

# Cobo - Assignment 4

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## 4.1 Scoping and symbol tables

- a) The value of `foo(8)` depends on the evaluation order of the line `c = c + g(d-b)`, and more specifically of the expression `c + g(d-b)`. If `c` is evaluated first, the expression is undefined, as `c` does not yet have a value assigned. If `g(d-b)` is evaluated first, the expression is equal to 10.

In C, the two operations (the computation of `c` and `g(d-b)`) are unsequenced and fall under undefined behavior according to [https://en.cppreference.com/w/c/language/eval\\_order#Undefined\\_behavior](https://en.cppreference.com/w/c/language/eval_order#Undefined_behavior) (UB, subsection 2).

b, c, d) See figure 1.

## 4.2 Lambda lifting

```
int d = 2;

int f(int x, int* b)
{
    int b = x + *b;
    return b;
}

int g(int x, int* b, int* c, int a)
{
    *c = f(x - *b, b);
    return *c + a;
}

int foo(int a)
{
    int b = 1;
    int c;
    c = c + g(d - b, &b, &c, a);
    return c;
}
```

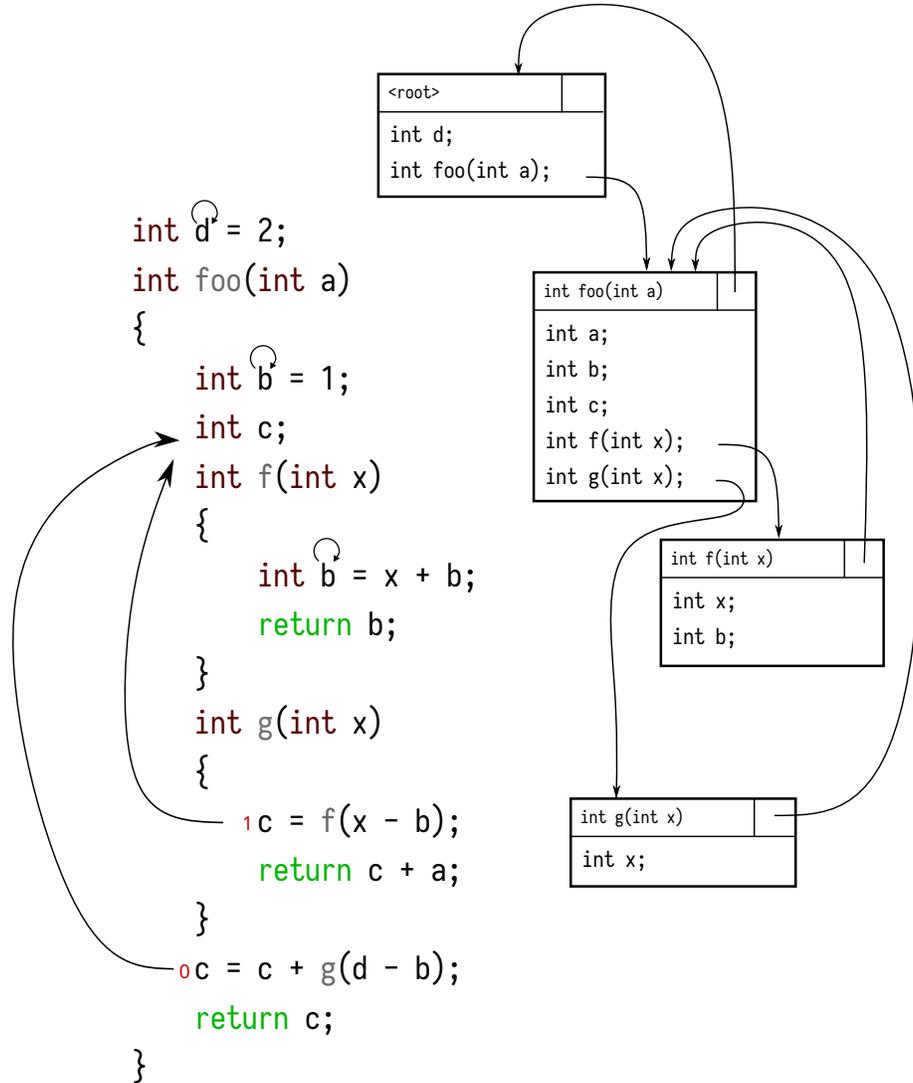


Figure 1: The annotated source of exercise 4.1. Arrows indicate the declaration corresponding to the variable assignment, red numbers indicate relative scope distance. An illustration of the symbol tables is also provided.

### 4.3 Function overloading

When it comes to semantic analysis, not much changes in the compiler. Two things stand out:

1. When checking whether a call is valid, doing a lookup in the symbol table for a function with a given name is not enough - the returned symbol might be an overload with a different signature. Therefore, there needs to be some way to look a function up based on a given function signature.
2. When checking whether a function definition is valid (traditionally: is a function with the given name not yet defined in the current scope) you also need to check whether a function with the given signature exists - if not, this is a new overload.

Finding the right symbol table entry may be implemented by enumerating all symbols with a given name by calling `symbol_lookup` multiple times and having it save state inbetween calls (à la `strtok_r`'s `saveptr`) until the right symbol is found or no symbols with a given name are left.