     eax,dword [ebp+8]
        add     eax,dword [ebp+12]
        mov     ebx,dword [ebp+16]
        mov     dword[ebx], eax
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



```
        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        mov     eax, result
        push    eax
        push    dword [a]
        push    dword [b]
        call    sum

         …
;;; sum function
sum:    push    ebp
        mov     ebp,esp
        push    eax
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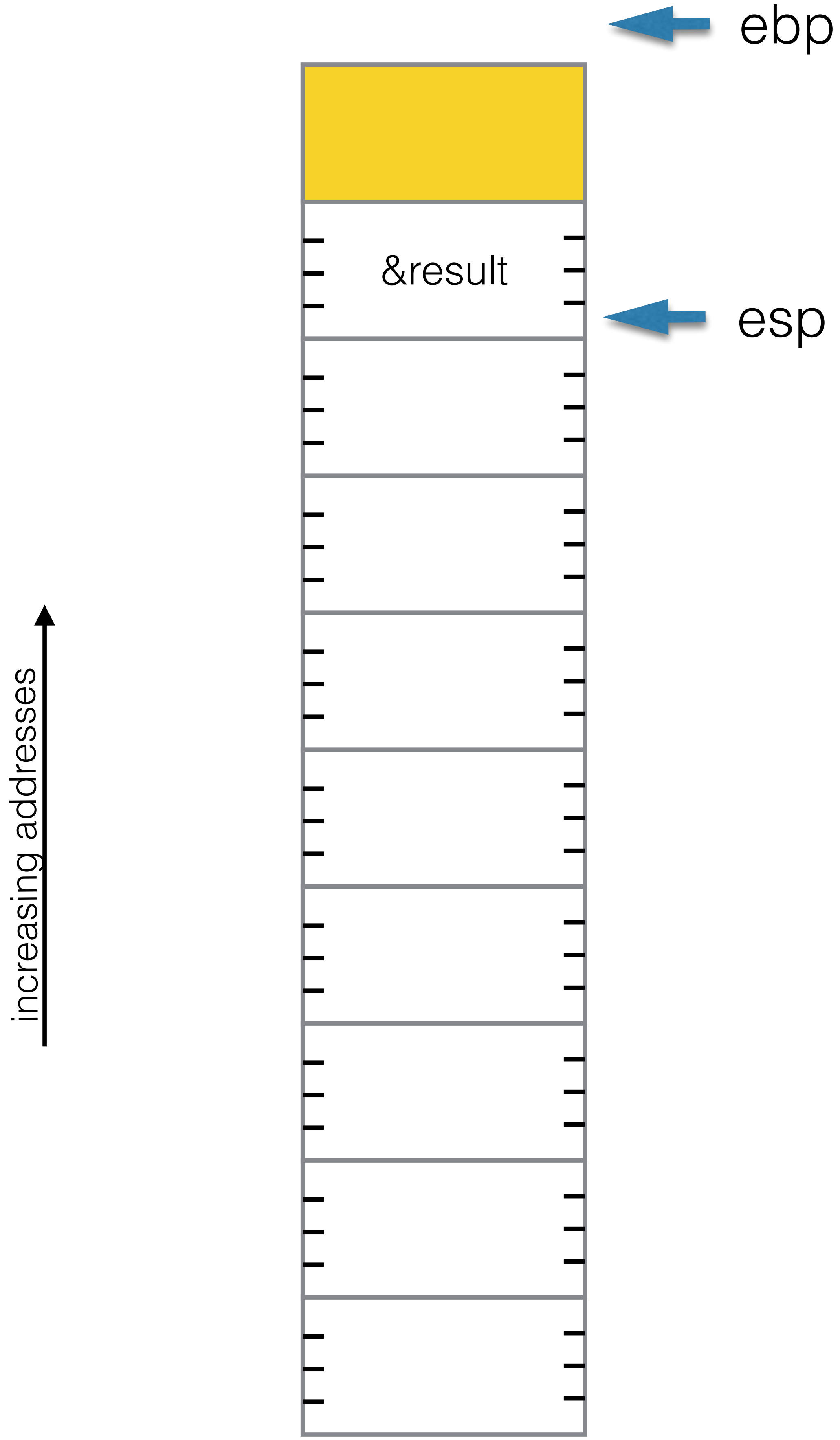
        mov     dword[ebx], eax
