Programming with C I

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Array Arguments

- We can write functions that have arrays as arguments.
- Such functions can manipulate some, or all, of the elements corresponding to an actual array argument.

Using Array Elements as Function Arguments

```
scanf("%lf", &x[2]);
```

Figure Function to Check Whether Tic-tac-toe Board is Filled

```
/* Check Whether a tic-tac-toe is completely filled.              */
int filled(char ttt_brd[3][3])        /* input  -tic-tac-toe board */
{
        int r, c;     /* row and column subscripts      */
        int ans=1;    /* whether or not board filled    */

        / * Assumes board is filled until blank is found             */
        for (r = 0; r < 3; ++r)
            for (c = 0; c < 3; ++c)
                if (ttt_brd[r][c])
                    ans = 0;

        return (ans);
}
```

Variable scope

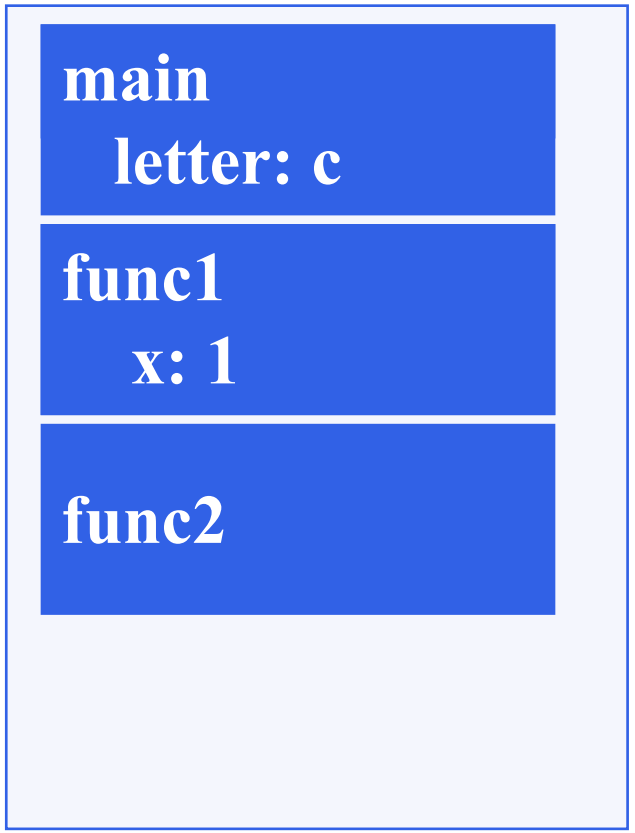
- Part of a program where a variable is accessible
- Lifetime of a variable

What happens when we run our executable file?

```
func2() {
    printf("%d\n", x);
}
func1() {
    int x = 1;
    func2();
}
int main(void) {
    char letter='c'
    func1();
}
```

out of scope!

Memory



What happens when we run our executable file?

```
void fill_array(
        int list[],
        int n,
        int in_value) {
    int i;
    for (i = 0;
          i < n; ++i) {
        list[i] = in_value;
    }
}
int main(void) {
    int arr[10];
    fill_array(arr, 5, 1);
}
```

