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[i]);
```

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

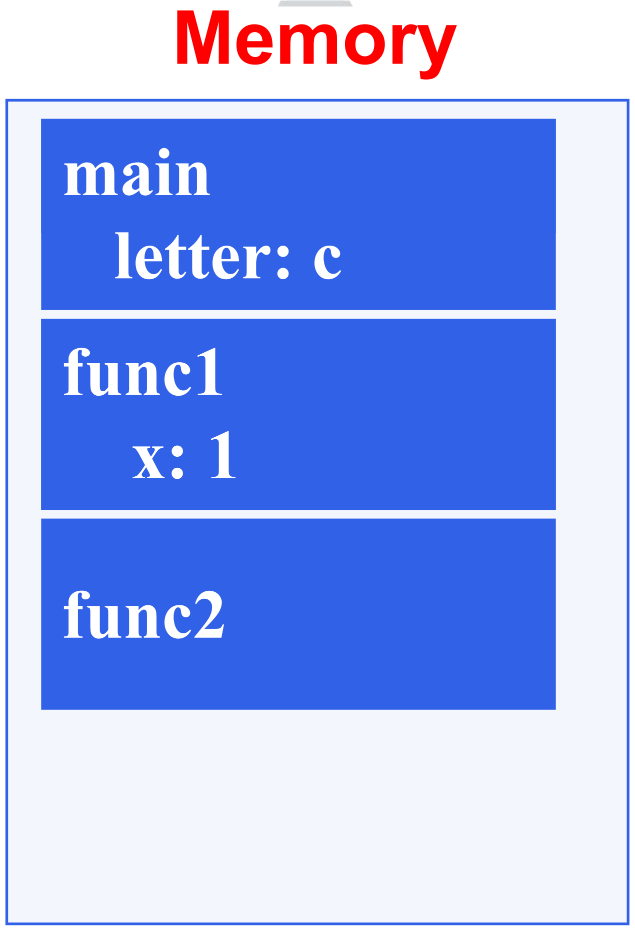
- Part of a program where a variable is accessible
- Lifetime of a variable

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!

Input data
Results



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);
}
```