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



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        section .data
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result  dd      0

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        mov     eax, result
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        push    dword [a]
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        call    sum

         …
;;; sum function
sum:    push    ebp
        mov     ebp,esp
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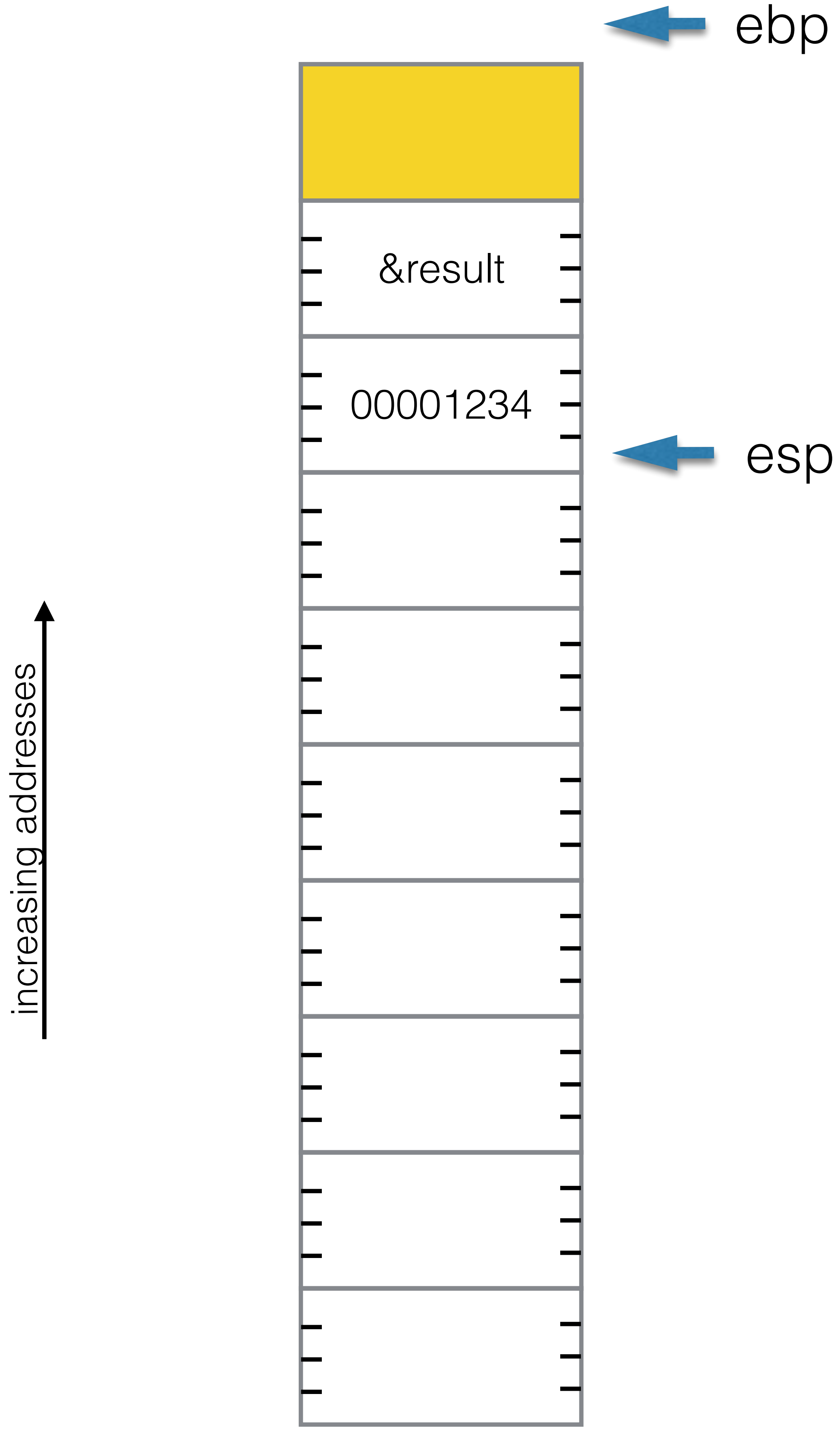
        mov     dword[ebx], eax
