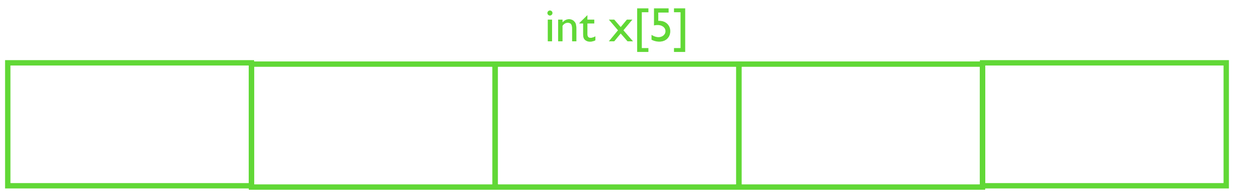
Desugaring arrays

what is the syntactic sugar?

- An array is just a series of boxes stored consecutively in memory
  - In some languages arrays are objects (store length, etc.)
  - In C/C++, arrays are just regions of memory



  - So how do we deal with arrays?
- Arrays are essentially pointers with special syntax!

allocating arrays

- An array is a **base pointer** plus a size
  - Base pointer is *just a pointer* that points to the beginning of the array
  - Size defines number boxes in array

- Allocating an array is just assigning a pointer

```
int * p
p = malloc(10 * 4) //allocate an array of 10 integers
```

allocating arrays

- An array is a **base pointer** plus a size
  - Base pointer is *just a pointer* that points to the beginning of the array
  - Size defines number boxes in array

- You may see explicit array syntax for global/stack allocation:

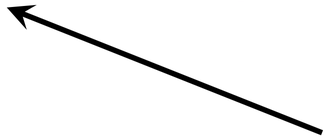
```
int p[10]; //allocate 10-integer array on stack
```

- In this case, p is still just an int * pointer with some extra compiler smarts (p == &p)

using arrays

- Accessing arrays is very simple syntactic sugar:

```
a[expr] === * (a + 4 * expr)
```



size of data type pointed to by a

code generation for arrays

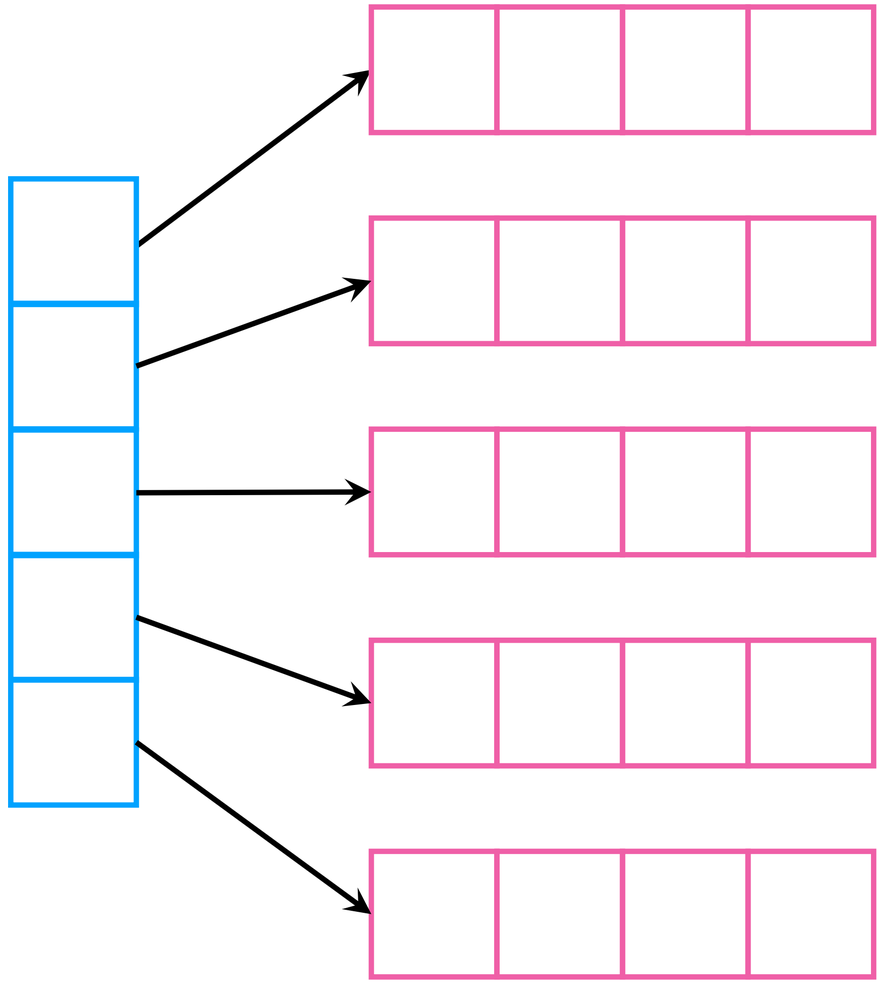
- Can generate code by implementing a **desugaring pass**
  - Before code generation, walk over AST, replace array nodes with corresponding pointer-based expression

- Can generate code by implementing desugaring during code generation

using arrays

- Desugaring composes!

```
a[i][j] ===
* (a[i] + 4 * j) ===
* (* (a + 4 * i) + 4 * j)
```

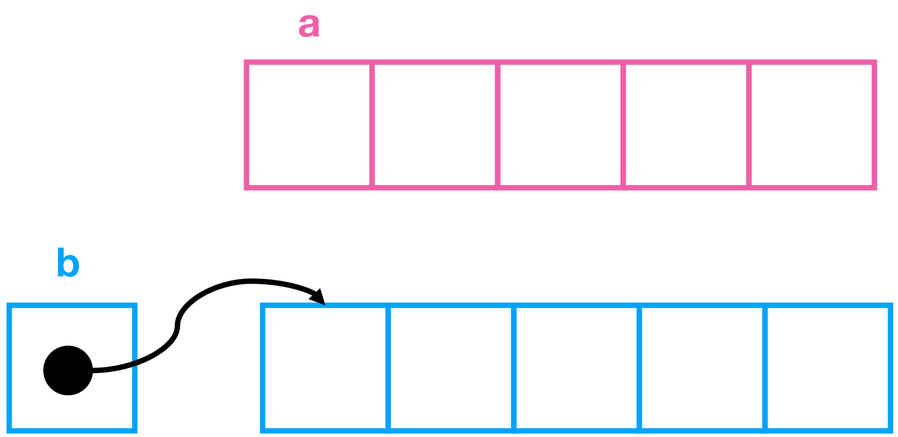


are arrays just pointers?

- Syntactic sugar can be complicated
  - In some sense, yes! Array accesses are explicitly equivalent to pointer arithmetic + a dereference, and pointers that point to a dynamically allocated array work as above
  - But in another sense, no. If arrays are declared as arrays, with either local or global allocation, they are **array** type and C/C++ do some magic with them:

```
int a[4] vs int * b = malloc(16)
```

- a refers to the whole box, a returns &a
- b is a pointer that points to a separate array:



next: analyzing code