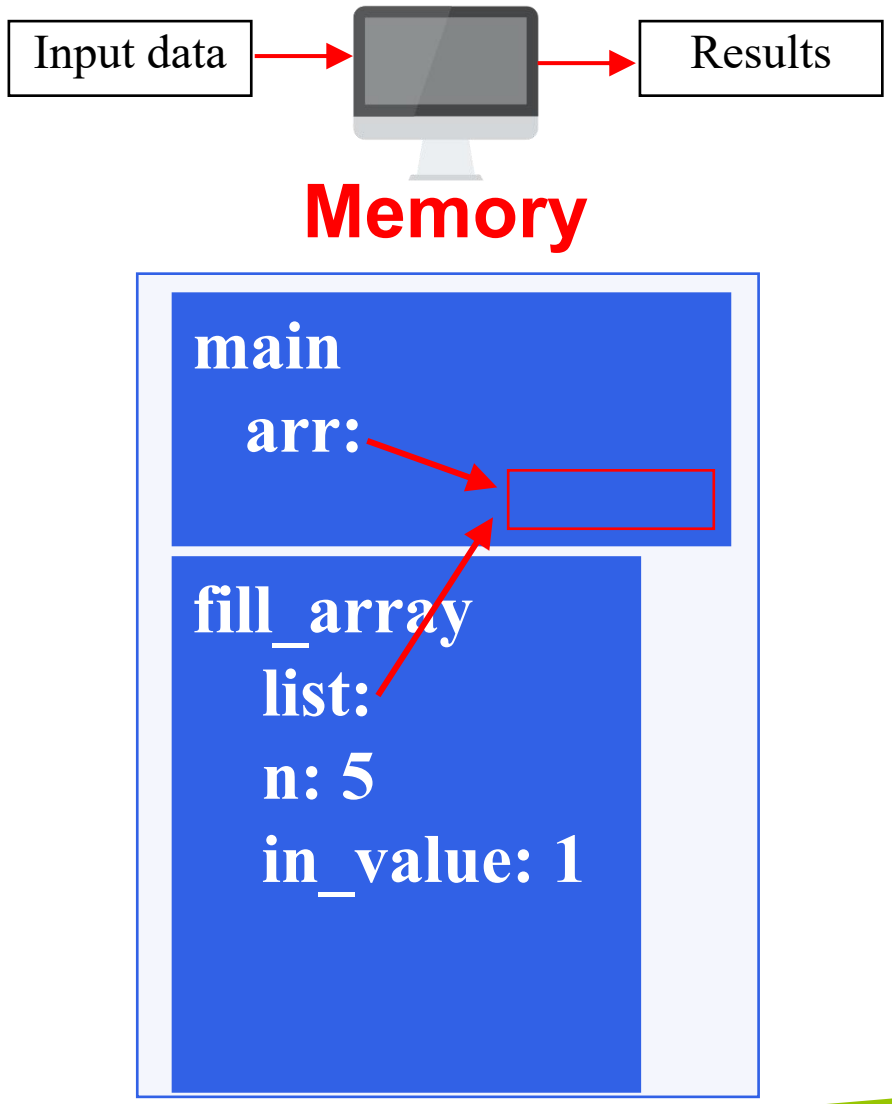
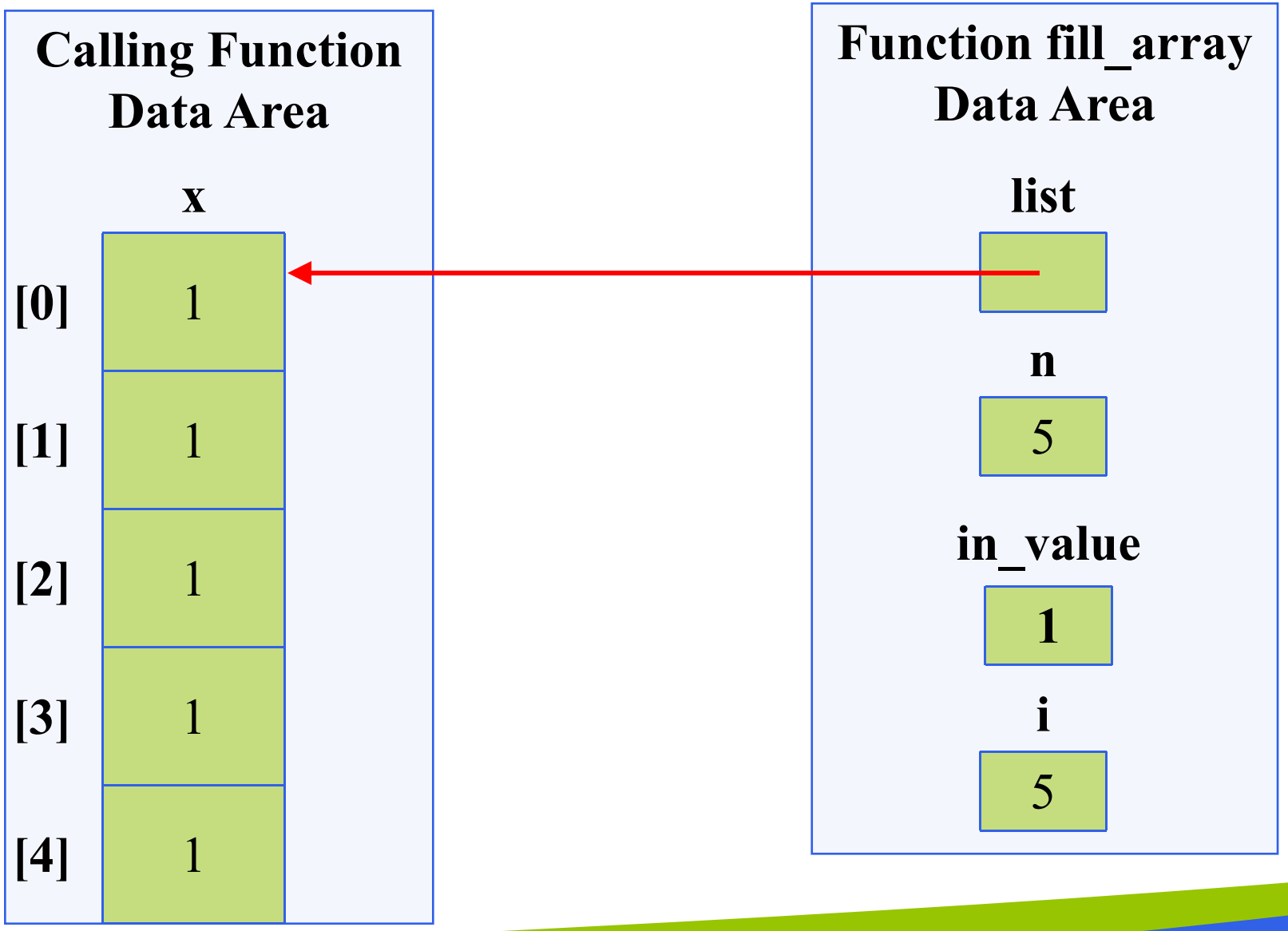


