COMP10002 Foundations of Algorithms

Workshop Week4

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GitHub Repo: https://github.com/AlanChaw/COMP10002-FoA

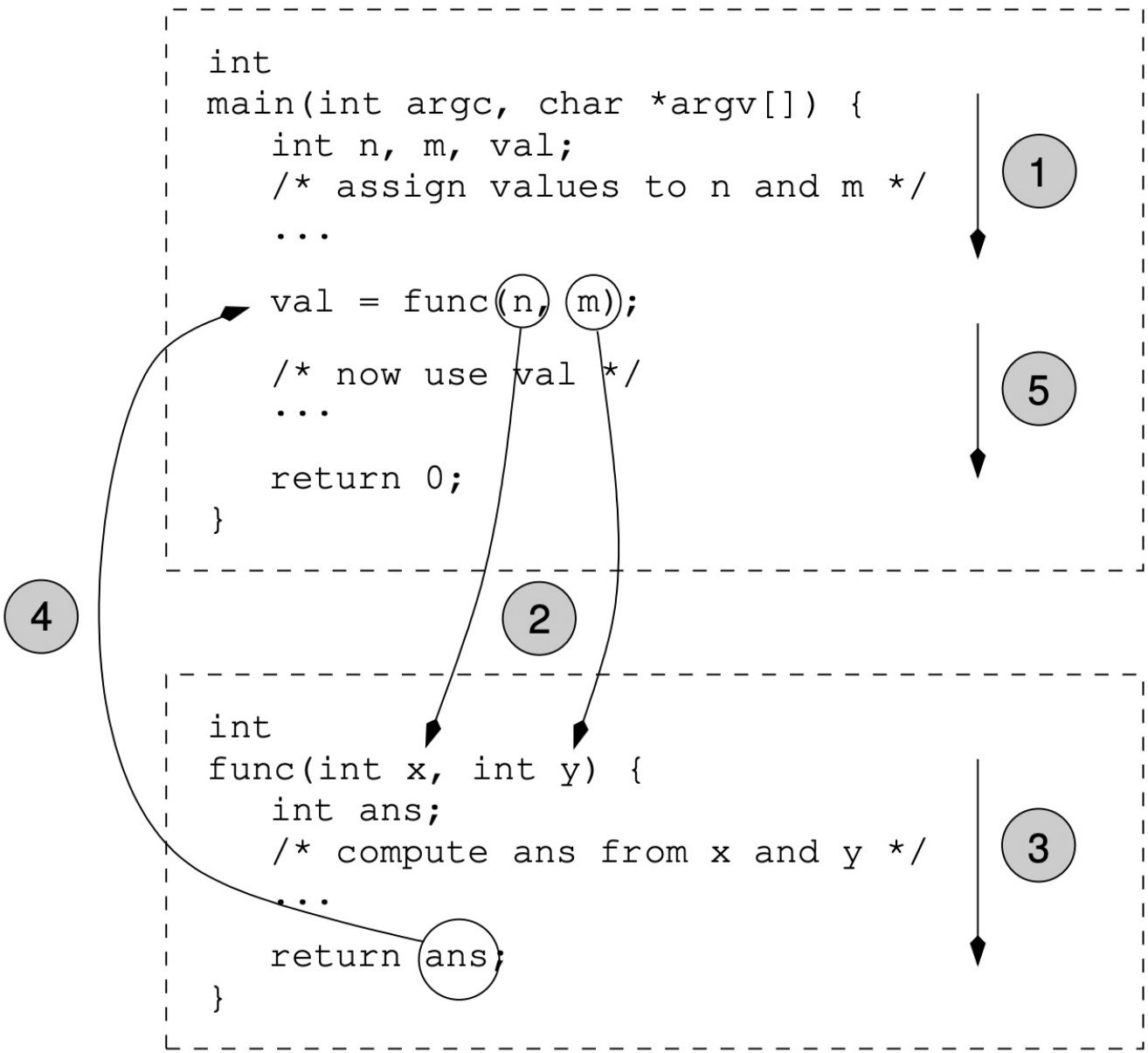
Recap

Functions

Pointer

Array

Functions


int
main(int argc, char *argv[]) {
int n, m, val;
/* assign values to n and m */
...
val = func(n, m);
/* now use val */
...
return 0;
}
1
5
4
2
int
func(int x, int y) {
int ans;
/* compute ans from x and y */
...
return ans;
}
3

Functions

Declaration and Defination

Arguments and Parameters

Recursion

Use of void

```c
void printHello(void){
    printf("hello\n");
}


int main(){
    printHello();
    printHello();
    printHello();
    return 0;
}
```

Output:

```
hello
hello
hello
```

Pointers

Scope Problem

- Changing the local variable in a function will not change the outside argument

```c
void func(int x){
    x++;
}

int main(){
    int x = 1;
    func(x);
    printf("%d\n", x);
    return 0;
}
```

- Functions cannot use the local variables of other functions

Discussion

Exercise 6.2

For each point, write down a list of all of the program-declared variables and functions that are in scope at that point (and the type for each identifier).

Pointers and pointer operations

- Pointer: Stores the memory address of another variable

```c
int main(){
    int a = 3;
    int* p = &a;  //p is a pointer to int

    printf("%d\n", a);
    printf("%p\n", &a);

    printf("%d\n", *p);
    printf("%p\n", p);

    return 0;
}
```

Output:

```
3
0x7ffeefbff5b8
3
0x7ffeefbff5b8
```

Pointer is like an "alias" of the variable

```c
int main(){
    int a = 3;
    int* p = &a;

    *p = *p + 1;

    printf("%d\n", a);
    printf("%d\n", *p);

    return 0;
}
```

Pointers as arguments (Call by Reference)

```c
void swap(int *p1, int *p2){
    int tmp;
    tmp = *p1;
    *p1 = *p2;
    *p2 = tmp;
}

int main(){
    int x = 2, y = 3;
    swap(&x, &y);
    printf("after swap: x=%d, y=%d\n", x, y);

}
```

Further Example

```
void myfunc(int *pointer){
    *pointer = *pointer + 1;

    int b = 10;
    pointer = &b;
    *pointer = *pointer + 1;
}

int main(){
    int a = 3;
    int* p = &a;

    printf("Before pass to function: %d\n", a);
    myfunc(p);
    printf("After executed of function: %d\n", a);

    return 0;
}
```

Array

Dicsussion - Exercise 7.3

Modify the program of Figure 7.3 on page 104 so that after the array has been sorted only the distinct values are retained in the array (with variable n suitably reduced)

Hands on exercise

Exercise 6.9

- Try to solve this question step by step
  - Copy, paste, read through, and run the program for **Exercise 3.6**
  - Add **try_one_coin()** function, and test
  - Add **print_change()** function, and test
  - Add **round_to_5()** function, and test
  - Write a **loop** to iterate the input from 1 to 1000 ($10)

Exercise 7.4