**Code style**

- In most programming languages **whitespace is ignored**
  - Leaves many options for styling
- The exact style is not important, no need to be “dogmatic” about it
- But it is very important to be **consistent**
  - Good style makes the code **readable**

**Naming conventions**

- Similarly, how we **name** things is important
  - variables
  - modules
  - functions
  - types
  - etc.
- Consistent naming greatly improves code quality

**In this class**

- The following slides present some style & naming choices
- The code used in the lectures follow this style
- You are **not** required to follow it
- But you are **are** required to consistently follow a specific style
Comments

- Makes it easy to toggle comments (Ctrl-/) in VS Code
- Don’t over-use comments
  - they should not explain what the code does
  - but how/why
- Don’t leave old garbage code in comments (Git keeps the history!)

Brackets

- One tab for each level
  - allows each developer to configure the tab size differently
- Alternative option: 4 spaces
  - appears the same in all editors
- Don’t mix the two

Pointer types

- Conceptually, int* is a type.
Variable declarations

```c
void foo() {
    int var1 = 1;
    int var2 = 3;
    ...
    int var3 = 3; // δε χρειάζεται πιο πάνω
    if(condition) {
        int var4 = 4; // var4 ορατό μόνο μέσα στο if
        ...
    }
    for(unsigned int i = 0; i < N; i++) { // i ορατό μόνο μέσα στο
        int var5 = 5;
        ...
    }
}
```

Names

- **Functions, variables, parameters**: lowercase_with_underscores
- **Types**: CamelCase
- **Constants**: UPPERCASE
- Choose readable names (not a, b, c, ...)
- In modules: prefix with name of module (or abbreviation)
  - avoids conflicts

How to test our code

- For simple code, we typically test it in `main`
  - often with input from the user
- This does not work for larger programs
  - Time consuming
  - Easy to miss edge cases
  - No automation
  - We tend to assume that xes remain forever
Unit Tests

- A **test** is a piece of code that tests some other code
  - e.g. tests a **module**
- It calls some functions of the module, then checks the result
- Each test should be **independent**
- It should test some basic functionality
  - especially edge cases

Advantages

- Re-run on every change
- Detect regressions
- Test different implementations of the same module
- Run in automated scripts (e.g. on **git push**)
- Write specifications even before writing the actual code
  - test-driven development

A simple test for stats.h

```c
#include "acutest.h"   // Απλή βιβλιοθήκη για unit testing
#include "stats.h"

void test_find_min(void) {
    int array[] = { 3, 1, -1, 50 };
    TEST_ASSERT(stats_find_min(array, 4) == -1);
    TEST_ASSERT(stats_find_min(array, 3) == -1);
    TEST_ASSERT(stats_find_min(array, 2) == 1);
    TEST_ASSERT(stats_find_min(array, 1) == 3);
    TEST_ASSERT(stats_find_min(array, 0) == INT_MAX);
}
```

A simple test for stats.h

```c
void test_find_max(void) {
    int array[] = { 3, 1, -1, 50 };
    TEST_ASSERT(stats_find_max(array, 4) == 50);
    TEST_ASSERT(stats_find_max(array, 3) == 3);
    TEST_ASSERT(stats_find_max(array, 2) == 3);
    TEST_ASSERT(stats_find_max(array, 1) == 3);
    TEST_ASSERT(stats_find_max(array, 0) == INT_MIN);
}
```

// Λίστα με όλα τα tests προς εκτέλεση
TEST_LIST = {
    { "find_min", test_find_min },
    { "find_max", test_find_max },
    { NULL, NULL } // τερματίζουμε τη λίστα με NULL
};
Test coverage

- How to know if the tests cover all functionalities of the code?
- Simple solution: check **which lines** are executed
- `lcov`: a test coverage tool for C
- Try the following in `sample-project`

```
  cd tests
  make coverage
  firefox coverage/index.html
```

Valgrind

- Tool to check memory access
- Finds memory **leaks**
- Also detects access of **deallocated** memory
- Simple use:

```
  valgrind ./program
```