Figure Function fill_array

```
/*
 * Set all elements of its array parameter to in_value.
 * Pre: n and in_value are defined.
 * Post: list[i] = in_value, for 0 <= i < n.
 */
void
fill_array (int list[],        /* output - list of n integers          */
            int n,             /* input - number of list elements      */
            int in_value)      /* input - initial value                */
{
        for (int i = 0; i < n; ++i)
            list[i] = in_value;
}
```

Figure Data Areas Before Return from fill_array (x, 5, 1);



Arrays as Input Arguments

- The qualifier **const** allows the compiler to mark as an error any attempt to change an array element within the function.

Figure Function to Find the Largest Element in an Array

```
/*
 * Return the largest of the first n values in array list
 * Pre: First n elements of array list are defined and n > 0
 */
int
get_max(const int list[],     /* input - list of n integers                    */
        int n)                /* input - number of list elements to examine    */
{
        int cur_large;        /* largest value so far                          */

        / * Initial array element is largest so far                           */
        cur_large = list[0];

        /* Compare each remaining list element to the largest so far;
           save the larger
        for (int i = 1; i < n; ++i){
            if (list[i] > cur_large)
                cur_large = list[i];
        }
        return (cur_large);
}
```

Returning an Array Result

- In C, it is not legal for a function's return type to be an array.
- You need to use an output parameter to send your array back to the calling module.