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



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        section .data
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result  dd      0

        section .text
        mov     eax, result
        push    eax
        push    dword [a]
        push    dword [b]
        call    sum

         …
;;; sum function
sum:    push    ebp
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        mov     eax,dword [ebp+8]
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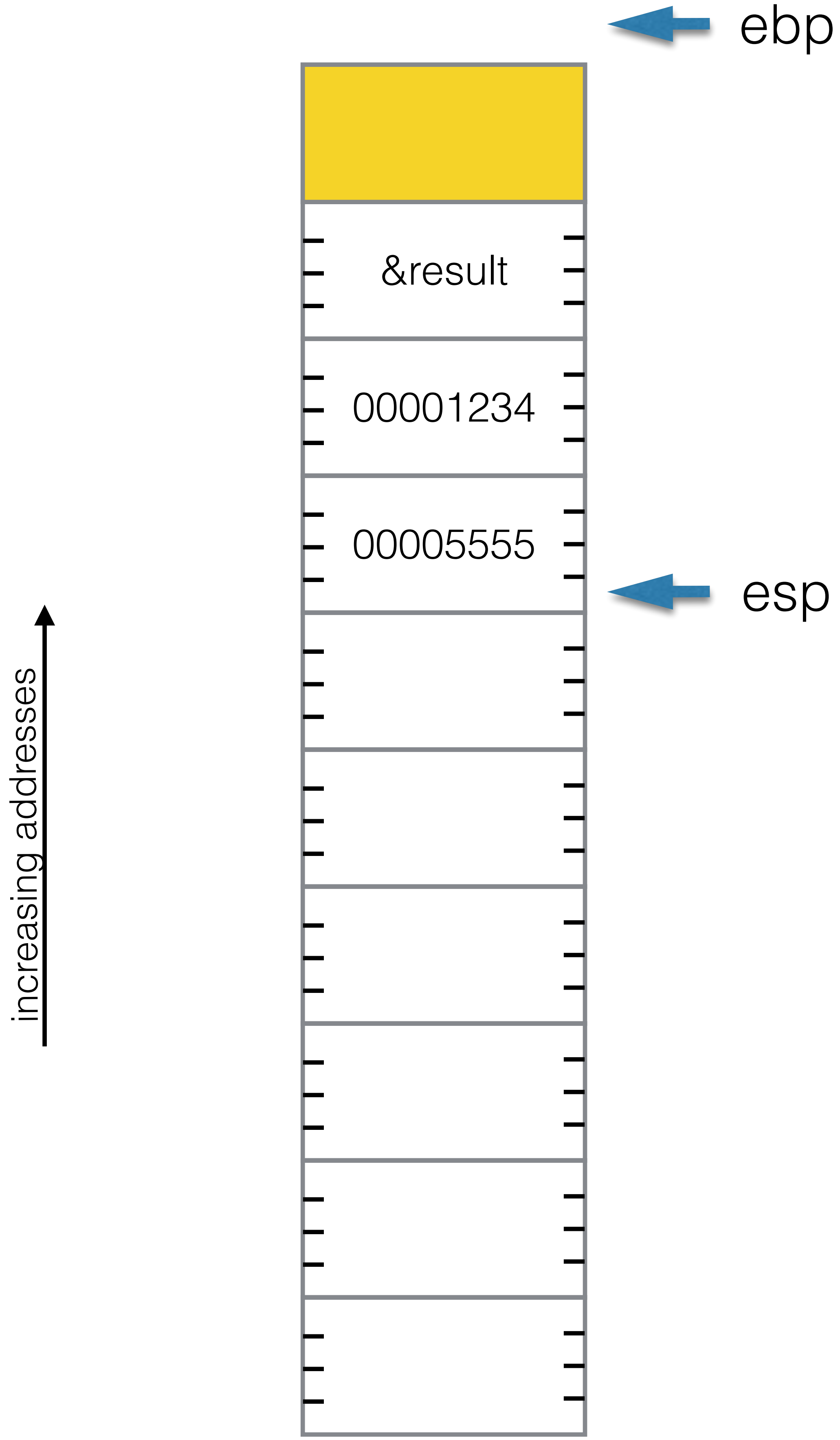
        mov     dword[ebx], eax