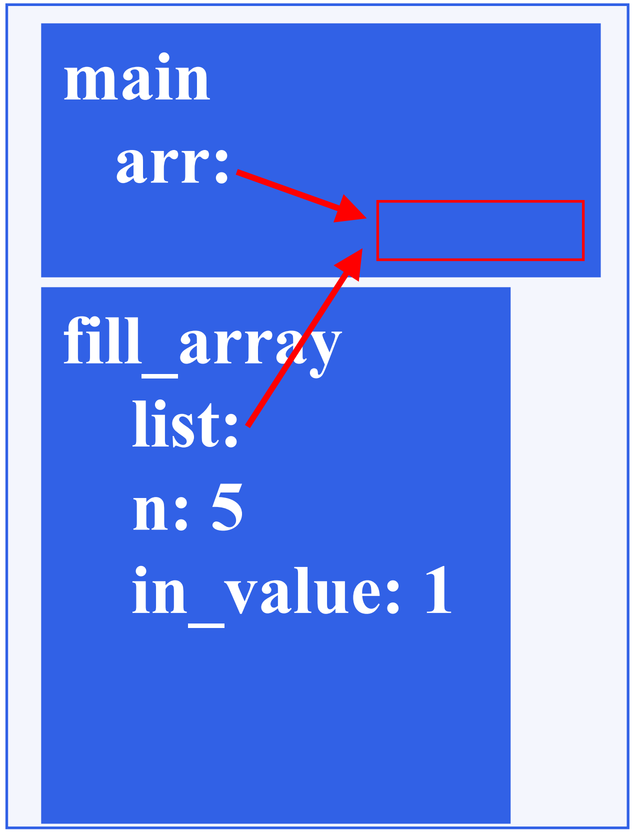
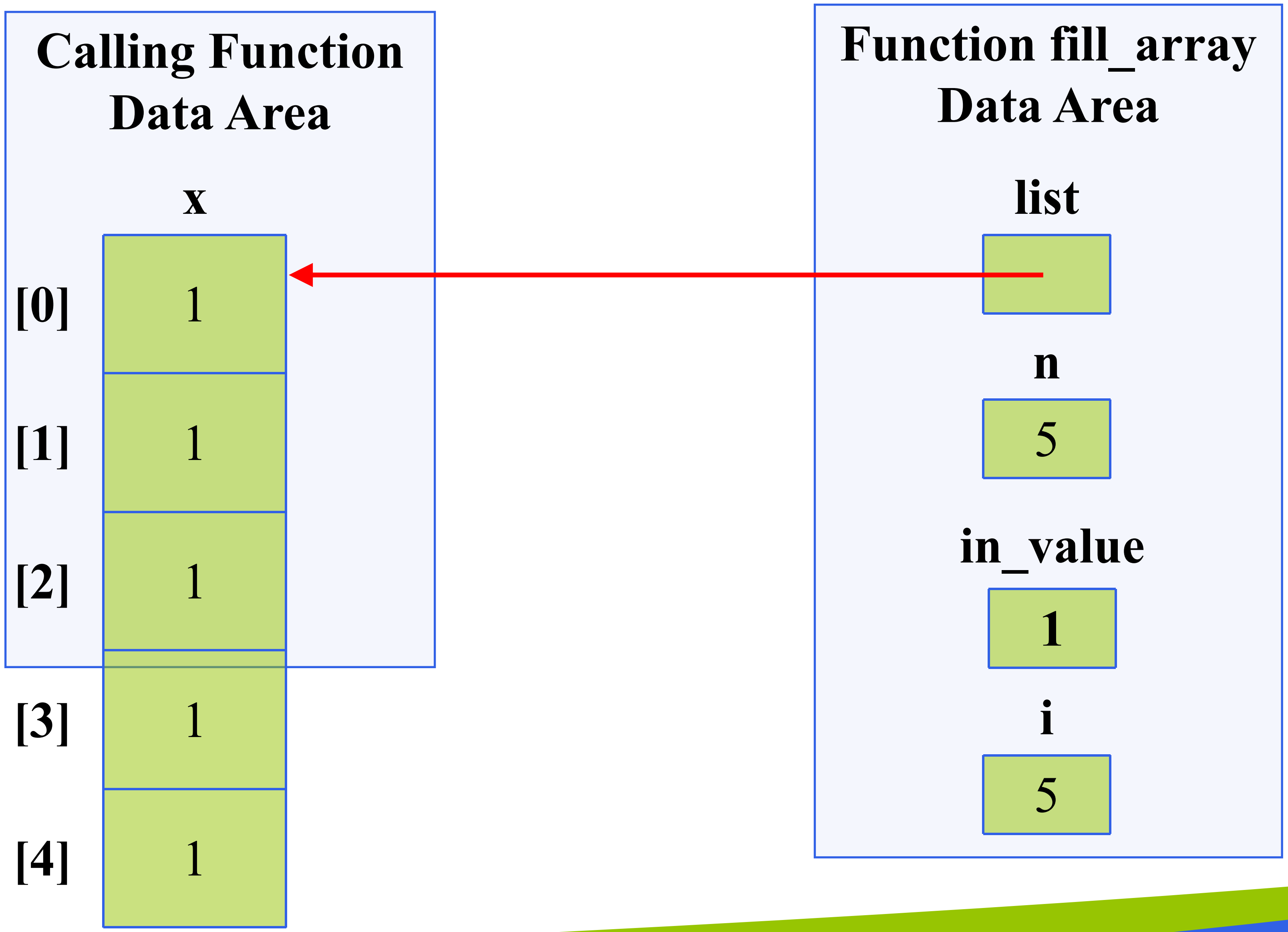


