

Template Arguments

In this lesson, we will look at template arguments.

WE'LL COVER THE FOLLOWING ^

- Conversion
- Explicit Template Arguments
 - Automatic Return Type
- Default Arguments

Template arguments can automatically be deduced for function templates. The compiler deduces the template arguments for the function arguments. Function Templates act like functions.

Conversion

- The compiler uses simple conversions for deducing the template arguments from the function arguments.
- The compiler removes `const` or `volatile` from the function arguments. It converts C-arrays and functions to pointers.

The types of function arguments must be exact since no conversion takes place.

```
template <typename T>
bool isSmaller(T fir, T sec){
    return fir < sec;
}
isSmaller(1, 5LL); // ERROR int != long long int
```



Providing a second template parameter completes the example.

```
template <typename T, typename U>
```



```
bool isSmaller(T fir, U sec){
    return fir < sec;
}

isSmaller(1, 5LL);    // OK
```

Explicit Template Arguments

- They are necessary if the template argument cannot be deduced from the function argument.
- They are required if a specific instance of a function template is needed.

```
template <typename R, typename T, typename U>
R add(T fir, U sec){
    return fir * sec; }
add<long long int>(1000000, 1000000LL);
```

Missing template arguments are automatically deduced from the function arguments.

Automatic Return Type

By using `auto` and `decltype`, you can use function templates in the alternative function syntax that will automatically deduce their return type.

```
template< typename T1, typename T2>
auto add(T1 fir, T2 sec) -> decltype(fir + sec){
    return fir + sec;
}
auto res = add(1.2, 5);
```

- `auto`: indicates the delayed return type
- `decltype`: defines the return type

With C++14, `decltype(fir + sec)` is no longer necessary.

Default Arguments

- The default for template parameters can be specified for class templates and function templates.

- If a template parameter has a default parameter, all subsequent template parameters also need a default argument.

```
template <typename T, typename Pred = std::less<T>>  
bool isSmaller(T fir, T sec, Pred pred = Pred()){  
    return pred(fir, sec);  
}
```



Let's take a look at a few examples of template arguments in the next lesson.