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



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        push    eax
        push    dword [a]
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        call    sum
*
         …
;;; sum function
sum     push    ebp
        mov     ebp,esp
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        push    ebx
        mov     eax,dword [ebp+8]
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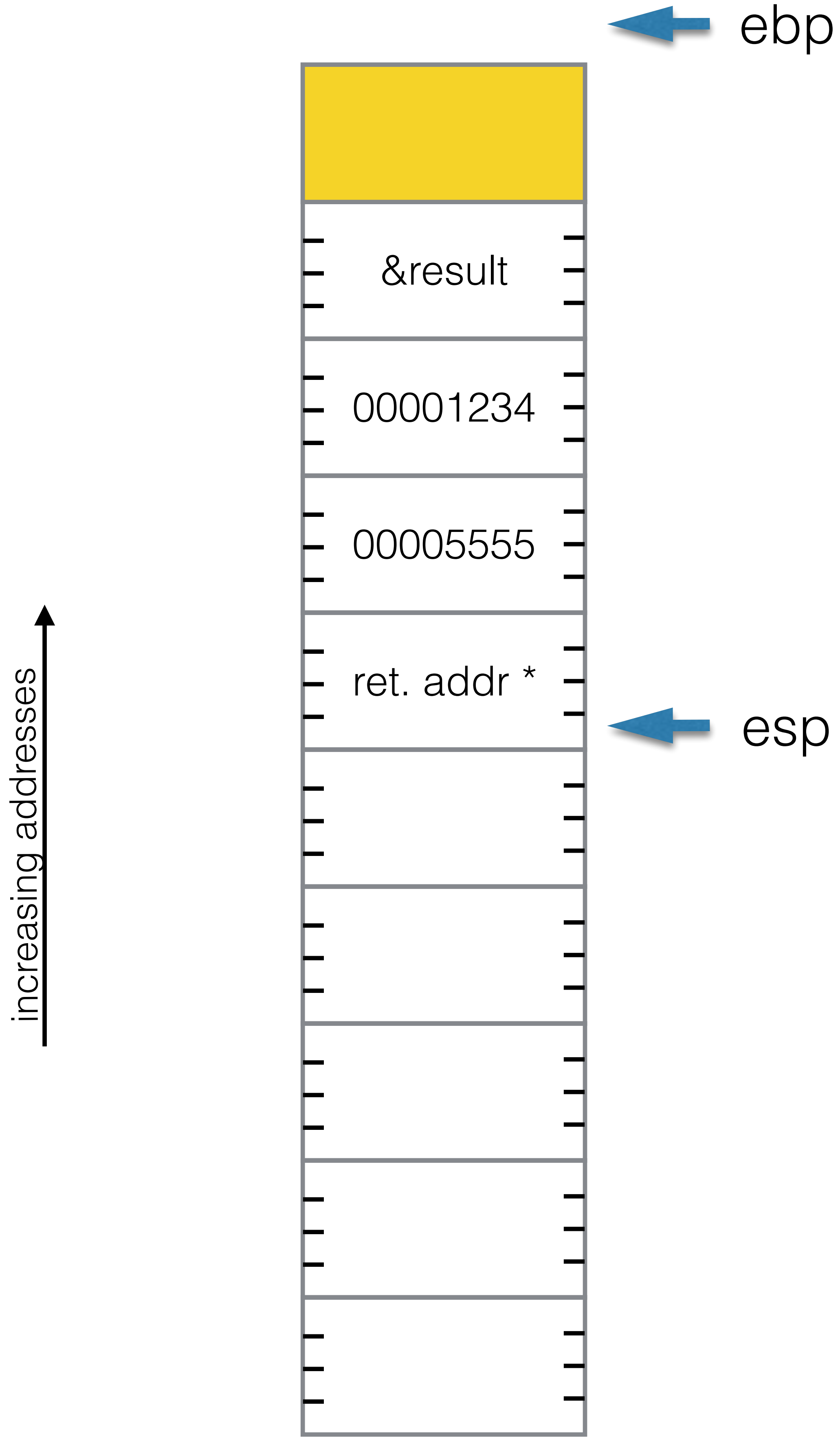
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



&result

00001234

00005555

ret. addr *

```
