

Fixes

Let's get started with the major fixes and improvements in C++17.

WE'LL COVER THE FOLLOWING



- New auto Rules For Direct-list-initialisation

We can argue what is a fix in a language standard and what is not.

Ahead, there are three things that might look like a fix for something that was missing or not working in the previous rules.

New auto Rules For Direct-list-initialisation

Since **C++11**, there's been a strange problem where

```
auto x = { 1 };
```

is deduced as `std::initializer_list<int>`. Such behaviour is not intuitive as in most cases you should expect it to work like `int x { 1 };`.

Brace initialization is the preferred pattern in modern C++, but such exceptions make the feature weaker.

With the new Standard, we can fix this so that it will deduce `int`. To make this happen, we need to understand two ways of initialization - **copy** and **direct**:

```
// foo() is a function that returns some Type by value
auto x = foo();    // copy-initialisation
auto x{foo()};    // direct-initialisation, initializes an
                  // initializer_list (until C++17)

int x = foo();    // copy-initialisation
int x{foo()};    // direct-initialisation
```



For the direct initialization, C++17 introduces new rules:

- For a braced-init-list with a single element, auto deduction will deduce from that entry.
- For a braced-init-list with more than one element, auto deduction will be ill-formed.

For example, lines 7 and 8 will cause errors in the code below. Highlighting them out will allow the code to compile successfully.

```
#include <iostream>
using namespace std;

int main(){

    auto x1 = { 1, 2 }; // decltype(x1) is std::initializer_list<int>
    auto x2 = { 1, 2.0 }; // error: cannot deduce element type
    auto x3{ 1, 2 }; // error: not a single element
    auto x4 = { 3 }; // decltype(x4) is std::initializer_list<int>
    auto x5{ 3 }; // decltype(x5) is int

}
```



Extra Info: The change was proposed in: [N3922](#) and [N3681](#). The compilers fixed this issue quite early, as the improvement is available in GCC 5.0 (Mid 2015), Clang 3.8 (Early 2016) and MSVC 2015 (Mid 2015). Much earlier than C++17 was approved.

Another improvement in the language is related to the `static_assert` method. Find out more in the next lesson.