Time Duration Calculations

This lesson will explain which time duration operations are supported in C++.

The time durations support basic arithmetic operations, meaning you can multiply or divide a time duration by a number. Of course, you can compare time durations. I explicitly want to emphasize that all these calculations and comparisons respect the units.

With the C++14 standard, it gets even better; the C++14 standard supports the typical time literals.

Type	Suffix	Example
`std::chrono::hours`	h	5h
`std::chrono::minutes`	min	5min
`std::chrono::seconds`	s	5s
`std::chrono::milliseconds`	ms	5ms
`std::chrono::microseconds`	us	5us
`std::chrono::nanoseconds`	ns	5ns

How much time does my son Marius (17 years old) spend in a typical school day? I will answer the question in the following example and show the result in various time durations formats.

```
// schoolDay.cpp

#include <iostream>
#include <chrono>

using namespace std::literals::chrono_literals;
using namespace std::chrono;
using namespace std;

int main(){

  cout << endl;

  constexpr auto schoolHour= 45min;

  constexpr auto shortBreak= 300s;
  constexpr auto longBreak= 0.25h;

  constexpr auto schoolWay= 15min;
  constexpr auto homework= 2h;

  constexpr auto schoolDaySec= 2*schoolWay + 6 * schoolHour + 4 * shortBreak +
                               longBreak + homework;

  cout << "School day in seconds: " << schoolDaySec.count() << endl;

  constexpr duration<double, ratio<3600>> schoolDayHour = schoolDaySec;
  constexpr duration<double, ratio<60>> schoolDayMin = schoolDaySec;
  constexpr duration<double, ratio<1,1000>> schoolDayMilli= schoolDaySec;

  cout << "School day in hours: " << schoolDayHour.count() << endl;
  cout << "School day in minutes: " << schoolDayMin.count() << endl;
  cout << "School day in milliseconds: " << schoolDayMilli.count() << endl;

  cout << endl;

}
```

I have time durations for a German school hour (line 14), for a short break (line 16), for a long break (line 17), for Marius's way to school (line 19), and his homework (line 20). The result of the calculation `schoolDaysInSeconds` (line 22) is available at compile time.

> **Evaluation at Compile Time**

> The time literals (lines 14 - 20), the `schoolDaySec` in line 22, and the various durations (lines 27 - 29) are all constant expressions (`constexpr`). Therefore, all values will be evaluated at compile time; just the output is performed at runtime.

The accuracy of the time tick is dependent on the clock used. In C++ we have the clocks `std::chrono::system_clock`, `std::chrono::steady_clock`, and `std::chrono::high_resolution_clock`.