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a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        mov     eax, result
        push    eax
        push    dword [a]
        push    dword [b]
        call    sum
*
         …
;;; sum function
sum:    push    ebp
        mov     ebp,esp
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        pop     ebx
        pop     eax
        pop     ebp
        ret     12
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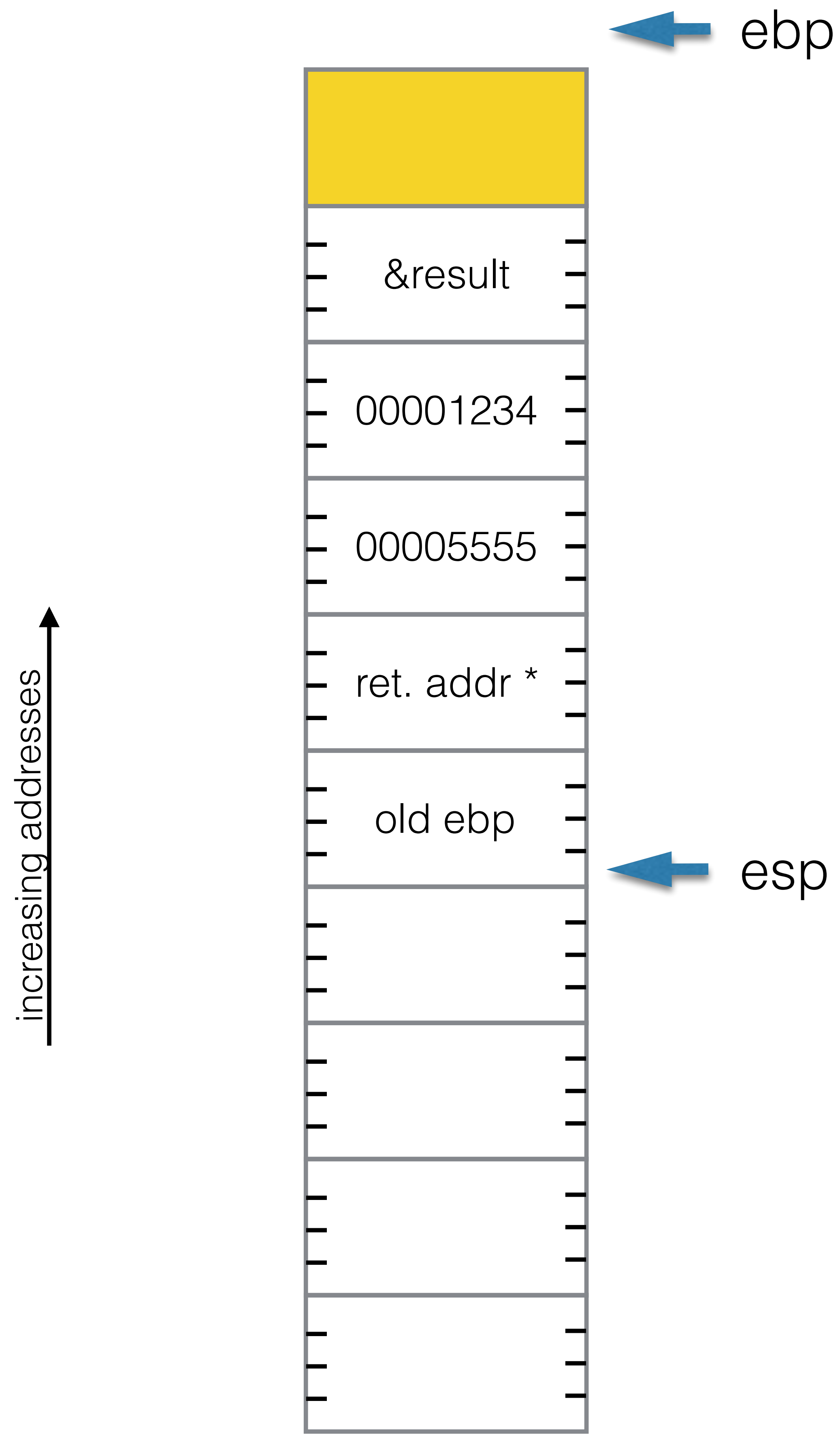

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        pop     ebx
