

- Solution

We'll learn different approaches to solve the previous challenge.

WE'LL COVER THE FOLLOWING



- Solution 1: Using Function Arguments
 - Explanation
- Solution 2: Using Template Arguments
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- Solution 3: Using Template Arguments and Function Arguments
 - Explanation

Solution 1: Using Function Arguments

```
// power1.cpp

#include <iostream>

int power(int m, int n){
    int r = 1;
    for(int k=1; k<=n; ++k) r*= m;
    return r;
}

int main(){
    std::cout << power(2,10) << std::endl;
}
```



Explanation

We're using a **for** loop to compute the power. The loop runs a total of **n** times by multiplying the number **m** by **r** for every iteration of the loop in line 7.

For a more in-depth insight into the solution above, click [here](#). It shows how

things are handled at the assembler level.

The critical point of this example is that the function runs at runtime.

Solution 2: Using Template Arguments

```
// power2.cpp

#include <iostream>

template<int m, int n>
struct Power{
    static int const value = m * Power<m,n-1>::value;
};

template<int m>
struct Power<m,0>{
    static int const value = 1;
};

int main(){
    std::cout << Power<2,10>::value << std::endl;
}
```



Explanation

The call `Power<2, 10>::value` in line 16 triggers the recursive calculation. First, the primary template in line 5 is called, then the `Power<m, n-1>::value` in line 7 is executed. This expression instantiates recursively until the end condition is met: `n` is equal to 0. Now, the boundary condition in line 12 is applied, which returns 1. In the end, `Power<2, 10>::value` contains the result.

To view how things are happening at the assembler level, click [here](#).

The critical point is that the calculation is done at compile-time.

Solution 3: Using Template Arguments and Function Arguments

```
// power3 .cpp

#include <iostream>

template<int n>
```

```

int power(int m){
    return m * power<n-1>(m);
}

template<>
int power<1>(int m){
    return m;
}

template<>
int power<0>(int m){
    return 1;
}

int main(){
    std::cout << power<10>(2) << std::endl;
}

```



Explanation

In the code above, the `power` function template exists in three variations. First, in the primary template in line 6. Second and third in the full specializations for 1 and 0 in lines 11 and 16. The call `power<10>(2)` triggers the recursive invocation of the primary template. The recursion ends with the full specialization for 1. After studying the example carefully, note that the full specialization for 1 is not necessary in this case because the full specialization for 0 is also a valid boundary condition.

When we invoke the `power<10>(2)` function, the argument in `()` brackets is evaluated at run-time and the argument in `<>` brackets is evaluated at compile-time. Therefore, we can say that the round brackets are run time arguments and the angle brackets are compile-time arguments.

Click [here](#) to view the assembler code.

In the next lesson, we'll learn about class templates in detail.