Figure Function fill_array

```
/*
 * 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.

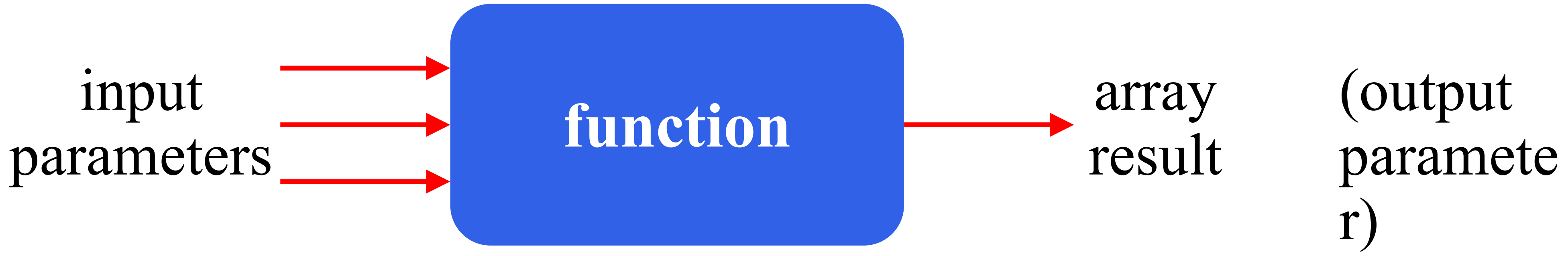


Diagram of a function That Computes an Array Result

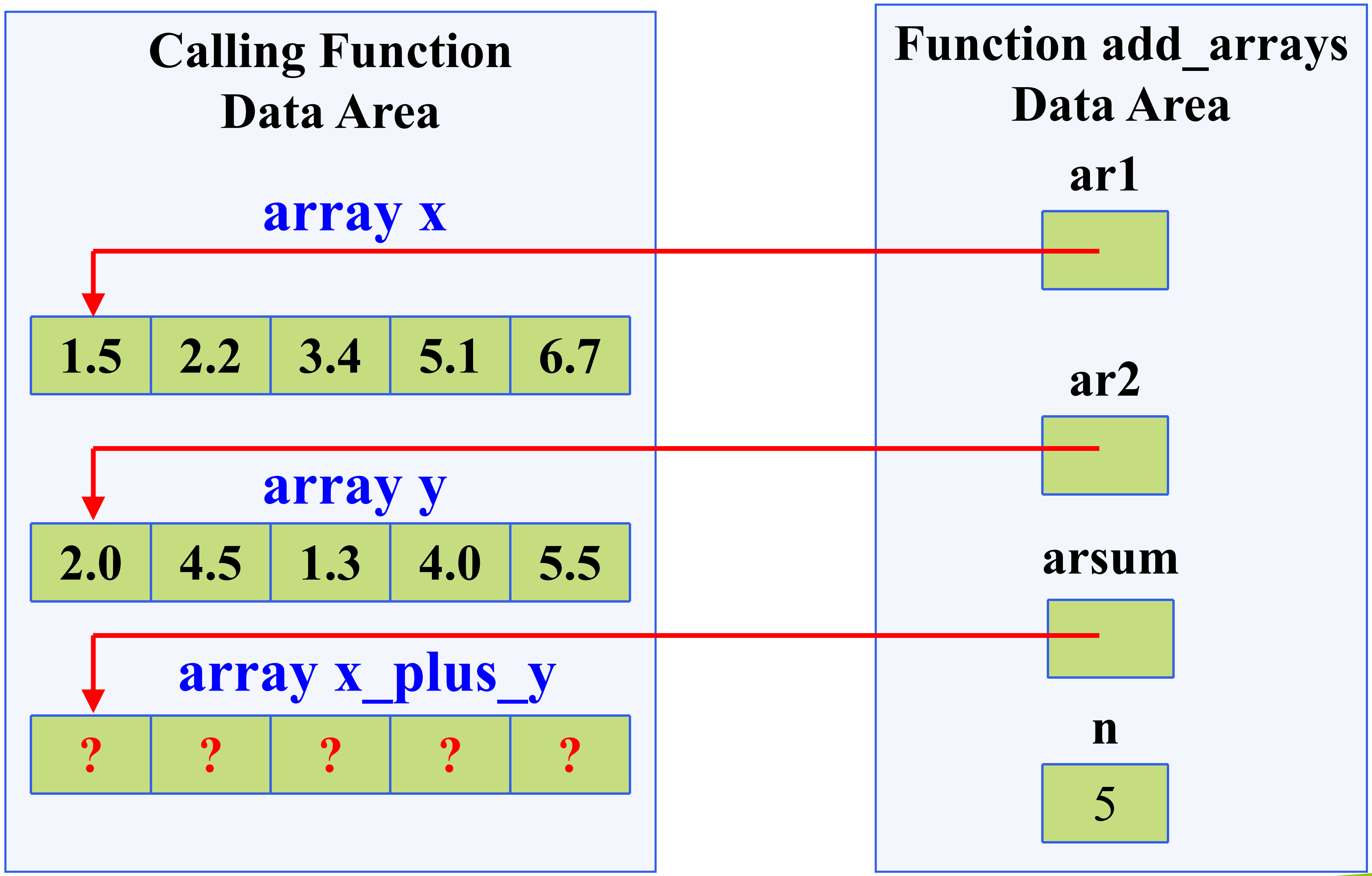
Figure Function to Add Two Arrays

```
/*
 * 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*/

{
          int i,

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

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



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