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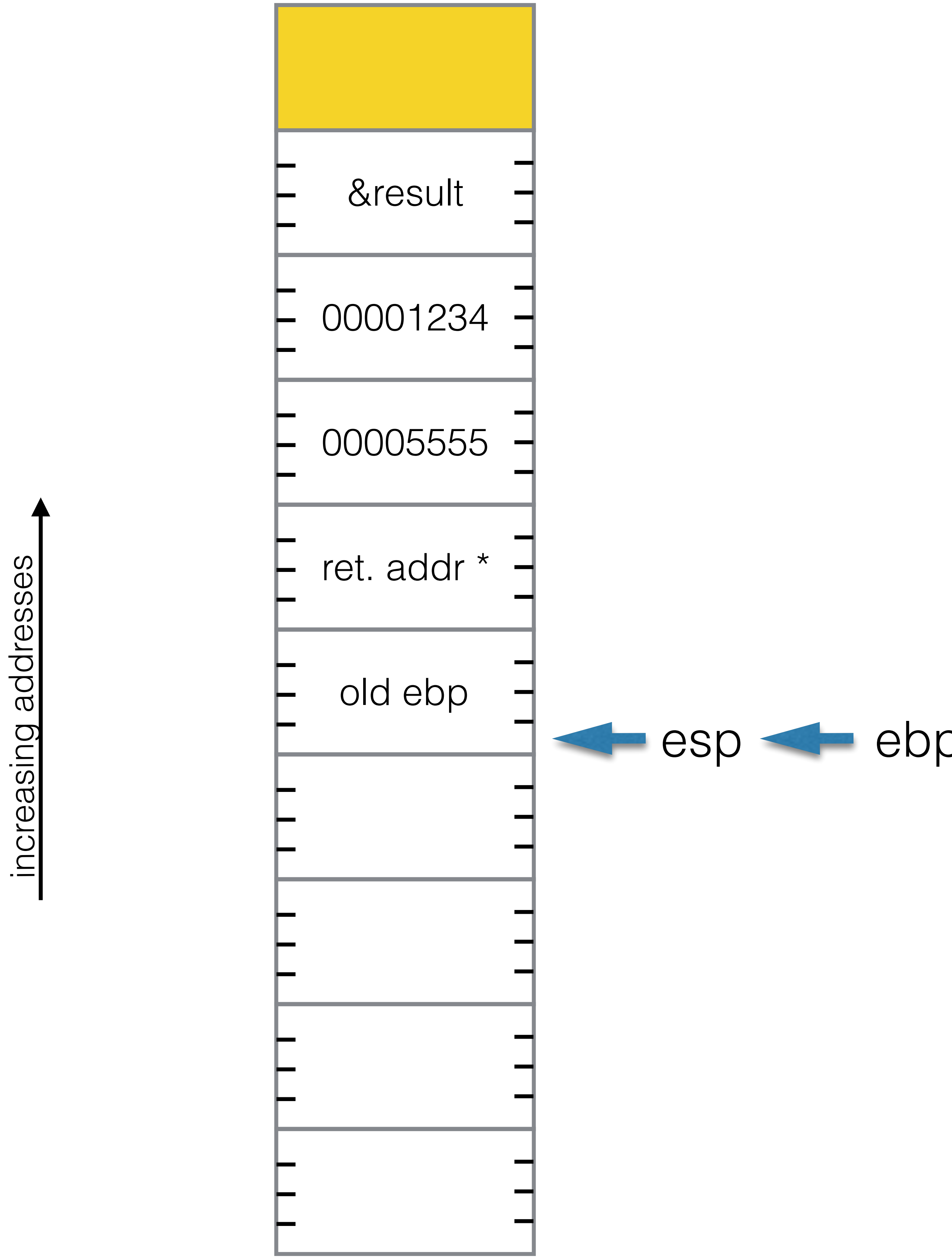
        pop     ebp
        ret     12
```



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        section .text
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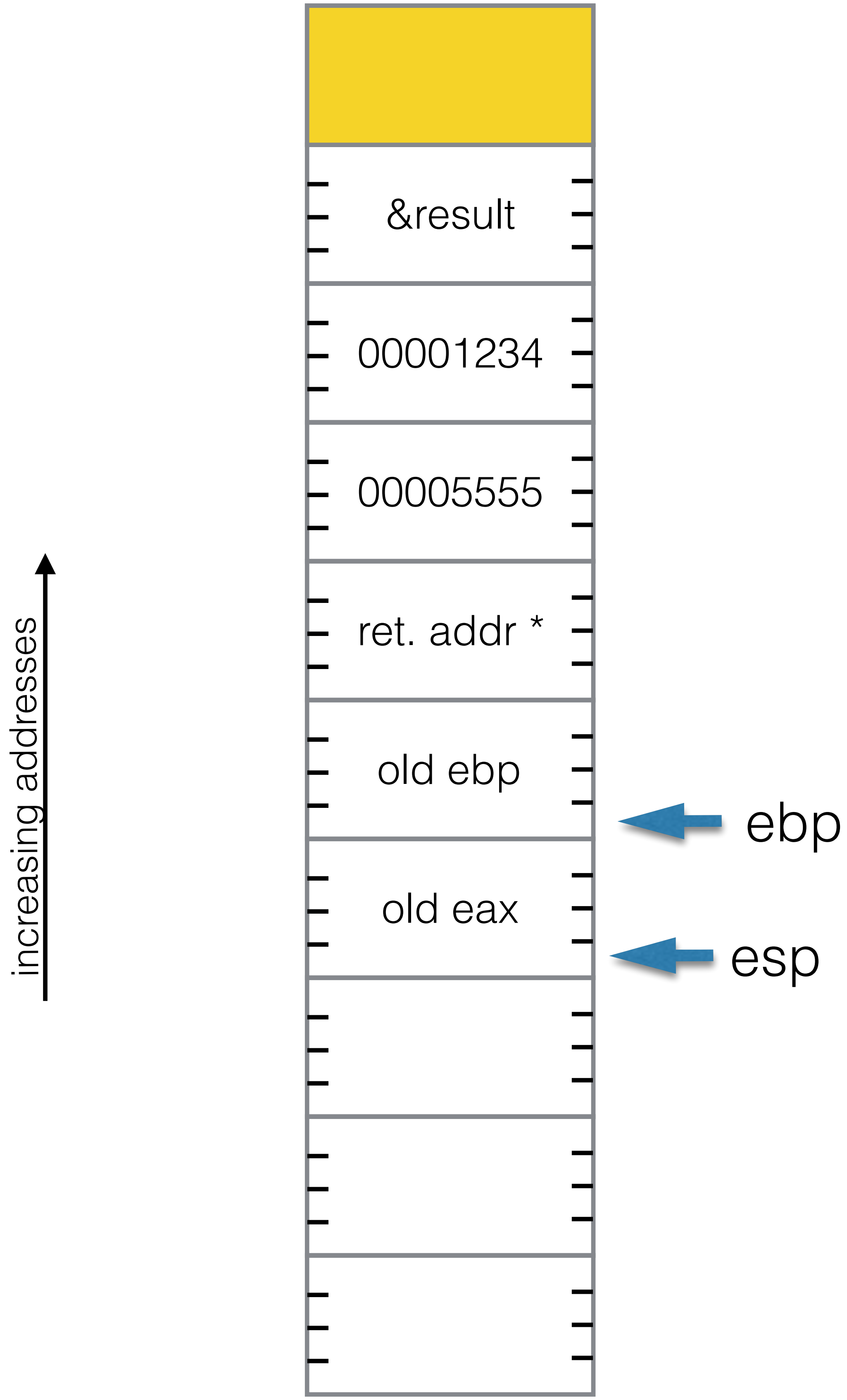
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



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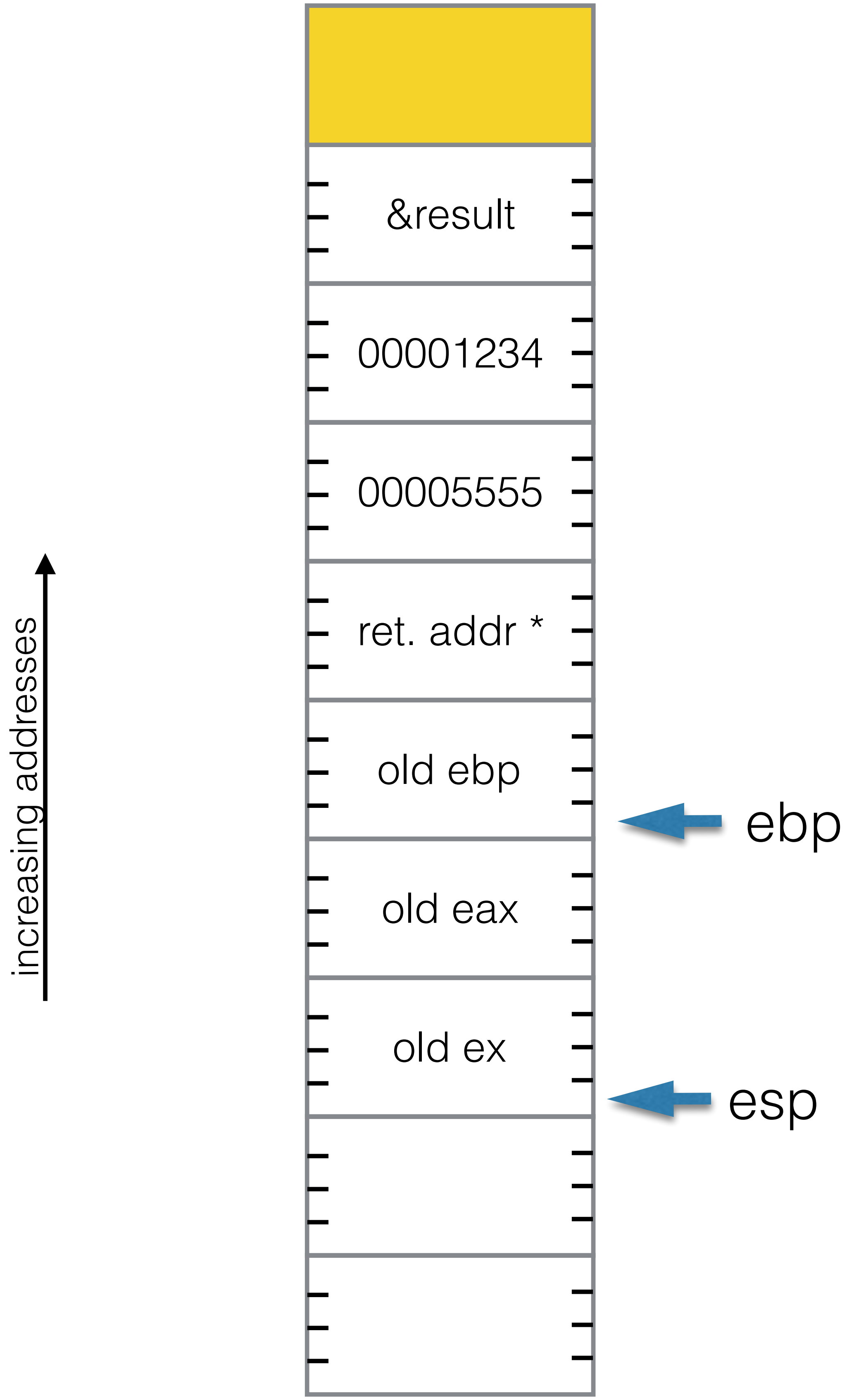

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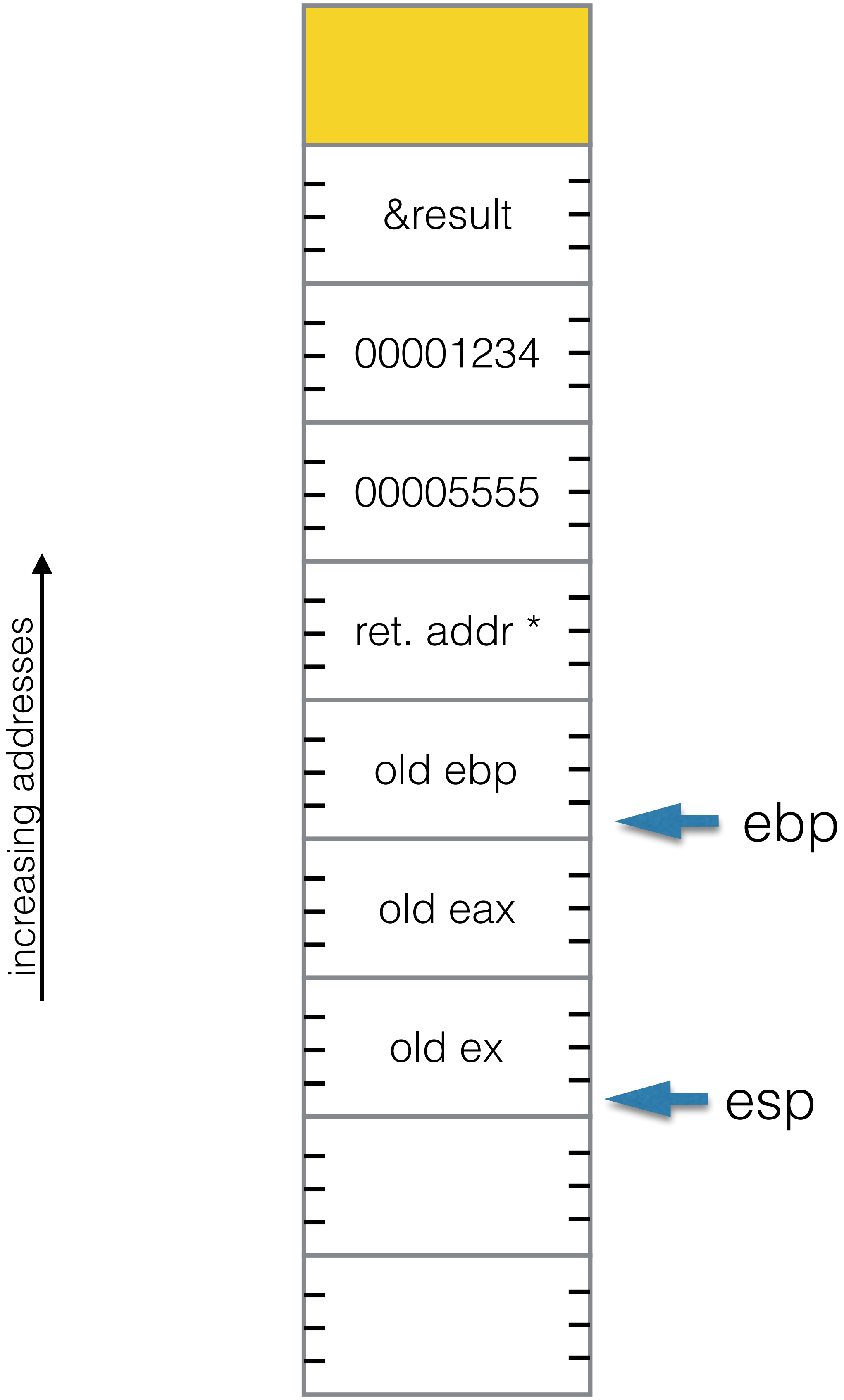

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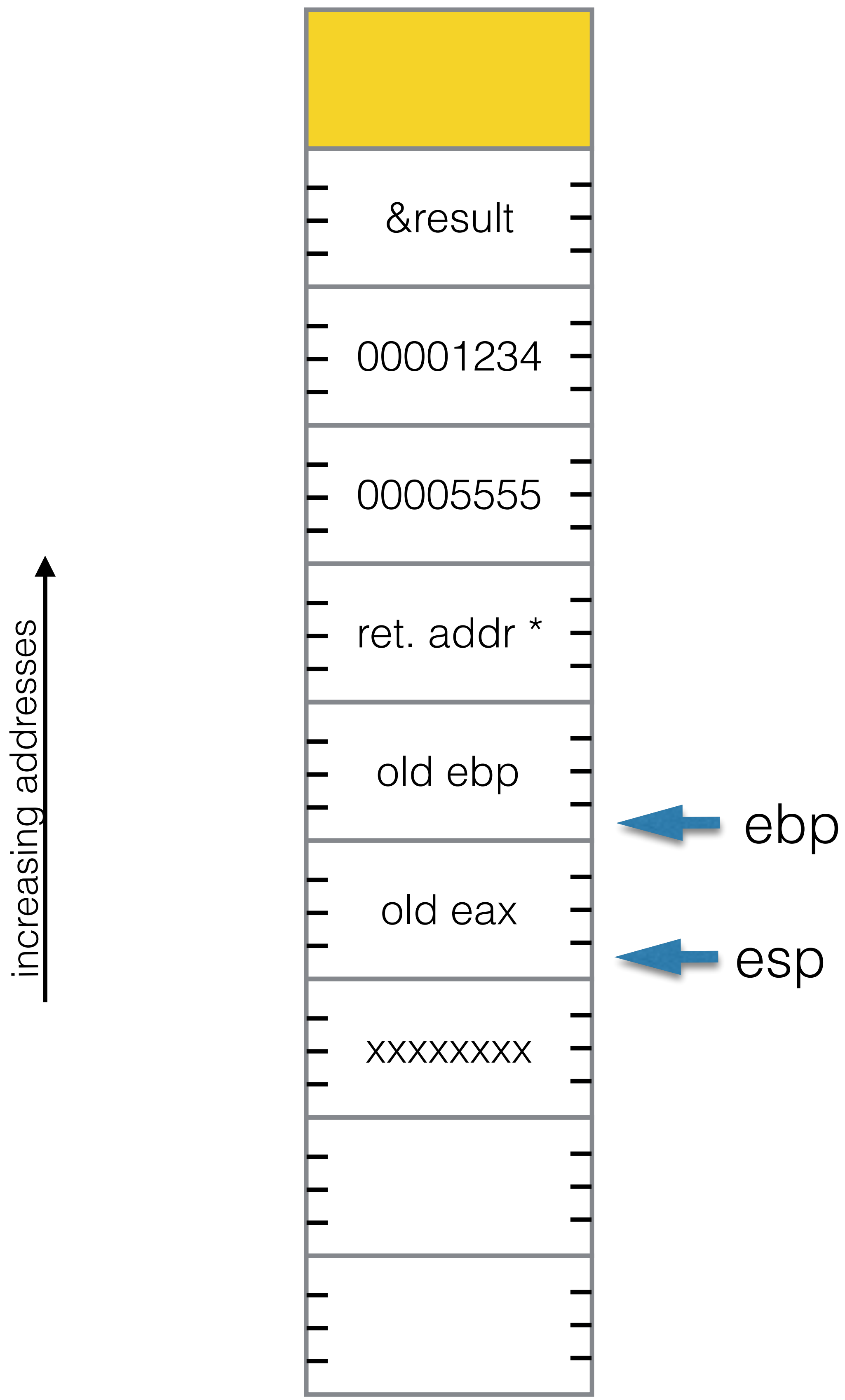
