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Non-member size() and more (Revision 2)

Introduction

This paper revises [N4155](#) "Non-member size() and more (Revision 1)" in response to feedback from the LWG. Please see the original paper, [N4017](#), for the rationale behind this proposal.

This paper includes the following change from N4155 as requested by the LWG:

- The proposed wording for overloads taking arbitrary C&/const C& now use a *trailing-return-type*.
- `empty()` for `initializer_list` is now specified with "Returns".

Proposed Wording

Modify the section 24.3 Header <iterator> synopsis [iterator.synopsis] by adding the following at the end of the synopsis:

// 24.8, container access:

```
template <class C> constexpr auto size(const C& c) -> decltype(c.size());
```

```
template <class T, size_t N> constexpr size_t size(const T (&array)[N]) noexcept;
```

```
template <class C> constexpr auto empty(const C& c) -> decltype(c.empty());
```

```
template <class T, size_t N> constexpr bool empty(const T (&array)[N]) noexcept;
```

```
template <class E> constexpr bool empty(initializer_list<E> il) noexcept;
```

```
template <class C> constexpr auto data(C& c) -> decltype(c.data());
```

```
template <class C> constexpr auto data(const C& c) -> decltype(c.data());
```

```
template <class T, size_t N> constexpr T* data(T (&array)[N]) noexcept;
```

```
template <class E> constexpr const E* data(initializer_list<E> il) noexcept;
```

Add a new section 24.8 Container access [iterator.container] containing the following:

In addition to being available via inclusion of the <iterator> header, the function templates in [iterator.container] are available when any of the following headers are included:

<array>, <deque>, <forward_list>, <list>, <map>, <regex>, <set>, <string>, <unordered_map>, <unordered_set>, and <vector>.

```
template <class C> constexpr auto size(const C& c) -> decltype(c.size());
```

Returns: c.size().

```
template <class T, size_t N> constexpr size_t size(const T (&array)[N]) noexcept;
```

Returns: N.

```
template <class C> constexpr auto empty(const C& c) -> decltype(c.empty());
```

Returns: c.empty().

```
template <class T, size_t N> constexpr bool empty(const T (&array)[N]) noexcept;
```

Returns: false.

```
template <class E> constexpr bool empty(initializer_list<E> il) noexcept;
```

Returns: il.size() == 0.

```
template <class C> constexpr auto data(C& c) -> decltype(c.data());
```

```
template <class C> constexpr auto data(const C& c) -> decltype(c.data());
```

Returns: c.data().

```
template <class T, size_t N> constexpr T* data(T (&array)[N]) noexcept;
```

Returns: array.

```
template <class E> constexpr const E* data(initializer_list<E> il) noexcept;
```

Returns: il.begin().

Acknowledgments

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Credit to Daniel Krügler for suggesting "container access" as the name of the new sub-clause in <iterator>.