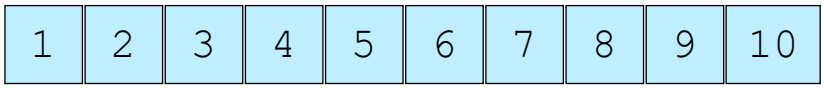
Arrays

The array type is perhaps the most popular sequential container. This lesson will cover its properties in detail.

This is what an array looks like:



std::array is a homogeneous container of fixed length. It needs the header `<array>`. The `std::array` combines the memory and runtime characteristic of a C array with the interface of `std::vector`. This means in particular, the `std::array` knows its size. You can use `std::array` in the algorithms of the STL.

You have to keep a few special rules in your mind to initialise a `std::array`.

- `std::array<int, 10> arr`: The 10 elements are not initialised.
- `std::array<int, 10> arr{}`: The 10 elements are default initialised.
- `std::array<int, 10> arr{1, 2, 3, 4, 5}`: The remaining elements are default initialised.

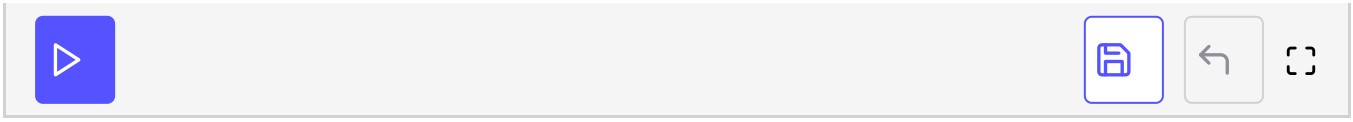
`std::array` supports three types of index access.

```
- arr[n];
- arr.at(n);
- std::get<n>(arr);
```

The most often used first type form with angle brackets does not check the boundaries of the `arr`. This is in opposition to `arr.at(n)`. You will get eventually a `std::range-error` exception. The last type shows the relationship of the `std::array` with the `std::tuple`, because both are containers of fixed length.

Here is a little bit of arithmetic with `std::array`.

```
// array.cpp
#include <iostream>
#include <array>
#include <numeric>

using namespace std;

int main(){
  std::array<int, 10> arr{1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
  for (auto a: arr) std::cout << a << " " ;    // 1 2 3 4 5 6 7 8 9 10
  cout << "\n";

  double sum= accumulate(arr.begin(), arr.end(), 0);
  std::cout << sum << std::endl;               // 55

  double mean= sum / arr.size();
  std::cout << mean << std::endl;              // 5.5
  std::cout << (arr[0] == std::get<0>(arr));   // 1 (1 represents true)

  return 0;
}
```



std::array