        mov     dword[ebx], eax
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



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        pop     ebx
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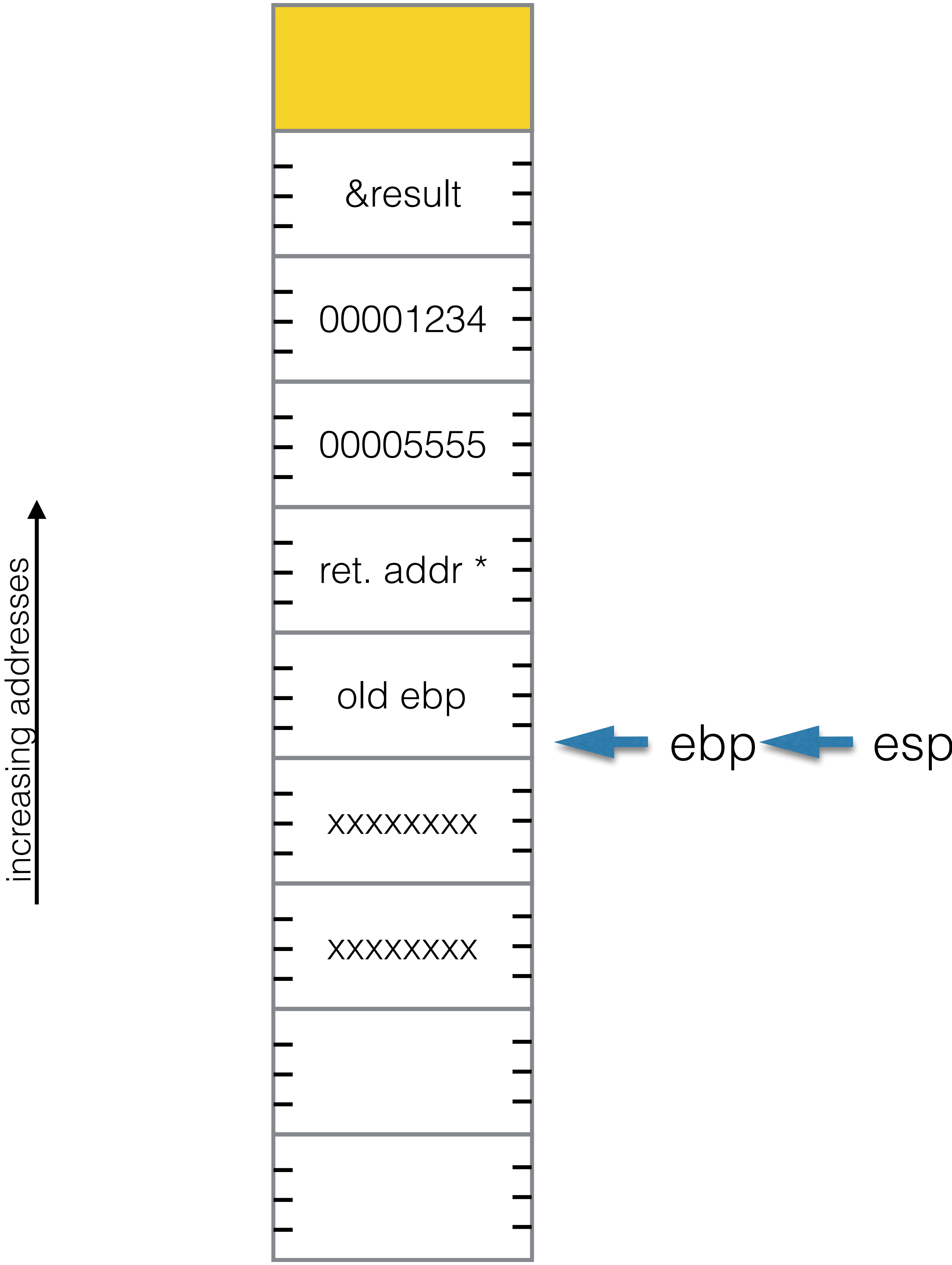
```



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        section .text
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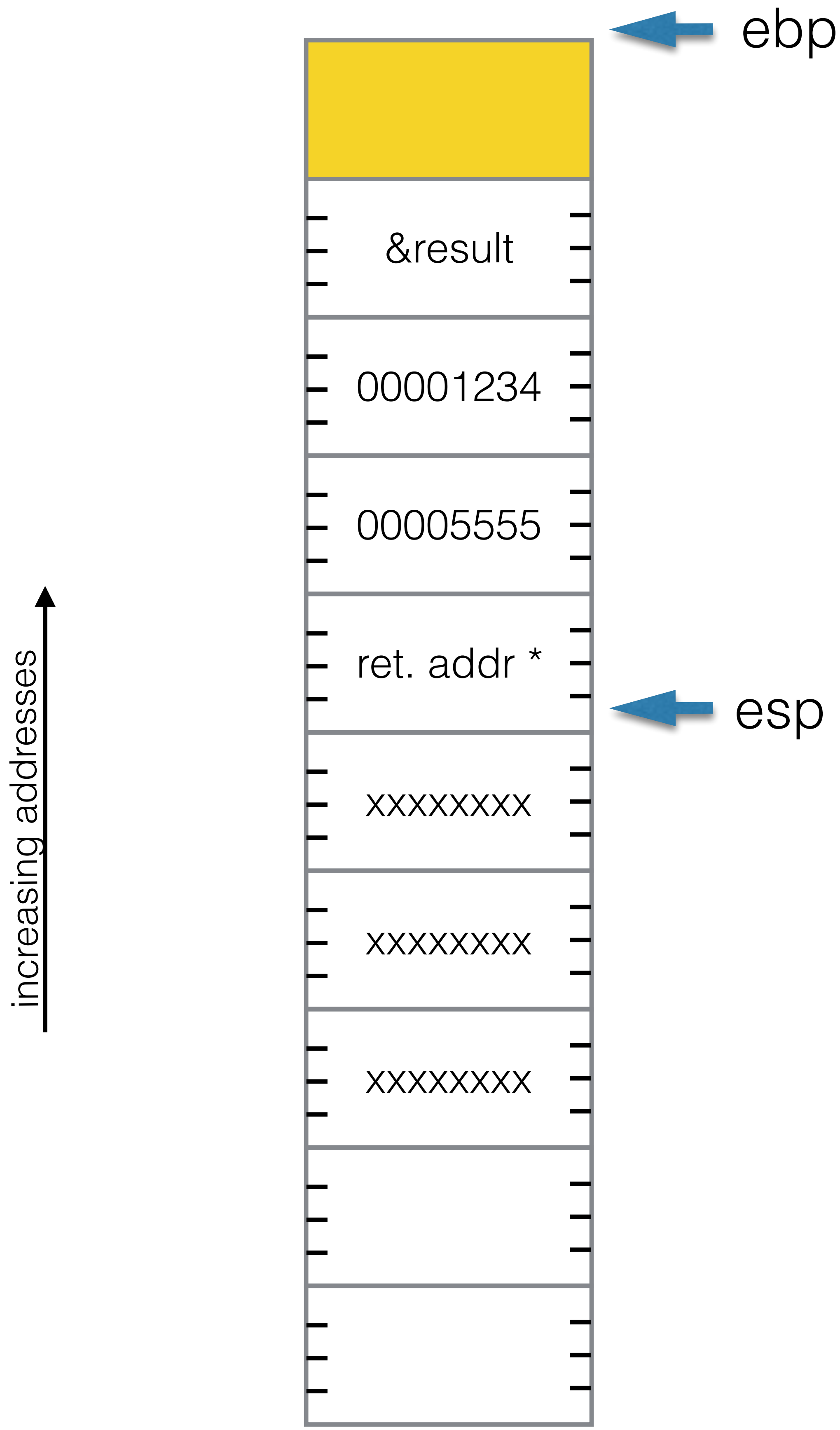
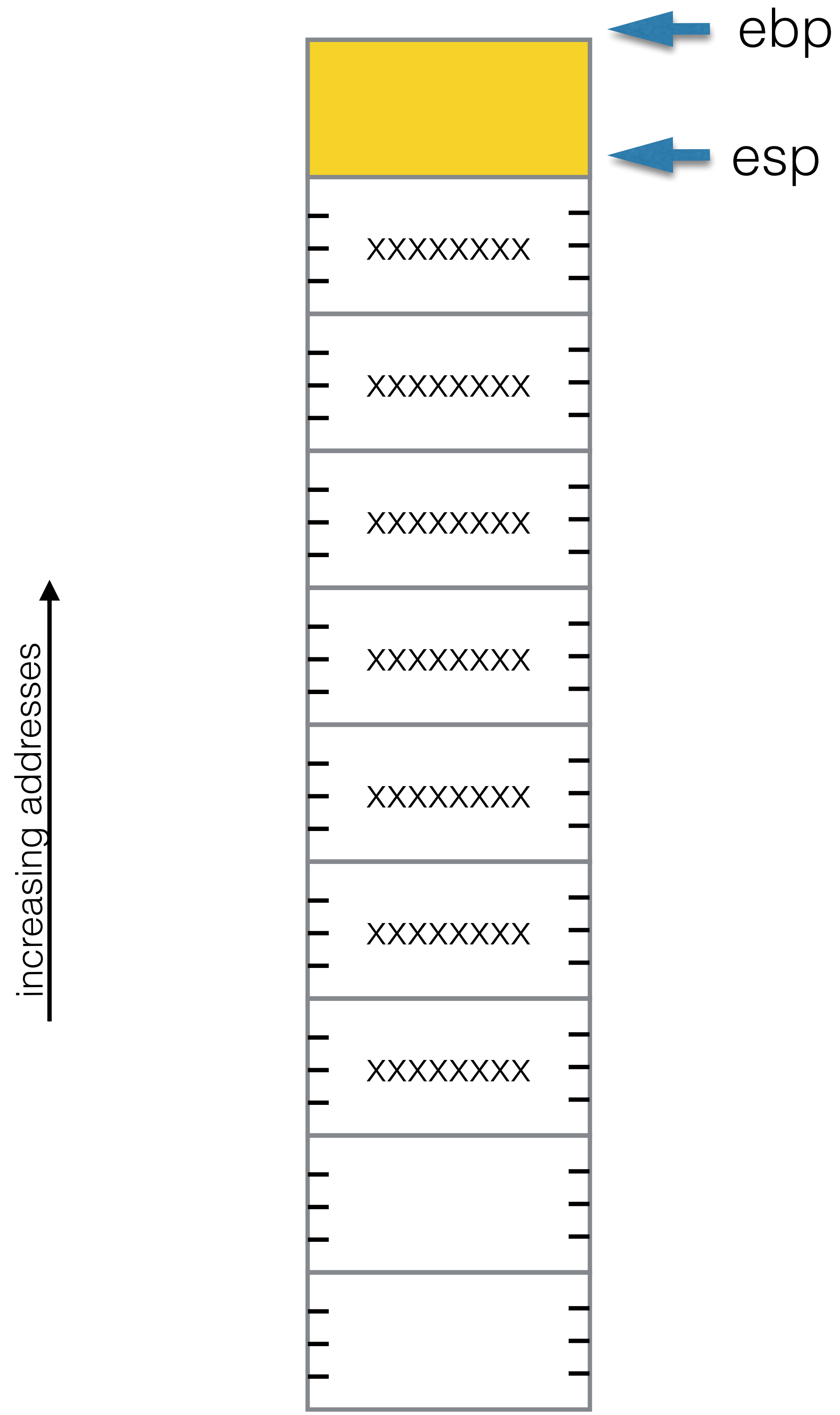
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```



```
        section .data
a       dd      0x1234
b       dd      0x5555
result  dd      0

        section .text
        mov     eax, result
        push    eax
        push    dword [a]
        push    dword [b]
        call    sum
* ➡
         …
;;; sum function
sum:    push    ebp
        mov     ebp,esp
        push    eax
        push    ebx
        mov     eax,dword [ebp+8]
        add     eax,dword [ebp+12]
        mov     ebx,dword [ebp+16]
        mov     dword[ebx], eax
        pop     ebx
        pop     eax
        pop     ebp
        ret     12
```


ebp
esp
XXXXXXXX
XXXXXXXX
XXXXXXXX
XXXXXXXX
XXXXXXXX
XXXXXXXX
XXXXXXXX
increasing addresses