

constexpr Functions

Chapter 2 Conditionally Safe Features

```
constexpr int h1(Lt* p) { return p->v; } // OK, parameter is a literal type.
constexpr int h2(Nlt* p) { return p->v; } // OK, " " " " "
constexpr int h3(Lt& r) { return r.v; } // OK, " " " " "
constexpr int h4(Nlt& r) { return r.v; } // OK, " " " " "
```

However, note that, because constructing an object of nonliteral type at compile time is not possible, there is no way to invoke `h2` or `h4` as part of a **constant expression** since the access of the member `v` in all of the above functions requires an already created object to exist. Pointers and references to nonliteral types can be **constexpr** provided they are not used to access their values at compile time:

```
Nlt arr[17];
constexpr Nlt& arr_0 = arr[0]; // OK, initializing a reference
constexpr Nlt* arr_0_ptr = &arr[0]; // OK, taking an address
constexpr Nlt& arr_0_ptr_deref = *arr_0_ptr; // OK, dereferencing but not using
static_assert(&arr[17] - &arr[4] == 13, ""); // OK, pointer arithmetic

constexpr int arr_0_v = arr_0.v; // Error, arr[0] is not usable.
constexpr int arr_0_ptr_v = arr_0_ptr->v; // Error, " " " " "
```

Literal types defined

As discussed, understanding which types are **literal types** is important for knowing what can and cannot be done during compile-time evaluation. We now elucidate how the language defines a **literal type** and, as such, how they are usable in two primary use cases:

- Literal types are eligible to be created and destroyed during the evaluation of a *constant expression*.
- Literal types are suitable to be used in the *interface* of a **constexpr** function, either as the return type or as a parameter type.

The criteria for determining whether a given type is a **literal type** can be divided into six parts:

1. Every scalar type is a **literal type**. Scalar types include all fundamental arithmetic (integral and floating point) types, all enumerated types, and all pointer types.

int	int is a <i>literal type</i> .
double	double is a <i>literal type</i> .
short*	short* is a <i>literal type</i> .
enum E { e_A };	E is a <i>literal type</i> .
T*	T* is a <i>literal type</i> (for any T).

Note that a pointer `T*` is *always* a **literal type**, even when it points to a type `T` that itself is *not* a **literal type**.