

# p0647r0 - Floating point value access for std::ratio

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## 1 Motivation

Preparing for standardizing units and using `std::ratio` for keeping track of fractions often one needs to get the quotient as a floating point number or as a number of a type underlying a quantity, e.g., a fixpoint type. Doing that manually means adding a cast before doing the division. This is tedious and it would be nice to just access the value, as one can do with `std::integral_constant`. I believe that omission is just a historical accident, because it was not possible to do compile-time computation with floating point values when `ratio` was invented. There are some options on how to access the fraction as a compile-time entity. I chose to make the value member a long double and provide a templated explicit conversion operator for accessing the fraction.

## 2 Acknowledgements

- Authors of N2661: Howard Hinnant, Walter Brown, Jeff Garland, Marc Paterno.
- Members of the LiaW workshop "Towards Units" at C++Now 2017: Billy Baker, Charles Wilson, Daniel Pfeifer, Dave Jenkins, Manuel Bergler, Morris Hafner, Nicolas Holthaus, Peter Bindels, Steven Watanabe, Tuan Tran.

## 3 Changes Proposed

Modify section 23.26.3 by inserting floating point access to the fractional value represented.

### 3.0.1 Class template `ratio`

[ratio.ratio]

```
namespace std {
    template <intmax_t N, intmax_t D = 1>
    class ratio {
    public:
        static constexpr intmax_t num;
        static constexpr intmax_t den;

        using type = ratio<num, den>;

        static constexpr long double value{ static_cast<long double>(num)/den };
        template<typename R>
        explicit constexpr operator R() const noexcept {
            return static_cast<R>(num)/static_cast<R>(den);
        }
    };
}
```