Diagram of a function That Computes an Array Result

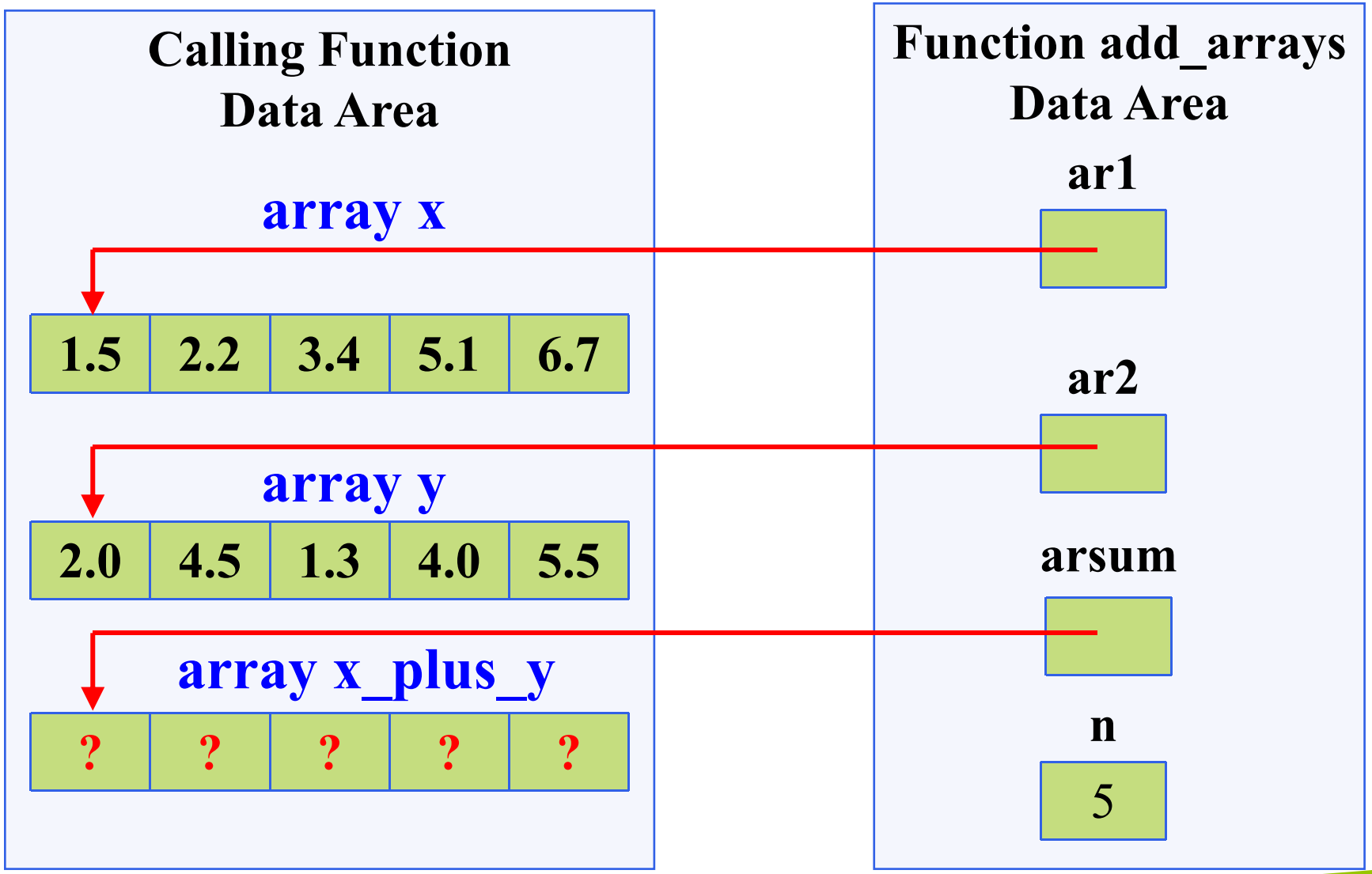
Figure Function to Add Two Arrays

```
/*
 * Adds corresponding elements of arrays ar1 and ar2, storing the result in arsum.
 * Processes first n elements only.
 * Pre: First n elements of ar1 and ar2 are defined. arsum's corresponding actual
        argument has a declared size >= n (n >= 0)
 */
void add_arrays(const double ar1[],              /* input - */
                const double ar2[],              /* arrays being added */
                double arsum[],          /* output - sum of ar1 and ar2 */
                int n)                   /* input - number of element paris summed*/

{

        / * Adds corresponing elements of ar1 and ar2                              */
        for (int i = 0; i < n; ++i)
            arsum[i] = ar[i] + ar2[i];
}
```

Figure Function Data Areas for add_arrays(x, y, x_plus_y, 5);



THE END

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