

# Adopt Selected Library Fundamentals V2 Components for C++17

*Document #:* WG21 P0295R0  
*Date:* 2016-03-01  
*Project:* JTC1.22.32 Programming Language C++  
*Audience:* LEWG  $\Rightarrow$  LWG  
*Reply to:* Walter E. Brown <[webrown.cpp@gmail.com](mailto:webrown.cpp@gmail.com)>

---

## Contents

1	Proposal . . . . .	<b>1</b>	4	Bibliography . . . . .	<b>2</b>
2	Proposed wording . . . . .	<b>1</b>	5	Document history . . . . .	<b>2</b>
3	Acknowledgments . . . . .	<b>2</b>			

---

## 1 Proposal

This paper proposes that the following selected components of [N4562] (Library Fundamentals V2) be adopted into the C++17 working paper:

- `gcd` and
- `lcm`

Together with the corresponding synopsis, the specification of these function templates comprise the entirety of subclause [numeric.ops] (13.1) in [N4562]. These function templates were adopted into Fundamentals 2 as proposed via [N4061]. They are now being proposed for C++17 for several reasons:

- They are very small, discrete components.
- Each is numerically very well understood, with an extremely long history<sup>1</sup>.
- They have proven extremely useful as fundamental building blocks in a great many application areas.
- Most significantly, their functionality is already part of every implementation, as implementation details underlying the arithmetic required by `<ratio>`; they have also been used in implementations of such algorithms as `rotate`.

## 2 Proposed wording

Add the components in the above list to the C++ working paper using the content for each component from the Library Fundamentals V2 working paper [N4562]. Move this content from the `std::experimental::fundamentals_v2` namespace to the `std` namespace. Strike `experimental/` from the header name. [These directions to the Project Editor are taken nearly verbatim from [P0220R0], as amended by subsequent LWG discussion.]

---

Copyright © 2016 by Walter E. Brown. All rights reserved.

<sup>1</sup>For example, the Euclidean algorithm for `gcd` has been dated to circa 300 B.C.E. according to [https://en.wikipedia.org/wiki/Euclidean\\_algorithm](https://en.wikipedia.org/wiki/Euclidean_algorithm).

### 3 Acknowledgments

This paper was drafted at the suggestion of Alisdair Meredith, and adopted valuable guidance provided by Beman Dawes and Jeffrey Yasskin; thank you, gentlemen.

### 4 Bibliography

- [N4061] Walter E. Brown: “Greatest Common Divisor and Least Common Multiple, v3.” ISO/IEC JTC1/SC22/WG21 document N4061 (pre-Lenexa mailing), 2014-06-30.  
<http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2014/n4061.pdf>.
- [N4562] Geoffrey Romer: “Working Draft, C++ Extensions for Library Fundamentals, Version 2.” ISO/IEC JTC1/SC22/WG21 document N4562 (post-Kona mailing), 2015-11-05.  
<http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2015/n4562.pdf>.
- [P0220R0] Beman Dawes: “Adopt Library Fundamentals V1 TS Components for C++17.” ISO/IEC JTC1/SC22/WG21 document NP0220R0 (pre-Jacksonville mailing), 2016-02-12.  
<http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2016/p0220r0.pdf>.

### 5 Document history

Revision	Date	Changes
0	2016-03-01	• Published as P0295R0.